EMERGENT URBAN RESILIENCE IN UKRAINE: ADAPTING TO POLYCRISIS IN TIMES OF WAR

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Abstract:
The concept of urban resilience is becoming increasingly significant as cities across the globe grapple with an array of pressing challenges, including those posed by climate change, socio-political conflicts, and economic instability. In contrast to structural resilience, emergent resilience arises spontaneously in response to unforeseen challenges, namely during or at the time of the challenge. One such challenge is the Russian military aggression against Ukraine and its cities. This paper presents an initial investigation into the concept of emergent urban resilience in the context of the ongoing war in Ukraine. The principal aim is to develop a systematic understanding of the nature of emergent resilience in such a crisis context and to emphasize the importance of examining the phenomenon of emergent resilience in urban contexts during periods of acute crisis, as well as in the subsequent period. This represents a hitherto under-explored type of case within the resilience discourse.

Key words: urban resilience, emergent resilience, polycrisis, adaptability, war, national security, Ukraine.

ВИНИКАЮЧА МІСЬКА СТІЙКІСТЬ В УКРАЇНІ: АДАПТАЦІЯ ДО ПОЛІКРИЗИ В УМОВАХ ВІЙНИ

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Анотація:
Концепція міської резильєнтності (стійкості) набуває все більшого значення, оскільки міста у всьому світі стикаються з низкою актуальних викликів, зокрема пов'язаних зі змінами клімату, соціально-політичними конфліктами та економічною нестабільністю. На відміну від структурної стійкості, виникаюча стійкість формується спонтанно у відповідь на непередбачені виклики, переважно під час або в момент їх появи. Одним із таких викликів для українських міст стала військова агресія Росії. У цій статті представлено результати початкового етапу дослідження концепції виникаючої міської стійкості в контексті триваючої війни в Україні. Головною метою є розробка наукового розуміння природи виникаючої стійкості в умовах гострої кризи та підкреслення важливості вивчення цього явища в міському середовищі як у період кризи, так і після неї. Погляд на міську стійкість через призму полікризи підкреслює її багатовимірну та полімасштабну природу. Такий фокус звертає увагу на необхідності розуміння того, як розвиваються процеси стійкості, чи залишаються вони появою та імпровізацією, чи переходять у більш стабільні інституціоналізовані системи. Випадок України ілюструє потенціал невідкладної стійкості для створення більш надійних, гнучких і сталих міських структур у відповідь на екстремальний стрес, пропонуючи критичні ідеї як для негайного відновлення, так і для довгострокової адаптації. Отримані знання в результаті вивчення виникаючої стійкості в українських містах створюють основу для розуміння того, як будувати більш адаптивні, інклюзивні та стійкі міські системи. Надалі важливо розробляти інструменти та методології, які не лише підтримують дослідження стійкості, але й сприяють їх практичному застосуванню.

Ключові слова: міська резильєнтність, виникаюча стійкість, полікриза, адаптивність, війна, національна безпека, Україна.

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Introduction

Russia's war against Ukraine highlights the interconnectedness of modern crises, combining geopolitical conflict, humanitarian issues, urban disruption, ecological disasters, food insecurity, demographic collapse, energy shortages, and public health risks. This war illustrates the broader trend of increasing global instability, where multiple crises, often referred to as polycrisis, interact in complex and unpredictable ways (Lawrence et al., 2024), exacerbating cities' vulnerabilities and creating new challenges. In this context, urban resilience, understood as both process and structure, has gained unprecedented importance as a way of understanding how communities and systems can adapt and survive in the face of threats.

The concept of emergent urban resilience holds particular significance in understanding how cities respond to unforeseen crises. Unlike formal resilience, which relies on pre-established structures and plans, emergent resilience encompasses the spontaneous and adaptive actions of communities in response to extreme and unpredictable challenges. This perspective offers deeper insights into the diverse ways cities cope with natural disasters, technological catastrophes, wars, or armed conflicts, each shaped by the unique circumstances of their locality. It highlights the critical role of flexibility, local expertise, and community-driven initiatives in fostering urban resilience during periods of acute crisis.

Why is it particularly relevant to discuss emergent resilience in Ukraine right now?

This question can be addressed from two distinct perspectives. The initial perspective concerns the war, which functions as an immediate test of the concept of emergent resilience. This type of resilience had not previously manifested at least for the European realm, as there were no comparable large-scale challenges within the last few decades that could provoke its emergence. The present context encompasses the phenomenon of urbicide, or the unprecedented destruction of urban areas, occurring within the context of the largest war of the 21st century, which is characterized by a multiplicity of forms of urbicide (Mezentsev & Mezentsev, 2022; Malchykova & Pylypenko, 2022). This can be characterized as a multi-faceted assault on the urban environment. Furthermore, the situation is exacerbated by the challenges of protracted mass internal displacement and refugee crises (Sereda, 2023; Havryliuk, 2022). Furthermore, the capacity of local communities to engage in resilient recovery represents a significant challenge.

The second perspective is framed by a polycrisis interpretation (Lawrence et al., 2024; Soldak & Mykhailenko, 2024). Ukrainian cities are navigating a convergence of crises, including economic instability, armed conflict, the global Covid-19 pandemic, and the ongoing full-scale war. These crises are deeply rooted in historical processes, such as the late socialist era, the collapse of the Soviet Union, and the drawn-out transition to a market economy. In this sense, Ukrainian cities are experiencing a prolonged poly-crisis, further intensified by global instability and the persistent threat of future military conflicts with the aggressor country.

Together, these perspectives position Ukrainian cities as a unique case for advancing the theorization of urban resilience. They provide invaluable insights into the dynamics of emergent resilience, offering a deeper understanding of how cities can adapt to unprecedented and multifaceted challenges.

This paper represents an initial investigation into the concept of emergent urban resilience in the context of the ongoing war in Ukraine, focusing on its critical role during periods of acute crisis. Centred on Ukrainian cities affected by Russia's full-scale aggression, the study highlights the importance of understanding emergent resilience as a key factor in urban sustainability. Additionally, it draws attention to the broader binational research project, EMBRACE[1], which examines resilience in extreme contexts and underscores its significance in addressing the challenges of conflict.

The article's primary objective is to address the following central research question: Why does the experience of Ukrainian cities during the war provide a valuable contribution to the understanding and developing emergent urban resilience in extreme crisis contexts? By doing so, it seeks to encourage further research that expands the existing debate, which has often overlooked the challenges of war and armed conflict in discussions of resilience.

Emergent urban resilience in a changing world

In recent decades, resilience has become a key concept for understanding how natural, social, and urban systems respond to disturbance. Initially rooted in ecology (Holling, 1973), resilience referred to the ability of ecosystems to absorb shocks and maintain their function. This idea has since been adapted across disciplines (e.g. Folke, 2006; Cutter et al., 2008), reflecting the growing need to understand complex and interconnected systems in a rapidly changing world.

In the context of cities, resilience has become increasingly significant as urban areas worldwide confront escalating challenges, including climate change, socio-political conflicts, and economic instability (Coaffee & Lee, 2016; Cutter et al., 2008; Baker & World Bank, 2012; Meerow & Newell, 2019; Burayidi, 2020). Urban resilience integrates physical infrastructure, social networks, governance frameworks, economic systems, and community dynamics, all of which must function together to enable cities to navigate uncertainties and crises effectively. This interconnected approach is vital not only for urban stability but also for broader national and global security (Macrae, 2019; Meerow & Newell, 2019). Addressing the complexity of overlapping crises in an unpredictable world necessitates interdisciplinary and transdisciplinary strategies, aimed at fostering multi-dimensional resilience systems capable of adapting to diverse challenges (Fathi, 2022; Fouda et al., 2023).

[1] Research project EMBRACE – Emergent Resilience: Mobilizing and Building Responsive and Adaptive Communities. https://www.staedtebau.rwth-aachen.de/cms/staedtebau/forschung/forschungsprojekte/stadtgestaltung-baukultur-und-staedteba/~bksgjg/embrace/?lidx=1

The concept of resilience is essential because it offers a framework that extends beyond mere survival, emphasizing adaptability, learning, and transformation (e.g., Meerow, Newell, & Stults, 2016). Resilience enables cities not only to recover from disruptions but also to proactively adapt and innovate, strengthening urban systems to better withstand future shocks and uncertainties (e.g., Folke, 2006; Meerow et al., 2016). This broader perspective is particularly crucial when examining cities in conflict zones, where resilience is tested at both systemic and community levels and often requires improvisation to respond to rapidly changing and extreme conditions (e.g., Lawrence et al., 2024; Pilav, 2012).

A key distinction in resilience literature is made between formal, pre-established resilience and emergent resilience. Formal resilience refers to structures and systems deliberately designed to mitigate risks and respond to crises (e.g., Alexander, 2013; UNDRR, 2015). This includes policies, emergency plans, and infrastructure investments established in advance. Such resilience is typically institutionalized and embedded within governance frameworks (e.g., Tierney, 2014; Pelling, 2011).

In contrast, emergent resilience arises spontaneously in response to unforeseen challenges, developing during or at the time of the crisis (e.g., Davoudi, 2012; MacKinnon & Derickson, 2013). It is characterized by the adaptive behavior of individuals, communities, and informal networks — whether social or digital — that unite to address immediate needs. Unplanned by nature, emergent resilience relies heavily on social cohesion, mental resilience, innovation, and local knowledge (e.g., Norris et al., 2008; Macrae, 2019).

Emergent resilience plays a vital role in sustaining shock-stricken cities by ensuring that basic functions either continue or are quickly restored, enabling the city to survive physically, socially, and functionally while laying the groundwork for long-term stabilization. During crises, emergent resilience is crucial in filling the gaps left by formal systems, enabling communities to survive and adapt when institutional support is absent, fails, or proves insufficient for ongoing challenges.

At the international level, the concept of urban resilience has been shaped by frameworks such as the United Nations' Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, which emphasize the importance of building resilient cities (see also Egerer et al., 2021). In Europe, scholarly work has particularly focused on the importance of multi-level governance, (flood) risk and disaster management, the integration of blue-green as well as climate change adaptation infrastructure, and the promotion of social equity and (environmental) justice as foundational elements for fostering resilience.

Urban resilience concept evolution in the Ukrainian context

In the context of Ukrainian academic discourse, the concept of resilience is largely aligned with the prevailing understanding observed in relevant international literature. However, while resilience serves as an overarching concept, encompassing diverse interpretations and approaches, most Ukrainian studies adopt a broad and elastic view, often attempting to cover its full spectrum within a single study. The discourse can be summarised by four key specificities.

Firstly, there is significant terminological ambiguity regarding the translation of "resilience" into Ukrainian, with no established consensus on its interpretation. Commonly used terms include "стійкість," "резильєнтність," and "життєстійкість." However, "стійкість" is often translated into English as "stability" or "sustainability," while "sustainability" itself is rendered as "сталість" or "самопідтримуваність." This overlap creates terminological confusion, frequently leading to a conflation of the concepts of resilience and sustainability.

Secondly, the concept of resilience has undergone significant evolution, reflecting changes in research focus and the emergence of new challenges. Initially centered on national and regional scales, resilience research has increasingly shifted toward urban and community-level perspectives (Soldak, 2023; Pankova, 2024; Serzhan, 2024). This transition also reflects a broader evolution from resilience in the context of natural and technological disasters to addressing pandemics, armed conflicts, and the complexities of full-scale war and post-war recovery (Serzhan, 2023; Pankova, 2024).

Following Ukraine's independence in 1991, the country faced significant socio-economic and political challenges that profoundly impacted urban development. During this period, urban resilience was primarily conceptualized in terms of socio-economic stability, environmental protection, and addressing the legacy of post-Soviet centralized urban planning. Efforts focused on improving infrastructure, mitigating environmental degradation, and transitioning to a more inclusive governance model. Resilience during this era was framed as planned or formal, emphasizing institutional structures and pre-established policies. External and internal pressures, including Ukraine's lagging economic growth compared to European nations (World Bank, 2024), prompted legislative reforms aimed at territorial development. However, the fragmented and varied implementation raised concerns about policy coherence (Shults, 2014).

The annexation of Crimea in 2014 and the subsequent conflict in Eastern Ukraine marked a critical turning point, highlighting the necessity for adaptive resilience in the face of geopolitical instability. Ukrainian cities were forced to respond to new realities, including population displacement, economic uncertainty, and military threats. Decentralization reforms, such as the redistribution of political and financial powers (Verkhovna Rada of Ukraine, 2014), empowered communities to address urgent needs, such as housing and social services, while integrating internally displaced persons. This period also saw increased reliance on local networks and community-level initiatives, which began playing pivotal roles in urban stability and rapid adaptation.

By 2021, the concept of resilience was formally integrated into state management through the *Concept*

of Ensuring the National Resilience System, identifying cities as key stakeholders (Verkhovna Rada of Ukraine, 2021). This framework reflected the ongoing evolution from formal to emergent resilience, as cities faced hybrid threats combining socio-economic, political, and military pressures. Ukrainian cities' adaptive strategies during this period underscore the importance of combining institutional and community-driven responses to navigate complex crises.

Thirdly, the concept of resilience is closely intertwined with several related concepts. This is especially relevant in the context of infrastructure destruction caused by bombings and shelling, as well as climate change adaptation. The discourse includes notions such as "reliable infrastructure," "green infrastructure," and "adaptive social infrastructure" (Dronova & Kononenko, 2019; Uninets, 2022; Savytska & Kurian, 2023). Resilience is also explored in relation to urban transportation networks, energy supply systems, and other critical infrastructures affected during wartime.

Another significant focus is the resilience of cities with a socialist legacy, often viewed as contributing to weaker societal engagement due to the lack of civil society under socialism (Mezentsev et al., 2017). At the same time, this legacy is seen as fostering greater adaptability to societal shocks, a trait rooted in Soviet history, particularly during perestroika, the Chernobyl disaster, and the collapse of the USSR. As a result, resilience is frequently analyzed through the lens of path-dependence.

Further studies highlight the interconnections between resilience and related concepts such as openness (transparency, inclusiveness, accessibility), affectedness and urban trauma, as well as the smart economy, smart cities, and the digital turn (Pankova, 2024; Uninets, 2022). Resilience is also interpreted in the broader context of globalization and modernity. Instead of fully integrating resilience into these frameworks, the focus tends to be on its relevance in a contemporary, globalized, and urbanized world.

Fourthly, attempts to justify resilience indicators or how they are measured are also notable. The discussion encompasses a variety of indicator sets for urban resilience assessment and the development of a specific resilience index (Venhryn, 2023; Serzhan, 2023). Conversely, scholars have also considered resilience within specific communities, cities, or regions, elaborating on measurement approaches such as he "degree of resilience", "level of resilience", "capacity of resilience" and "resilience potential" (e.g. Brunn et al., 2021; Dronova & Kononenko, 2019). Concurrently with the development of academic discourse, the term "resilience" is becoming increasingly prevalent in the public sphere. It is the subject of numerous forums, workshops, panel discussions, and public lectures on popular science. In this context, several key areas of focus emerge. The most prevalent theme is post-war recovery through resilience discussions, including the search for rebuilding principles for Ukrainian cities. Another area of focus in public discourse is the planning perspective. In particular, these discussions emphasise a participatory approach to planning, integrating resilience into urban development concepts, enhancing municipal capacities, and addressing public safety, social policy, and other domains.

Recently, in the context of reconstruction and recovery in Ukraine, international networks have been established (e.g. within the framework of UNDRR activities) that employ the term "post-conflict resilience". These networks emphasise the importance of capacity building for the long-term and sustainable recovery of Ukrainian cities and the formation of new alliances in Ukraine. Furthermore, international actors are being engaged in order to ensure a better equipment to tackle current and future challenges (UNDRR, 2024).

Learning emergent urban resilience from war

The full-scale Russian invasion of Ukraine in February 2022 profoundly disrupted global economic and political stability, imposing unprecedented challenges on Ukrainian cities and testing the limits of resilience. Resilience has become central to political discourse, particularly as it relates to national security, while at the practical level, it has been crucial for urban areas to adapt to persistent shelling, infrastructure destruction, and large-scale displacement. Emergent resilience, characterized by the spontaneous actions of local communities, informal networks, and grassroots organizations, has played a vital role in addressing the gaps left by overwhelmed formal systems. This adaptive and evolving form of resilience has proven indispensable for urban survival during the war, offering valuable lessons for fostering urban systems capable of withstanding current challenges and adapting to future uncertainties.

Urban resilience in wartime operates inherently across multiple scales, involving a complex interplay of actors, entities, resources, and processes. At the individual and neighborhood levels, resilience manifests in coping strategies such as securing food and water, preserving seeds for the restoration of urban ecosystems, and establishing mutual aid networks (Pilav, 2012). These localized efforts interact with broader city governance structures and national policy frameworks, which coordinate emergency responses, manage displaced populations, and maintain critical infrastructure. Efforts also extend to the natural environment, addressing issues such as the decontamination of soil and water bodies polluted during the ongoing war. This intricate web of interactions underscores the interconnectedness of resilience, where actions at one scale influence resilience across others (Folke, 2006).

Examining urban resilience through the lens of polycrisis highlights its multi-dimensional and cross-scale nature. These dynamics emphasize the need to understand how resilience processes evolve, whether they remain emergent and improvisational or transition into more stable, institutionalized systems. The Ukrainian case illustrates the potential for emergent resilience to inform more robust, flexible, and sustainable urban frameworks in response to extreme stress, offering critical insights for both immediate recovery and long-term adaptation.

The concept of urban resilience is inherently multi-dimensional, encompassing domains such as individual security, social cohesion, economic stability,

environmental integrity, and mental well-being. In the context of armed conflict, urban areas must develop comprehensive and multifaceted strategies to protect residents and maintain essential services. Resilience, in this context, refers to the capacity to adapt to a variety of shocks, whether immediate and physical, such as missile attacks, or prolonged, such as economic decline, infrastructure destruction, and food shortages.

The natural environment also requires resilience to withstand the impacts of conflict, such as rocket fire and fires. However, research on this aspect remains limited, with the exception of a few studies, notably from the Yugoslav civil war in the 1990s (Lacan et al., 2024). To provide effective protection and adaptation for urban populations, it is crucial to address each dimension of resilience with tailored, context-specific responses.

The war has underscored the deep interdependence of urban systems, encompassing economic, ecological, social, and psychological dimensions. To effectively address urban resilience, it is crucial to adopt a holistic perspective that recognizes the intricate connections between these domains. Economic resilience, for instance, is closely tied to social resilience, as economic stability reinforces community cohesion and access to vital resources. In this context, Ukrainian communities have demonstrated remarkable adaptability by organizing and mobilizing resources to address challenges such as waste management resulting from destruction. Despite limited financial, technical, and human resources, they have coordinated efforts for waste sorting and removal to specialized sites while identifying temporary storage locations in compliance with regulations (Rubryka, 2024). Population migration, whether of internally displaced persons or refugees, further emphasizes the critical role of psychological resilience. Mental health becomes a cornerstone of community stability, underscoring the importance of addressing emotional and social well-being alongside physical recovery. Understanding these interconnected aspects provides a more comprehensive framework for analyzing and fostering urban resilience in the face of wartime adversities.

The Ukrainian case provides a valuable opportunity to learn from a wide spectrum of situations, as the impacts of the war vary significantly across communities due to both the immediate effects of the conflict and pre-existing conditions (e.g., as the state of a city's infrastructure, level of economic development, community cohesion, etc.). In areas directly affected by the conflict, immediate threats to physical survival and security, along with the destruction of critical infrastructure and housing, are particularly pronounced. Conversely, in less impacted regions, the focus shifts to managing economic repercussions, integrating internally displaced persons, and assisting relocated enterprises in resuming operations. For example, in safer regions, the relocation of enterprises from frontline territories posed significant challenges, requiring swift identification of suitable locations and resolution of logistical issues, such as impacts on utilities and the recruitment of qualified personnel. Effective communication with entrepreneurs became critical, enabling businesses to seek assistance and collaborate with local stakeholders. In some cases, communities provided temporary warehousing facilities for equipment from evacuated businesses, allowing decisions on permanent relocation to be made under calmer conditions (Kozytskyi, 2024; Zaparanyuk, 2024).

This diversity in both pre-war conditions and wartime impacts necessitates tailored approaches and adaptive actions, revealing the multifaceted nature of emergent resilience. The variation between communities demonstrates how resilience strategies must account not only for the challenges posed by the conflict but also for the structural and social characteristics that existed beforehand. These insights underscore the importance of understanding resilience as a dynamic, context-sensitive process that evolves in response to unique local circumstances.

Emergent resilience in Ukrainian cities is a dynamic process that evolves in response to changing circumstances, initially arising as an improvised, resource-dependent reaction to immediate crises. Over time, these spontaneous efforts, such as community-based initiatives or digital aid networks co-designed on social media, often transition into formalized structures, becoming integrated into urban resilience strategies (Macrae, 2019; Triandafyllidou & Yeoh, 2023). While this evolution enhances preparedness and stability, it may reduce the flexibility and adaptability that are crucial in rapidly changing environments. The Ukrainian experience highlights how resilience has shifted across three phases: pre-war, wartime, and an imagined post-war future. Before the war, resilience relied on institutional frameworks and urban planning, while the conflict introduced a greater emphasis on rapid adaptation, improvisation, and the mobilization of local knowledge and networks. Looking forward, post-war resilience will require blending emergent and formal approaches to rebuild cities, address immediate and long-term impacts, and enhance sustainability and health. These insights, drawn from Ukraine's experience, offer a foundation for developing adaptive, inclusive urban resilience strategies that are better equipped to navigate future challenges, including global issues such as climate change, which particularly affect vulnerable urban populations (Lin et al., 2021).

How do we move on from this point?

The insights gained from studying emergent resilience in Ukrainian cities offer a foundation for understanding how to build more adaptive, inclusive, and sustainable urban systems. Moving forward, it is essential to develop tools and methodologies that not only support resilience research but also facilitate its practical application. This includes enhancing digital tools for urban profiling and implementing resilience strategies, as well as institutionalizing resilience by establishing dedicated resilience programs and centers to reinforce urban capabilities.

The ongoing debates about recovery paths—whether to pursue short-term recovery or focus on long-term sustainable development—underscore the complex decisions facing Ukrainian cities. This discourse also touches upon differing principles of recovery, such

as "build back better" versus "build forward better," emphasizing the need to tailor recovery strategies to the specific conditions and challenges of each city. Issues like infrastructure and housing reconstruction, mental health support, and climate adaptation are central to these discussions, as well as the importance of learning from European resilience experiences to integrate Ukrainian cities into a broader network of resilient urban systems.

Practically, emergent resilience raises critical questions across several implementation fields. In housing, there is a need for quality standards for temporary and transitional accommodations for displaced populations, fostering solidarity and ad-hoc support networks, and planning for sustainable reconstruction including non-fossil energy supply. Infrastructure resilience must also be enhanced and modernised, with a focus on maintaining essential services like energy, water, transportation, and digital connectivity during crises. Urban nature plays a key role in resilience, supporting ecological recovery, mental well-being, and climate adaptation through initiatives like urban gardening and green and/or carbon neutral reconstruction. Human resources, affected by migration and demographic shifts including population ageing and age cohort gaps, require strategies to address the loss of expertise while leveraging community solidarity and adaptability.

Our project, *EMBRACE*, aims to contribute to these efforts by taking a transdisciplinary approach to both concept formation and knowledge gathering. By connecting various sources of knowledge and reconciling inductive and deductive research methods, we seek to deepen the understanding of emergent resilience and contribute to global resilience discourse, particularly by examining Ukrainian experiences. Our focus is on documenting how communities, local organizations, and urban systems adapt to extreme crises, especially how emergent resilience transitions into more formalized structures to meet both immediate and long-term challenges.

We invite scholars, practitioners, and stakeholders to engage with us in further refining the concept of emergent resilience. Your insights and expertise are vital as we work together to create more resilient urban environments capable of adapting to the uncertainties of the future. By bridging the gap between theory and practice, we can foster urban systems that not only withstand crises but also thrive amidst them.

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