

**TYOLOGY AND INFLUENCE OF CRISIS PERIODS ON THE DEVELOPMENT OF RESIDENTIAL BUILDINGS IN MODERN CITIES**

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**Abstract.** The impact of crisis periods on the development of modern cities and residential development is an extremely important aspect of urban infrastructure analysis and planning. Different types of crises, including natural crises, economic crises, social conflicts, pandemics, military conflicts and others, can have different consequences for cities and residential development. In the context of crisis periods, cities need to be prepared for the challenges that may arise. This means developing effective action plans that include adapting to new conditions, restoring the housing stock, ensuring housing affordability and protecting residents from various threats. It is also important to remember that crises can test the resilience of cities and housing infrastructure, but they can also create opportunities for improvement and innovation. Bringing authorities, communities and developers together to work and develop together can help create more resilient and viable housing estates that meet the demands of the new realities.

The purpose of this paper is to study the typology of crisis periods for modern cities, to identify different types of crises, their characteristics and impact on the development of residential development. The study was conducted using graph analytical and mathematical methods. The research requires the use of methods of both general scientific nature (systematic analysis and synthesis) and those borrowed from other fields of knowledge (philosophy, economics, sociology, psychology), which is explained by the phenomenological nature of the research object itself.

In general, given the different types of crisis periods, it is important to develop comprehensive strategies to ensure the sustainability and safety of housing in modern cities. Responding to and recovering from crises determines how successful the development of cities and housing infrastructure will be in the future.

**Keywords:** crisis periods, urban development, residential development, impact of crisis periods on urban development, development of residential development in crisis periods.

**Introduction.** The impact of the crisis periods on the development of residential buildings in modern cities is the topic that reflects the multi-aspect interaction between social, economic, technological, and cultural factors in the structure formation of the urban environment. The history of urban development shows that the crises, regardless of their nature, have always been accompanied by the impact on urban development and residential development. From the collapse of economic systems to the global conflicts, from the natural disasters to the epidemics, these crises lead to the changes in the residents' lifestyle, new requirements for existing and new development to help them adapt to new realities.

This article examines the typology of the crisis periods for urban settlements, their impact and consequences on housing infrastructure and urban structure to better understand the contribution that crises make to the formation of the modern city.

**Analysis of recent research and publications.** The scientific work [1] uses the basic methodology of Kulp and Strauss (2017) to assess the vulnerability of affordable housing (and general housing for comparison), who defined the expected annual vulnerability – the amount of a certain variable (e.g., dwelling stock) that is expected to be affected by at least one coastal flood risk event during a current year. The vulnerability of individual buildings and housing units within them is assessed by calculating their expected annual exposure and a new metric is introduced – the expected

annual number of flood risk events – the expected total number of flood risk events that each building/unit may have. During the crisis, the community members need a clear understanding of what is happening and that an effective response to the crisis will not be delayed. People want to know how the crisis will affect them and how to get help. In addition, the public safety agencies, emergency services and volunteers need to be informed quickly. Crisis communication is the link between the local authorities and the community – the community members, civic activists and other groups – before, during, and after the crisis. The need for crisis communications also lies in the fact that they can not only lighten or eliminate the crisis consequences but can sometimes build a more positive reputation for an organization than it had before the crisis [2].

**Problem definition.** The study of the typology of crisis periods for modern cities, the definition of different types of crises, their characteristics and impact on the development of residential development. The vision of the characteristics of crisis periods will help cities to develop more effective strategies for managing, adapting and responding to the challenges they may face in future.

**Aims and goals.** To study the typology of crisis periods for modern cities, to identify different types of crises, their characteristics and impact on the development of residential development.

**Materials and research methodology.** The materials for this study are the typology of residential development in modern cities. In particular, the typology of crisis periods for urban settlements, their impact and consequences for the housing infrastructure and the structure of the cities were considered in order to better understand the crises contribution to the formation of the modern city. The combination of the results research of the available material base and the theoretical foundations of residential development typology in modern cities became the main methodological basis of this research paper.

**The main part.** In today’s world, the cities face a variety of challenges and crises that can dramatically affect their development and functioning [3]. Providing the constant changes in the geopolitics, society, technology and environment, the cities are becoming real centers of adaptation and innovation [4]. In such circumstances, it is important to develop the comprehensive strategies and action plans to solve various types of crisis situations. Crisis periods for modern cities can be different according to their nature and consequences. These crises pose the challenges to safety, economic sustainability, public health, housing infrastructure, and many other aspects of urban life [5]. In this context, the classification system can be useful for understanding and analyzing crisis situations. Depending on the cause, the crisis periods for the cities are divided into the following main groups (Fig. 1).

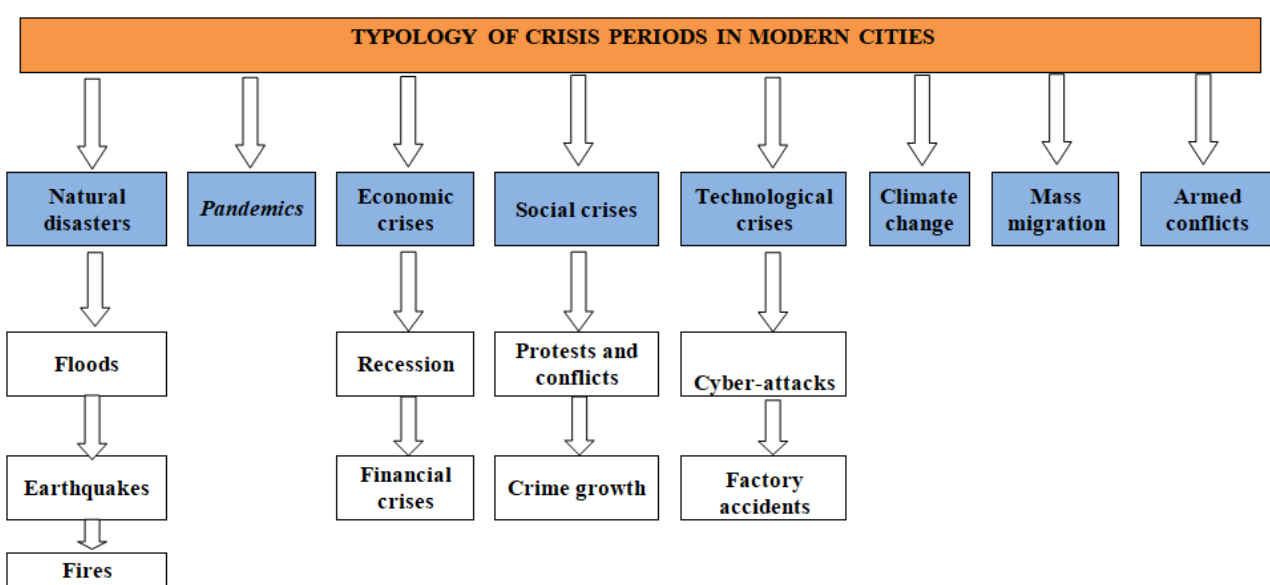


Fig. 1. Typology of the crisis periods in modern cities depending on the causes of the crisis

*Natural disasters.*

*Floods* – the high-water levels can lead to urban flooding and damage of the infrastructure and residential buildings. The most common consequence of floods is the water flooding of the residential areas [1]. This can lead to the destruction of the buildings, damage of the property, and life danger. The low-rise residential buildings are particularly affected by the floods (Fig. 2).

The studies show that it is the so-called affordable and social low-rise housing that is most often affected, as its residents are the most vulnerable group of the community.



Fig. 2. USA, Los Angeles, New Orleans. Residential development and flooding (Hurricane Katrina), 2005

The floods can also result in the mixing of wastewater with the water bodies, which can lead to the pollution of water sources and endanger human life or health.

In future, when developing a strategy for the development of residential areas, it is possible to provide the list of the recommendations and additional requirements for the residential premises [6]. Such as a higher ground floor level, additional drainage systems and other measures to prevent the future flooding of the residential premises.

*Earthquakes* – the seismic activity can lead to the destruction of the residential buildings, infrastructure, and casualties among the city residents. Depending on the development density and terrain, the earthquake consequences may vary in the scale and number of resources required for the recovery.

It should also be noted that in the seismic areas, the requirements and building codes for the design of residential and public buildings are more stringent (especially in terms of the structural diagram of the buildings). However, there are large-scale earthquake damage almost every year (Fig. 3).

*Fires* – the forest fires or urban fires can create emergencies (Fig. 4) and lead to the destruction of residential buildings, including the residential blocks and infrastructure. This can require large resources to rebuild housing and infrastructure. Such crises create an immediate danger for the lives and safety of the residents. The residential development should take into account safety standards, such as availability of layouts to facilitate quick exits and equipping dwellings with fire safety systems.





Fig. 3. Turkey, Gaziantep city. Effects of the earthquake and destruction in the residential blocks, 2023



Fig. 4. USA, California, Santa Rosa. Effects of the wildfire and affected low-rise residential buildings, 2017

*Pandemics.* The global diseases – the pandemics, such as COVID-19, can lead to a large spread of disease and require the control and treatment measures. In the short term, such large-scale crises have a significant impact on the urban development. For example, the COVID-19 pandemic has had a significant impact on the residential development in modern cities, causing a number of changes and trends.

First of all, it is a change in housing demand. Many people have switched to remote work, which has led to a greater demand for comfortable, spacious housing in the complexes with the additional infrastructure for the residents of this building. It has led to the increasing of housing demand outside the city, in a less polluted environment. Secondly, it is the increasing of hygiene requirements, namely for the ventilation and air purification systems.

The design and construction of the residential buildings has been adapted to meet these new requirements. When examining the individual residential units (apartments), the new remote working lifestyle during the pandemic requires more functional spaces and area separation for relaxing/entertainment, eating, working and sleeping (Fig. 5, 6). The COVID-19 pandemic has also influenced the development of public areas in residential complexes, including the space increase for outdoor terraces, barbecues and sports areas [7].

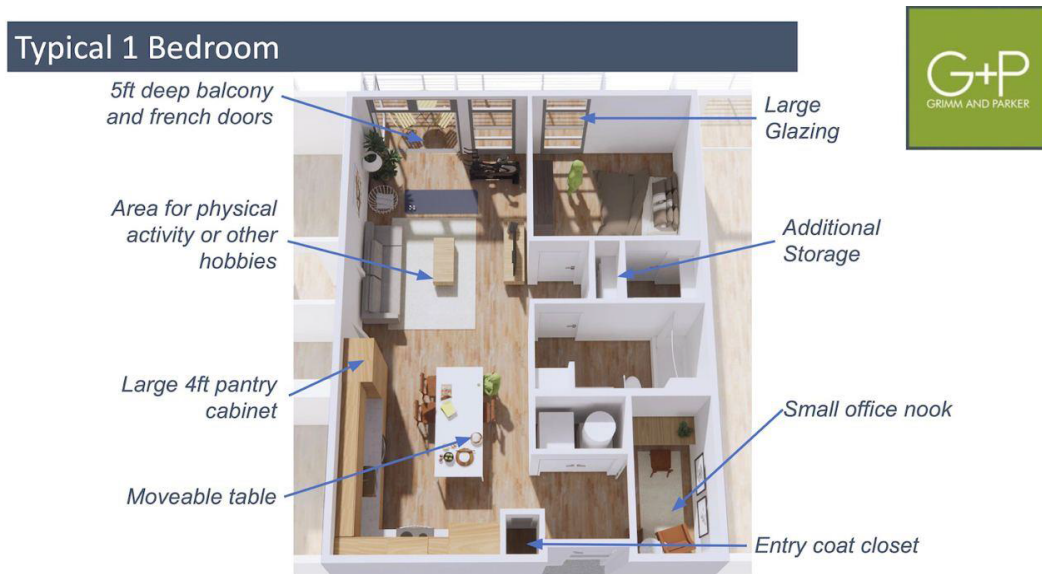


Fig. 5. Typical layout of a 1-room apartment – plan by Grimm+Parker, 2021



Fig. 6. Typical layout of a 1-room apartment – visualization by Grimm+Parker, 2021

Another aspect is the impact on property values. In some cases, the pandemic has had a short-term impact on housing prices. The large cities became less attractive for some time period due to the risks associated with the pandemic, while smaller towns and districts gained popularity. In some cases, the pandemic has led to rethinking of urban densities, including more space for green areas and open spaces.

The COVID-19 pandemic has significantly changed the approaches to housing development in the cities, prompting greater consideration of comfort, safety and hygiene in the residential complexes [8].

*Economic crises.*

*Recession* – the economic contraction may lead to mass unemployment and income loss in the city, which will have a direct impact on the housing development and the lifestyle of the residents. The recession can worsen the living conditions of many residents, in particular, lead to the increasing of housing problems and decreasing of the life quality.

*Financial crises* have a significant impact on the development of the housing sector [9]. The following key trends can be during such crises:

- decreasing of housing demand;
- the delays in the construction of the residential complexes;
- decreasing of housing prices (lower demand may lead to lower housing prices, which may affect the price and quality of the construction in the real estate market);
- the complications in loan issues;
- the development and promotion of alternative forms of housing (during the financial crises, more people may prefer alternative forms of housing, such as renting or sharing);
- the variation in the geography of housing development (new financial realities change the priorities of the investment and development in different areas);
- the social issues (such as the increasing number of people without a fixed place of the residence and the growing need for social housing in the short term).

*Social crises.*

*Protests and conflicts* – the social conflicts due to the political differences, social inequality, and racism create the tension and an unsafe environment in the city. The most popular locations for the protests are usually the central locations or important infrastructure facilities, rather than residential areas. However, it is systematic and long-term conflicts (such as social inequality or racism) that lead to the most negative consequences. Such crises endanger human life or health and create unmanageable social processes.

The impact on the housing development of social inequality, which often leads to the separation of the residential areas from the affordable and more expensive housing, should be examined separately. This "separation" contributes to the development of social conflict and worsens the quality of the urban living environment [10].

Social conflicts can lead to the revision and rethinking of city development plans and housing projects. The changes of the city development plan, and the planning of new residential areas may be the response to residents' demands and complaints.

*Crime growth* – the growth of crime and violence can lead to the crisis situation for public safety and urban development.

One of the consequences is housing demand decreasing in this crime-ridden neighborhood and, consequently, decreasing of property prices. On the other hand, the residents face increased security costs, including the installation of the security systems and the hiring of the security firms. This increases the cost of housing and maintenance.

However, Urban science offers simple tools to make the cities safer and more transparent for the residents [11]. For example, the good street lighting and the presence of people in the street are much more effective tool than installing the fences or watching cameras.

*Technological crises.*

*Cyber-attacks* – the attacks on the information systems can lead to the privacy violation and the security of the citizens. Such crises are becoming more frequent and primarily affect the security of the residential environment. Cyber-attacks can be directed both at a single apartment (residential unit) or an entire residential complex.

Many modern residential premises are equipped with "smart" devices that are connected to the Internet. Cyberattacks can affect such systems, including the control of lighting, temperature and other aspects of home comfort. On the other hand, the most common target of cyberattacks is the personal data of the residents, which poses a threat of privacy and personal security.

*Factory accidents* – the accidents at the industrial enterprises can lead to the emissions release and threaten the public health of joint residential areas. Typically, the state building codes and standards restrict the construction of the industrial facilities near the residential areas. However, a short-term consequence of an accident at the industrial enterprise may be the evacuation of the population until the accident is fully remediated and a safe living environment is restored.

*Climate change.* Extreme weather conditions. Climate change leads to the extreme weather conditions, such as heavy showers, hurricanes, tornadoes and droughts. It damages camp accommodation facilities and leads to loss of property and even threats to the livelihoods of city residents.



Speaking long-term, the climate change requires the cities to develop more sustainably, save resources, and use the recycled and more environmentally friendly materials. The conscious environmental approach requires the changes of housing design (such as additional opportunities for waste sorting, the battery charging for electric vehicles, the use of alternative energy sources, etc).

*Mass migration.* Refugees and forced migrants: The growth of refugees and forced migrants puts the pressure on the housing market, social services and infrastructure.

With a growing number of the residents, the cities have to adapt the infrastructure and public services to new needs [12]. This includes the development of transport, education, healthcare and other branches. Such needs are usually difficult to meet quickly. The temporary housing for migrants is not often comfortable and safe. Therefore, in the short term, mass migration is a great stress for the city, its residents and the refugees themselves.

However, in the long run, the arrival of migrants usually leads to increasing of housing demand in the city. This creates new opportunities for the housing developers and influences the property prices. Migrants can have a positive impact on the urban development, but their acceptance and integration require the consideration to various aspects of the housing sector, from housing affordability to socio-cultural issues and infrastructure development.

*Armed conflicts.* Military operations and occupation of urban areas. Armed conflicts have a serious and nonreciprocal effect on housing and housing infrastructure (Fig. 7). Military operations lead to the destruction and damage of the residential buildings, as well as to the safety threats of the residents, including physical danger and injury. During the armed conflicts, the residents need to look for the strong rooms and bomb shelters.

The war forces the residents to evacuate and look for the strong rooms in other places or even in other countries. This leads to massive migration and creates urgent housing problems for the refugees. In the long term, the forced migration to other territories is critical to the future development of the city after the conflict ends.

The infrastructure that serves residential areas, such as water, electricity and transport systems, is damaged and destroyed during the conflict [13-15]. This leads to a temporary loss of access to the communication lines, services and comfortable living standard.

Military conflicts also lead to decreasing of the property values in the territories where they are. It can affect homeownership and mortgages, as well as delays and reconstruction of new housing developments.

War has long-lasting social and psychological consequences on the residents, including post-traumatic stress and other health problems.



Fig. 7. Ukraine, Donetsk region, Avdiivka. Consequences of shelling of residential areas during the russian invasion, 2023

**Conclusions and directions for further research.** The impact of the crisis periods on the development of modern cities and residential development is an extremely important aspect of the urban infrastructure analysis and planning. The different types of crises, including natural crises, economic crises, social conflicts, pandemics, military conflicts, and others, can have different consequences for the cities and residential development.

In the context of the crisis periods, the cities should be prepared for the challenges that may arise. This means the development of the effective action plans that include adapting to new conditions, the restoration of housing facilities, providing housing affordability and treat protection.

It is also important to take in account that the crises can test the stability of the cities and housing infrastructure, but they can also create the opportunities for the improvement and innovation. The interaction between the local authorities, communities and developers to work and develop together can create more stable housing developments that meet the demands of the new realities.

In general, given the different types of the crisis periods, it is important to develop the comprehensive strategies to provide the sustainability and safety of housing in modern cities. Responding to and recovering from the crises determine how successful the development of the cities and housing infrastructure will be in the future.

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## ТИПОЛОГІЯ ТА ВПЛИВ КРИЗОВИХ ПЕРІОДІВ ЧАСУ НА РОЗВИТОК ЖИТЛОВОЇ ЗАБУДОВИ У СУЧАСНИХ МІСТАХ

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**Анотація.** Вплив кризових періодів на розвиток сучасних міст та житлову забудову є надзвичайно важливим аспектом аналізу та планування міської інфраструктури. Різні типи криз, включаючи природні кризи, економічні кризи, соціальні конфлікти, пандемії, військові конфлікти та інші, можуть мати різні наслідки для міст і житлової забудови. У контексті кризових періодів міста повинні бути готовими до викликів, які можуть виникнути. Це означає розробку ефективних планів дій, які включають адаптацію до нових умов, відновлення житлового фонду, забезпечення доступності житла та захист мешканців від різних загроз. Важливо також пам'ятати, що кризи можуть перевіряти стійкість міст та житлової інфраструктури на міцність, але вони також можуть створювати можливості для вдосконалення та інновацій. Об'єднання зусиль влади, громад та забудовників для спільної роботи та розвитку може допомогти створити більш стійкі та життєздатні житлові комплекси, які відповідають вимогам нових реалій.

Метою даної роботи є дослідження типології кризових періодів для сучасних міст, визначення різних видів криз, їх характерні особливості та вплив на розвиток житлової забудови. Дослідження проведено з використанням графоаналітичних та математичних методів. Для дослідження необхідне застосування методів як загальнонаукового характеру (системний аналіз і синтез), так і запозичених з інших галузей знань (філософії, економіки, соціології, психології) що пояснюється феноменологічною природою самого об'єкта дослідження.

В цілому, враховуючи різні види кризових періодів, важливо розробляти комплексні стратегії для забезпечення сталості та безпеки житла в сучасних містах. Реагування на кризові ситуації та відновлення після них визначає, наскільки успішним буде розвиток міст та житлової інфраструктури в майбутньому.

**Ключові слова:** кризові періоди часу, міський розвиток, житлова забудова, вплив кризових періодів часу на міський розвиток, розвиток житлової забудови в кризові періоди.

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