urban science

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New Territorial Unit of the Urban Structure of Cities—The Urbocell

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Abstract: One of the most significant factors shaping the formation of new urban structures is climate change—including global warming and the associated emerging issues—heatwaves, storms, hurricanes, floods, droughts, fires and others. In recent times, new threats have emerged, including war risks, radiation, pandemics and other potential factors, whose devastating consequences are no less severe than those of climate change. Concerning these and other potential threats, this work aims to develop a new, sustainable urban structure element—a territorial unit or complex to be used in creating a new city planning framework. The formation of this sustainable urban unit or complex is based on three fundamental sustainability principles—social, ecological and economic—the harmonious interaction of which can enable the creation of a safe, healthy and convenient urban environment for living, working and leisure. Such a structural urban complex would consist of a group of neighbourhoods with various building densities, enclosed by public transport streets that integrate the complex into the city's overall spatial structure. To support the complex's functioning, a structural element—a green core—is planned at its centre, serving as a space for residents' recreation, protection from various threats and social interaction. Given that this technical, structural and urban territorial unit, in terms of its autonomous functionality, structure, composition, significance and other characteristics, is identical to a natural cell, it is proposed (based on the principles of bionics) to name this structural urban territorial unit an 'urban cell' or 'urbocell' for semantic clarity.

Keywords: urban structure; sustainable urban development; territorial unit of urban structure; urban cell (urbocell); sustainable urban complex

Received: 25 April 2025
Revised: 11 June 2025
Accepted: 12 June 2025
Published: 16 June 2025

Citation: Dringelis, L.; Ramanauskas, E. New Territorial Unit of the Urban Structure of Cities—The Urbocell. *Urban Sci.* **2025**, *9*, 227. https://doi.org/10.3390/urbansci9060227

1. Introduction

Countries around the world are increasingly experiencing global warming, its associated threats and potential consequences. The extreme phenomena caused by climate change—heatwaves, storms, hurricanes, downpours, floods, fires and other adverse factors—have devastating effects on nature, people, and cities and their surroundings [1–3].

In addition to these natural threats, recent times have also brought anthropogenic threats such as war, potential radiation exposure and pandemics, whose consequences are equally devastating to nature, cities and people [4,5].

Numerous important international documents have been issued to mitigate the alarming processes of global climate change and protect against, or alleviate, their disastrous consequences. The most significant ones are the Kyoto Protocol, signed in 1997 [6], the Paris Agreement in 2015 [7] and the relevant decisions adopted by the European Union—'Roadmap to a Resource Efficient Europe' (2011) [8], 'Living Well, Within the Limits of Our Planet' (2013) [9] and 'The European Green Deal' (2019) [10].

Some provisions of these international documents have been transposed into national-level documents in various countries, including laws, directives and resolutions. In Lithuania's case, notable examples include the Law on Climate Change Management [11] and the National Climate Change Management Policy Strategy [12].

The primary focus of these climate change mitigation and prevention documents is on reducing environmental pollution, greenhouse gas emissions and fossil fuel consumption and protecting the natural environment by conserving land, ensuring its rational use and compacting urbanised areas.

When assessing these international and national documents, which critically address and regulate climate change and its consequences, it becomes evident that insufficient attention is given to territorial planning, urban development, city structures and preparedness for mitigating the effects of extreme events.

The main Lithuanian state document regulating territorial planning, urban development, spatial structure formation and other related matters is the Law on Spatial Planning [13]. This document should account for climate change and other threats, as well as protective measures against them, but it does not. As a result, urban planning in the country continues in an outdated manner—on a plot-by-plot basis, unstructured, without a systematic approach and without consideration of emerging natural and anthropogenic threats [14–17]. It should be noted that similar spatial planning issues are also relevant in many other countries [18–21].

The aim of this article is to propose the formation of a new, sustainable urban structure based on research in national urban planning, foreign experience, historical urban development analysis, and the assessment of natural and anthropogenic threats. This approach would enable the creation of an appropriate social, ecological and economic urban environment.

To achieve the objective set out in this article, a detailed proposal is also provided for the formation of a new territorial unit within the urban structure—an urban complex. The principles of the formation of such a complex have already been discussed in previous issues of this journal (Urban Science, 2024, vol. 8, iss. 4, art. no. 186, pp. 1–29) [22] in the context of improving urban structures with the consideration of climate change and other potential threats. Therefore, this article can be regarded as a continuation of the earlier foundational article that included urban planning and other research and presents a functional structural model for a new sustainable urban structure—the urbocell—adapted to new climatic and other adverse conditions. The urban analysis method is used for the formation of the urban structure model. The analysis of various previously prepared works on systematic town development is continued herein, and the main principles are connected and supplemented with new aspects of current urban challenges.

It is expected that this proposal for a new sustainable territorial unit within the urban structure—the urbocell—will find its place in urban planning theory and practice. It is seen as one component of a means to reduce and mitigate climate change and other potential threats to people and their environment.

Literature Review

For the formation of the proposed complex, ongoing work in the fields of urban planning and spatial development is evaluated, along with the key directions and principles of contemporary urban development.

The development of an urban complex as a territorial unit is significantly influenced by research on city structure evolution, which examines various functional and compositional urban planning models, urban structure development, experimental projects and conceptual ideas. Among the systematic studies conducted in Lithuania on urban structure

development, notable works include research by Seselgis (1996) [23], Vanagas (2003) [24] and Zaleckis (2018) [25]. Also noteworthy are the works carried out in this field on an international scale [26–29], in which urban model classification is conducted, their adaptation to contemporary conditions is examined and other aspects are explored.

In assessing the search for specific urban territorial units, Howard's Garden City (1898) [30,31] and, in particular, Perry's proposed neighbourhood unit concept (1928) should be mentioned [32]. These ideas were especially prominent from the perspective of functional and social environment creation. However, due to their radical aspects of social environment formation, they proved unsuccessful [31,33].

The development of urban structure ideas continues to this day. Such comprehensive structural studies are driven by emerging issues of urban sprawl, land conservation, social infrastructure and enhancing city vitality, which are being addressed in many countries [13–21].

From this perspective, the ideas of New Urbanism, which emerged around 1980, are of significant importance in the search for improved urban structures. These ideas are based on urban compactness and controlling urban sprawl [34–36]. Particularly important in this context are the principles of sustainability and sustainable development, which were introduced internationally by G. H. Brundtland in 1989 [37].

Considering the proposed ideas for sustainable city formation, it is appropriate to highlight urban studies that address the efficiency of urban land use and land conservation issues. In this field, notable works [38–40] examine the possibilities of urban compactness, addressing questions of social service accessibility and the reachability of various facilities. Recently, a particularly strong foundation has been established for Moreno's (2016) concept of the 15 min city [41]. Also, the analysis of works of green structure development could be considered, especially those on the maintenance of green structures for mitigating new climate change issues [42–45].

These areas for improving urban structures create the prerequisites for models aimed at the redevelopment of the urban fabric of existing cities. Among these are the outstanding proposals for the formation of a super-quarter model, which have been proposed to address the issues of the humanisation of densely built-up inner-city spaces and adaptation to climate change [46–48]. Also noteworthy are the works dealing with urban energy issues and distinguishing urban cells in this respect [49,50]. Furthermore, urban research is increasingly gaining significance in the context of information technologies, integrating new technological applications such as smart cities, high-frequency cities and other models [51,52]. In recent times, new ideas of eco-districts, as well as ideas on the development of data-based smart eco-cities, appear more popular [53]. There are new possibilities for city structure creation, given the development of artificial intelligence [54].

The works that are analysed in the theoretical literature show the direction for urban territorial unit structure optimisation. Nevertheless, the proposed urban models do not fully evaluate all possible ways to form new towns with a sustainable, functional and spatial urban structure, to form their parts or to carry out essential reconstruction [55–57]. For example, the proposals of superblocks are bound by the existing urban structure and involve a minimal level of spatial intervention; the '15 minute' concept mainly concerns how to reach basic services and how to bring diverse functions closer to inhabitants. The formation of green structures is often analysed separately from the general spatial organisation of a town. According to this, it could be said that joint functional and spatial planning questions have not been completely evaluated and explored. To reduce this gap, further evaluations of the main existing approaches of urban models are conducted. To a certain extent, these are utilised while being supplemented by newly emerging factors in the formation of urban environments—considering and integrating aspects of climate change, extreme threats, civil security and other sustainability concerns.

2. Development of Urban Structures and the Current State of Territorial Planning in Lithuania

The primary and traditionally established element of urban structure is the residential quarter [22]. It consists of a perimetrically built group of houses, surrounded by service streets designed for vehicle access and pedestrian access.

With the rapid increase in the Earth's population, existing cities have begun to grow intensively and new cities have started to emerge. Alongside urban growth, industries, transport, public services and other new urban functions have begun to develop rapidly [22,23,25–28]. It is evident that the new factors that emerged in the late nineteenth and early twentieth centuries necessitated new principles and directions for urbanisation, as well as new urban structures. One such structure is Howard's Garden City (1898) [29,30].

Given that the planned residential blocks were relatively small (around 3–4 hectares), they lacked the capacity to accommodate other necessary functions such as services, recreation and childcare. As a result, their size was increased (to 5–6 hectares), but this mechanical expansion of blocks proved ineffective, highlighting the need for new urban solutions. Moreover, the system of such blocks increased and densified the street network, making it inefficient and inconvenient—particularly for pedestrians (due to numerous intersections and crossings)—and especially unsuitable for vehicular traffic.

Faced with this situation, new directions and ideas for urban planning, as well as new, more convenient elements of urban structure, were sought on a global scale. As a result, in the first half of the twentieth century, proposals emerged to create urban territorial units that would include everyday service facilities such as schools, shops, sports facilities and others (Perry's neighbourhood unit) [31,32]. This structural urban complex was designed by placing arterial roads around its perimeter while leaving only service streets inside, thereby creating a safe residential environment.

These proposals for the creation of urban structural units first emerged in the United States [29] and later spread to Europe (England, France, and Germany) [58,59]. In Europe, these proposals developed into the planning of large urban complexes with expansive open spaces [60,61]. In Lithuania, they were adopted under the name 'mikrorajonai' (Lith.) or 'microdistricts' [22,23]. The first microdistricts were planned in the areas of Vilnius (Žirmūnai, Lazdynai and others), in Kaunas (Kalniečiai) and elsewhere. The planning and construction of these microdistricts in Lithuania took place roughly between 1965 and 1990.

However, from 1990 to 1991, due to changes in the country's political, economic and demographic situation—intensified emigration, shrinking cities and depopulating regions—construction activity declined, and the development of microdistricts came to a halt. Urban development and construction, previously managed by state policy, were taken over by the private construction sector, which prioritised economic profit. As a result, only individual houses were built on separate plots, lacking green spaces, engineering and social infrastructure, without any coordinated efforts to shape a well-balanced urban living environment or meet residents' needs.

To improve the urban situation and living environment in the country, by a decision of the government of Republic of Lithuania, a new law, the Law on Green Areas, was prepared and adopted in 2007 [62,63]. This law was designated for the formation of new green areas and recreational zones while undergoing new urban development; it was compulsory for urban design projects of towns (the author of this paper—Dringelis—participated in the creation of this law). The classification of towns' green areas, norms, the allotment of green areas in the urban structure, reach distances and other requirements were set in this law. The law was successfully used for town planning documents, such as master plans and preparation, but it was difficult to implement because of housing development in scattered separate parcels or small blocks.

In accordance with this situation and due to pressure from developers, the Law on Green Areas was changed, the norms for green areas were changed and the distance from inhabitants' houses to green structures was increased (2020, 2022) [64,65]. All this, unfortunately, has not improved the social, ecological or recreational situation of the towns' living environment.

The shortcomings in urban territorial planning, residential environment development and public space formation in Lithuanian cities have become particularly evident in the present day, amid threats such as climate change, war, radiation, pandemics and other potential crises [2–5]. Preliminary studies have shown that the country's cities, their urban structures, the limited number of existing civil protection facilities and other infrastructure are not adequately prepared to combat, mitigate or reduce the dangers and destructive consequences of these threats.

Considering all these factors, the necessity has arisen to form a new element of urban structure—a structural territorial unit or urban complex—that would create a sustainable, safe and environmentally friendly living environment, providing comfortable conditions for people to live, work and relax.

3. Key Factors Influencing the Formation of a New Urban Structure in Cities

It can be stated that the main and most important factors determining the formation of a new urban structure in cities are climate change, global warming and the related emerging problems—heatwaves, storms, hurricanes, floods, droughts, wildfires and others. Although these catastrophic phenomena are natural, they are said to be caused or provoked by the negative, selfish activities of humans worldwide [66,67].

Global climate change and its associated threats have been known for quite some time. To reduce the course of climate change and protect against its tragic consequences, several documents on these issues have been adopted at both the international and national levels [6–12]. These documents focus primarily on issues such as reducing emissions, limiting the use of fossil fuels and improving ecological conditions, but they hardly mention the formation of a new urban structure or living environment in cities, taking into account climate change forecasts.

In addition to global climate change, in recent times, local anthropogenic factors have also contributed, including wars (such as bombing, shelling, and the destruction of people and the environment) [68,69], radiation (the radioactive contamination of large areas) [70,71], pandemics (such as a mass infection of the population) [72,73] and other possible factors, whose catastrophic consequences are no less significant than those of climate change.

Considering all this, it is necessary to take into account these and other potential negative factors when creating a new, sustainable urban structure for cities.

To achieve the sustainability of the planned urban structure, it is essential first to assess the principles of sustainability, which were outlined in the 1987 report 'Our Common Future' by the United Nations World Commission on Environment and Development [36]. In the presented concept of sustainability, it is emphasised that when creating a sustainable environment, it is necessary to strive for harmonious interaction and balance between the key components of sustainability—social, ecological and economic—which are closely interconnected, complement each other and can provide suitable and safe conditions for people to live, work and relax.

When forming the new sustainable urban structure element, it is necessary to assess and consider the tasks posed by the components of sustainability—social, ecological and economic [36,74]:

1. Tasks for the implementation of the social sustainability component are as follows:
    a. Ensuring the health, safety and comfort of residents;
    b. The creation of opportunities for recreation, leisure and social interaction;
    c. The creation of opportunities for social activities for residents of all ages;
    d. The creation of conditions for children's education, various activities, sports and recreation;
    e. Convenient and safe accessibility of public transport connections and green recreational areas.
2. Tasks for the implementation of the ecological sustainability component are as follows:
    a. The creation of a healthy, safe and ecologically friendly living environment;
    b. The elimination of transport from the living environment by establishing car parking spaces for residents near internal service roads;
    c. The creation of a green space system in the living environment and easily accessible public spaces.
3. Tasks for the implementation of the economic sustainability component are as follows:
    a. Basing the planned urban structure, street network, building type and other decisions on rational, compact and cost-effective solutions;
    b. Creating reliable management, communication, security and engineering infrastructure for the planned urban structure;
    c. Ensuring the planned urban area is compact, economical, rational and cost-effective.

The implementation of the key sustainability components—social, ecological and economic—in forming the urban structure of the city will create an opportunity to establish a comprehensive, high-quality, sustainable and safe living environment.

4. Formation of a New Sustainable Urban Structure Territorial Unit—The Urban Complex

Based on the above sustainability principles and objectives, the aim of this article is to form a new sustainable urban structure element—a territorial urban unit or complex—to be used in the design of a new urban planning structure.

This urban structural complex should consist of a part of the city's territory, bounded on all sides by the city's public transport streets (category B and C), which will connect this complex with the entire city's urban space. These public transport streets, according to the city's traffic organisation requirements [23,75–77], should be placed at intervals of 600–800 m, forming a planned urban complex area of 40–60 hectares (Figure 1).

The internal structure of this urban complex would consist of a group of residential quarters, each 4–5 hectares in size with various building types and heights, bounded by internal service and auxiliary streets (category D) where parking spaces for residents' cars are planned. Each quarter may include an internal green space, eliminating any transport from within.

In the centre of the urban complex formed, surrounded by residential quarters, a central structural element of the complex is planned—a multifunctional green core, whose main purpose is to ensure the safety and protection of residents from various threats (such as climate change, war, radiation and pandemics), to create the conditions necessary for residents' rest and recreation, to provide opportunities for social interaction and activities, and more. The foundation of the green core of the complex would consist of greenery, which would include recreation and play areas, educational institutions for children, community social and communication houses, shelters and bunkers (used for cultural, educational

and other purposes in peaceful periods), as well as a management, communication and engineering service centre.

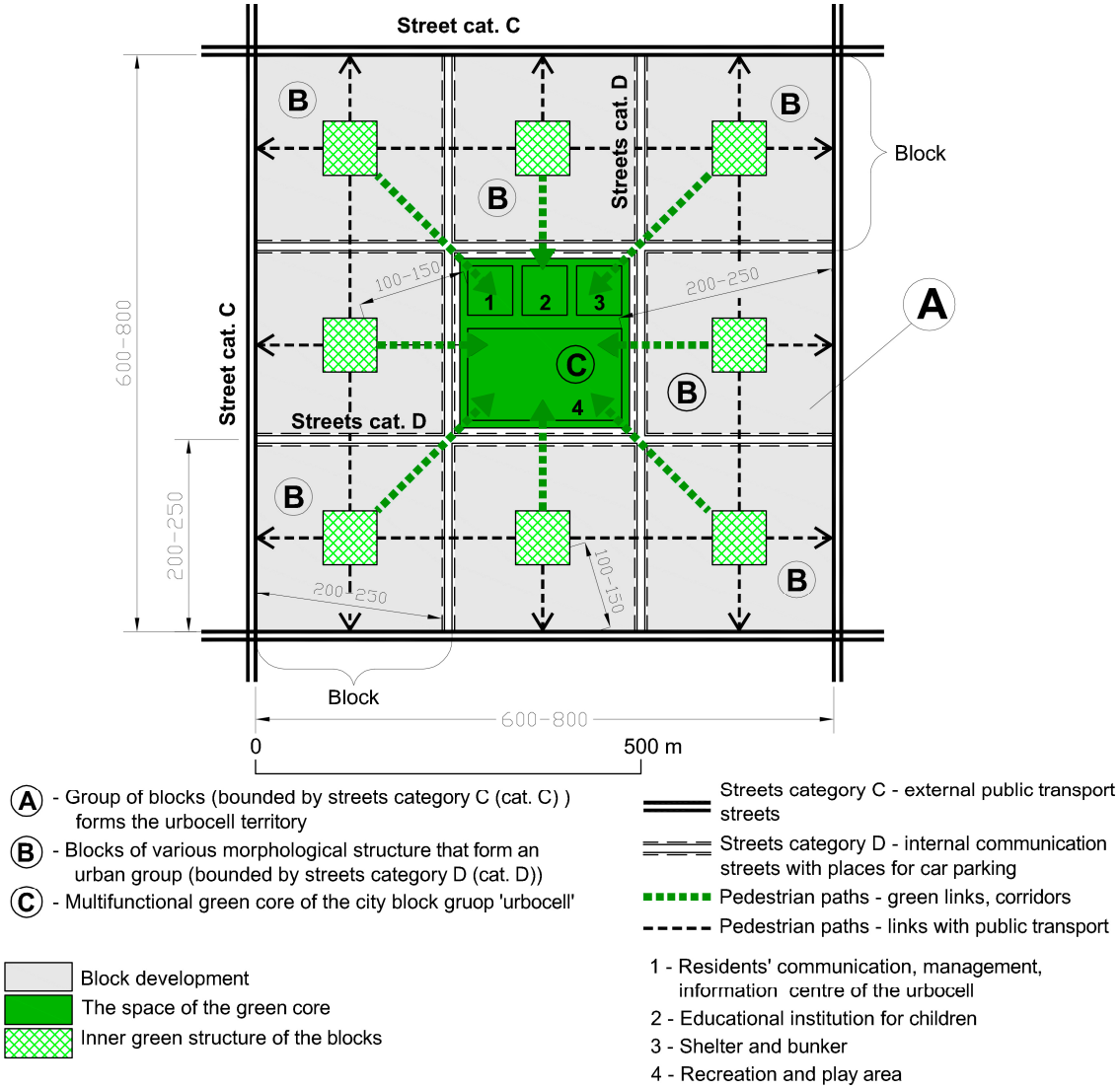

Figure 1. Functional and structural model of the sustainable urban complex of city urban structure (prepared by the authors).

The transport system of the urban complex being formed would consist of external public transport (category C) streets connecting the complex to the urban structure of the whole city and internal communication (category D) streets, which bound the blocks and allow access to the houses, bicycle and roller-skating paths, as well as vegetated pedestrian paths (green links and others), which safely connect the blocks of the complex with each other, with the external public transport streets and with the internal vital centre—the green core.

The distances between the centre of the quarters and points of interest (such as locations for external transport and the internal green core) would average about 100–150 m, corresponding to the accessibility requirements specifying walks of 5 to 10 min.

The population of the planned urban complex, depending on its total area (40–60 hectares), the type of development and height, for example, could average between 7000 and 8000 or between 12,000 and 15,000 residents or more.

5. Semantic Naming of the Urban Complex—Newly Formed City Urban Structure Territorial Unit

A meaningful name is needed for this newly formed, sustainable urban structure territorial unit—a structural complex, based on the science of bionics, which studies the use of the structure and vital activity principles of organisms in technology [78]. It has been established that the characteristics of this proposed new urban structural complex—its functioning nature, form, structure and composition, for example—fully correspond to the properties of a natural biological cell.

According to the description of a biological cell [79], it is an elementary living system capable of independently existing, growing and reproducing, and it is the foundation of the structure, development and vital activity of organisms. A cell consists of living contents—the protoplasm and the nucleus—that regulate its metabolism and synthesis processes and are involved in inheritance. The key components of the nucleus structure are chromosomes, which contain inheritance units—genes. A cell is separated from its environment by a biological membrane that regulates the cell's composition and helps form sustainable connections between cells.

The proposed new, sustainable structural urban complex is autonomous and self-functioning but can connect with other similar urban complexes. The structure of this complex consists of residential quarters with internal infrastructure and the main, central and vital element of the complex—the green core, where objects for residents' rest, communication, civil safety, management, engineering infrastructure and other features are located. This urban complex is bordered along its entire perimeter by public, communal transport streets, which protect the complex from external noise and pollution, and provide an opportunity to connect with the entire city's urban space.

In addition to the similarity of these basic structural, functional, sustainability and other properties, these two structures—the urban physical, technical structure and the natural, biological cell structure—are also similar in other ways. For example, the streets bordering the urban complex can be likened to a biological membrane, which protects the autonomy of the cell and simultaneously helps it connect with other cells. The residential quarters of this complex can be compared to the cell's protoplasm, which fills the interior of the cell. The green core of the complex, which is vital for its functioning, can be likened to the cell's nucleus, which regulates the cell's functions and gives it life.

Considering all that has been stated, to provide a meaningful name for the newly created territorial unit of the urban structure—the structural urban complex, it is proposed to name it the 'urban cell' or 'urbocell' (Figure 1). It is expected that this new sustainable urbocell, when used, will form a basis for creating new, sustainable, compact, rational, and socially, ecologically and economically sound urban structures.

The size of this urban structural complex or urbocell territory is determined by the public passenger transport streets (categories B and C) that border the complex, which are placed at intervals of 600–800 m and form an average area of about 40–60 hectares for the urbocell territory. Depending on the nature of the development in the urbocell quarters, the height and environmental conditions, it can accommodate from 7000 to 8000 or from 12,000 to 15,000 residents, or more. The size of the green core, depending on its programme of use, can range from five to eight hectares. The distance from the centre of the quarters to the centre of the green core is about 100–150 m, and to the public transport streets, it is about 150–200 m. This is a walking distance of about 5–10 m.

In conclusion, it can be stated that the presented urban structure territorial unit—urbocell—is a comprehensive, convenient, safe, ecological and economical urban structural element for living.

6. Incorporating the New Sustainable Urban Structure Territorial Unit—Urbocell—into the City's Fabric

The new, sustainable urban structural complex—urbocell—is a complex, autonomously functioning part of the urban structure, a unit consisting of a group of residential quarters with the necessary green core for the functioning of the cell, where all the necessary elements for servicing the residents of the urbocell—rest, communication, civil safety, information, management and other components—are concentrated. This urbocell is the smallest part of the urban structure, which is integrated into the composition of residential areas, which in turn form part of the entire city's urban fabric.

A city residential area is a part of the city territory that is primarily designated for residential purposes. A residential area is usually shaped by the city's high-speed (category A) streets and main (category B) streets. These are laid out at intervals of 1000–1500 m and divide the city territory into areas of approximately 150–200 hectares. Depending on the nature of the development, such an area can reasonably accommodate from 15,000–20,000 or 25,000–30,000 residents or more, and the area of the district centre with a park should be about 20–30 hectares (Figure 2).

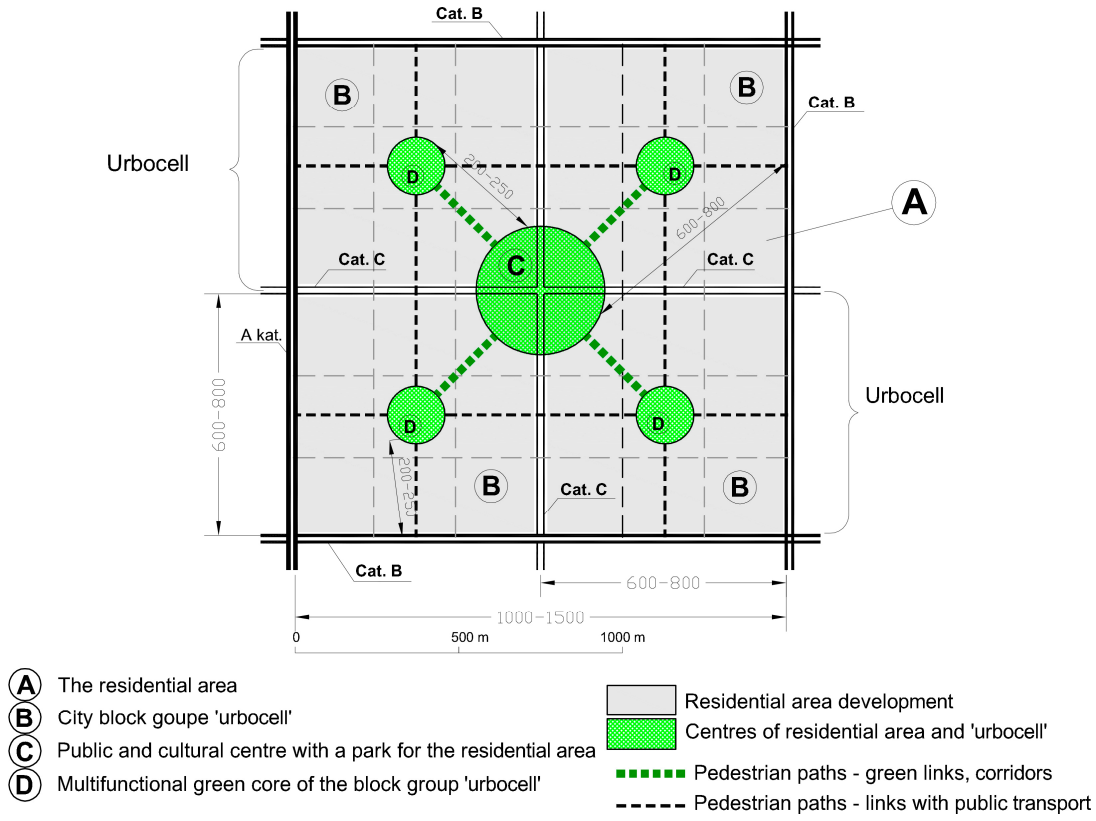

Figure 2. Urban structure scheme of the residential area (prepared by the authors).

The service radius of such a district centre with a park would be about 500–700 m, which would result in a 15 min walk, assuming a 1 km walk takes 15–20 min. All the facilities servicing the district's residents—such as public, commercial, medical and other centres; civil safety, sports, recreation and communication areas; necessary facilities; and other services—should be located in this district centre, near the park.

Depending on the size of the residential area, it can consist of several urbocells, interconnected by landscaped pedestrian paths to the district centre and to each other, forming a safe, sustainable district urban system with a structure within a 15 to 20 min walking distance.

The presented sustainable city residential area (Figure 2) is integrated into the overall urban fabric of the entire city, which, we believe, will be resilient in dealing with existing and potential threats, overcoming their negative, destructive consequences.

The urban structure of the city consists of the residential area previously discussed, which in turn is made up of groups of residential blocks or urban cells with a vital, mandatory green core. The main and most important element of the city's urban structure is the public, cultural and administrative centre with the city park, around which are located all the key elements for city leisure, social activities, communication, civil protection shelters and other necessary facilities.

To create a sustainable and safe urban green system, all city green spaces with civil protection objects—starting from the green core of the urban cell and the residential district central park and ending with the central park of the entire city—are connected within a single entity through green links or green corridors, allowing people to move safely around the city based on their requirements.

The provided urban structure formation scheme is conditional (Figure 3), and it may change depending on natural conditions, urban situations and other factors, while maintaining the fundamental principles of sustainability and safety.

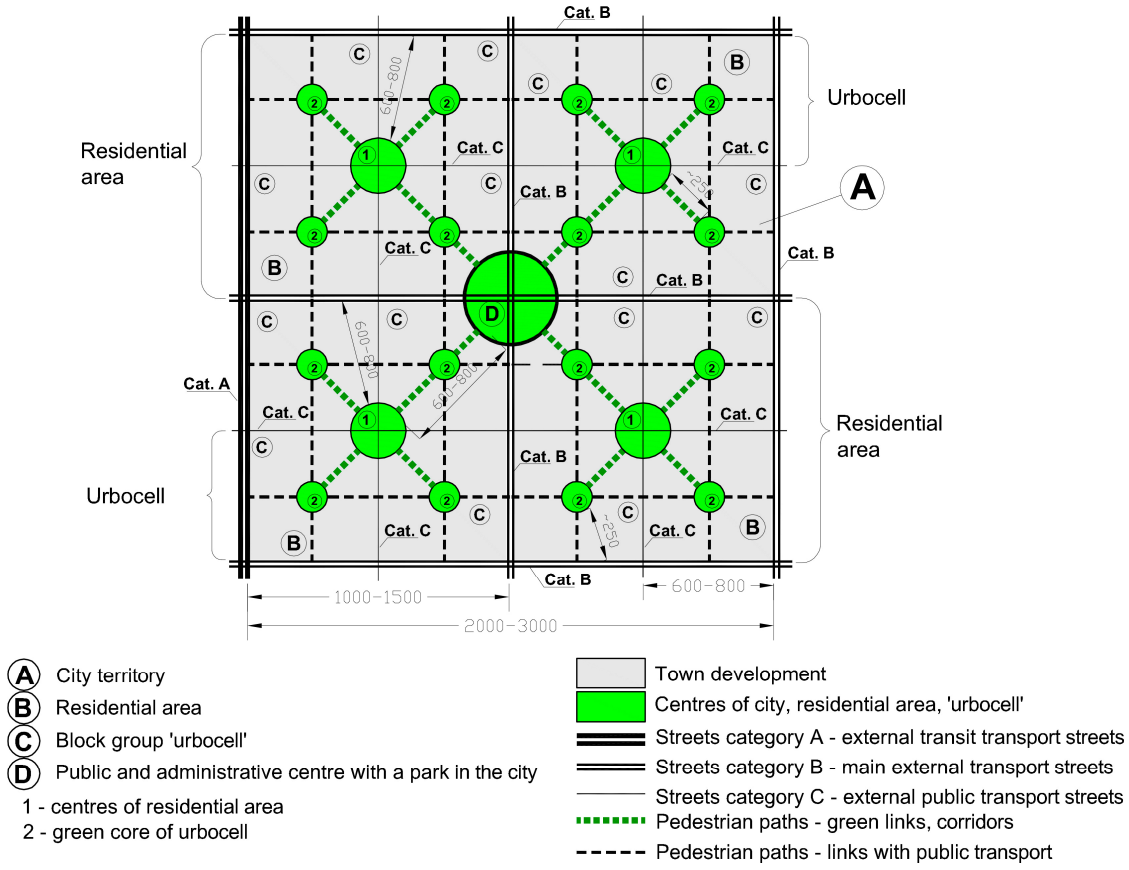

Figure 3. Urban structure scheme of the city (prepared by the authors).

7. Summary

After discussing the process and results of creating the urban structure territorial unit or structural urban complex ('urbocell') presented in this article, it is also appropriate to discuss the international theoretical and practical experience in urban planning that influenced the preparation of this work.

First, as already mentioned, the primary sustainability theory principles—social, ecological and economic—were used as the system and methodological foundation, based on which the structural model of the urbocell was developed.

The application of this sustainable urban structure in city planning is expected to significantly increase the sustainability of cities and their resilience in combating various threats and mitigating their consequences.

When forming and creating the urban structure territorial unit—the urbocell—particular attention is paid to the responsible, rational use of city territory, creating a compact, sustainable, liveable urban structural complex capable of functioning autonomously in a relatively small area (40–60 hectares).

This trend of the work fully aligns with the recommendations of international documents (Paris Agreement, 2015 [7]; Kyoto Protocol, 2015 [6] and others), which outline the main directions for urban development in cities, including the preservation of planned territories, their rational use and the compactness of urban structures (EU Environmental Directives, 2011, 2013 [8,9]; Sustainable Development Goals, 2015 [74]).

When forming a compact urban structure, other important transport issues are also addressed, such as reducing traffic and increasing pedestrian and bicycle connections, possibly further shortening commute times (to 15 min or less). When creating the structural urban complex (urbocell), passenger public transport is outside the cell, with only pedestrian connections inside. The distances inside, from the group of housing centres to the entire cell's centre—the green core—as well as to public transport, average around 150–250 m or a 10 to 15 min walk. The residential area's distance from the urbocell's green core to the district's public centre is about 500–700 m or a 15 to 20 min walk. All of this aligns with contemporary urban ideas for creating car-free cities [34–38,46–48].

Analysing the technical literature, the concept of the cell was also found, though not in the field of urban planning and territorial development. This concept was used to address energy issues, determining that both the energy structure and the areas of communications and information management, for example, should form a harmonious, sustainable system that operates on the cell principle [80,81].

When discussing the urban structural urbocell model, it is relevant to mention the development process and reasons behind it. The urbocell model was developed by the authors of this paper 10–15 years ago when the country began experiencing increasing and more frequent negative climate change phenomena, such as storms, floods and heatwaves. Little was done to manage the situation, although foreign countries were preparing for it. These climate change threats were compounded by the risks of pandemics and war, yet the situation continued to deteriorate. In fact, the opposite occurred—green spaces, plantings and public spaces were reduced, with these areas being allocated to construction needs.

The theoretical and practical basis for the concept of this proposed model of the structural urban complex 'urbocell' was the Law on Green Areas of the Republic of Lithuania (2007), which was adopted by the government and was used in urban practice, although not frequently enough.

During the preparation of the Law on Green Areas (it was mentioned previously that the author of this paper (Dringelis) participated in this), the structural models of green structure system planning were prepared. These models were published in the scientific press [82] and are also used for the formation of this conceptual model of the 'urbocell' structural urban complex.

Taking into account the threats posed by climate change, war and others, the urbocell structural model provides opportunities for rest and recreation in green areas. This is supplemented with civil security services, shelters, and bunkers; objects for social activity, community meetings, and childcare; and other necessary buildings and facilities.

Finally, it could be emphasised that here that only the conception of the model of the urbocell structural urban complex is proposed, which is not detailed but is supported with its main parameters. A more detailed version of this model will be elaborated in further stages of the broader survey, which is being carried out now; its adaptation for the urban planning process will also be proposed. The finished work model will be sent to the government for approval, introduced in the urban and legal literature, and used in urban planning practice.

In this situation, and with the aim of improving it, the sustainable structural urban model of the urbocell was created, designed for people to live, work and rest in the face of various threats. The principles of creating this urban model were outlined in a previous article (Urban Science, 2024, vol. 8, iss. 4, art. no. 186, pp. 1–29) [20], and now a detailed description of it is presented here.

In conclusion, it can be stated that the developed structural model of the urban territorial unit—the urbocell—aligns with contemporary urban development ideas and directions and supports and adheres to established sustainability and other principles, while being distinctive, original and authentic.

It can be expected that the proposed new sustainable urban structural model, urbocell, will find application in both our country's and foreign countries' urban planning theories and practices.

8. Conclusions and Recommendations

1. There are dangers posed by global climate change, war, pandemics and other potential threats to people, cities and the natural environment. There is also a recognition that the country is unprepared to overcome or mitigate the disastrous consequences of these threats. This work presents proposals for the formation of a new, sustainable and safe urban structure;
2. The formation of a new, sustainable urban structure uses three main sustainability principles—social, ecological and economic—whose harmonious interaction can create opportunities and prerequisites for the creation of a safe, healthy and comfortable living, working and recreational urban environment;
3. The newly proposed sustainable urban territorial unit, the structural complex, would consist of a group of blocks with varying types of development, surrounded by public city transport streets (B and C categories), which would connect this complex to the spatial structure of the entire city. For the functioning of the complex, a mandatory structural element is planned in its central area—the green core—designed to serve the complex's residents: to protect them from various threats, facilitate communication, and offer social activities, children's engagement opportunities, recreation and rest;
4. The theoretical unit of the new urban structure of cities somewhat resembles the properties of a natural biological cell. This is in terms of its functional purpose, structure, composition, ability to maintain internal operational autonomy and potential to connect to the broader urban fabric of the city. Therefore, to ensure semantic clarity, it is proposed to name this territorial urban complex the 'urban cell' or 'urbocell';
5. The newly presented sustainable urban structure element, the urbocell, is just like a natural biological cell. While preserving its internal structural and functional autonomy, a cell naturally connects with other similar cells to form a collective living biological tissue. Similarly, the proposed new technical urban cell, while maintaining its sustainable structural and functional autonomy, has the potential to connect with other similar technical cells into a collective sustainable urban fabric, forming new cities and their districts.

Author Contributions: Conceptualisation, L.D.; methodology, E.R. and L.D.; software, E.R.; validation, L.D.; formal analysis, E.R. and L.D.; investigation, E.R. and L.D.; resources, E.R.; data curation, E.R.; writing—original draft preparation, L.D. and E.R.; writing—review and editing, E.R. and L.D.; visualisation, E.R.; supervision, L.D.; project administration E.R.; funding acquisition, E.R. and L.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Science Council of Lithuania (Lietuvos mokslo taryba LMT), grant number S-MIP-23-62.

Data Availability Statement: When conducting this research study, no data were created.

Conflicts of Interest: The authors declare no conflicts of interest.

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