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15-MINUTE CITY CONCEPT AS A SUSTAINABLE URBAN DEVELOPMENT ALTERNATIVE: A BRIEF OUTLINE OF CONCEPTUAL FRAMEWORKS AND SLOVAK CITIES AS A CASE

Peter MOCÁK[A*], Kvetoslava MATLOVIČOVÁ[B], René MATLOVIČ[C], János PÉNZES[D], Piotr PACHURA[E], Prabuddh K. MISHRA[F], Katarína KOSTILNÍKOVÁ[G], Michaela DEMKOVÁ[H]

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A* University of Prešov, Department of Geography and Applied Geoinformatics, 17. novembra 1, 080 01 Prešov, Slovakia
https://orcid.org/0000-0003-1792-2266
peter.mocak@smail.unipo.sk, (corresponding author)

B University of Economics, Faculty of Commerce, Department of Tourism, Dolnozemská cesta 1, 852 35 Bratislava, Slovakia
https://orcid.org/0000-0001-9635-4177
kvetoslava.matlovicova@euba.sk

C Institute of Geography, Slovak Academy of Sciences, Štefánikova 49, 814 73 Bratislava, Slovakia
https://orcid.org/0000-0002-8935-6462
geogmatl@savba.sk

D University of Debrecen, H-4032 Debrecen, Egyetem tér 1., Hungary
https://orcid.org/0000-0002-4870-087X
penzes.janos@science.unideb.hu

E Częstochowa University of Technology, Faculty of Management, 42-201 Częstochowa, ul. H. Dąbrowskiego 69, Poland
https://orcid.org/0000-0003-2007-6005
piotr.t.pachura@gmail.com

F University of Delhi, Department of Geography, Shivaji College, 110027, India
https://orcid.org/0000-0002-3073-8175
prabuddh@shivaji.du.ac.in

G University of Prešov, Department of Geography and Applied Geoinformatics, 17. novembra 1, 080 01 Prešov, Slovakia
https://orcid.org/0000-0002-7665-8170
katarina.kostilnikova@smail.unipo.sk

H University of Prešov, Department of Geography and Applied Geoinformatics, 17. novembra 1, 080 01 Prešov, Slovakia
https://orcid.org/0000-0003-3844-2130
michaela.demkova@smail.unipo.sk

Abstract:
In this review article, we intend to initiate a discussion on the possibilities of implementing the 15-minute city concept (FMC) in Slovak cities. Our research motivation is the relatively high potential of the idea to contribute to solving current problems of sustainable urban development to strengthen cities' resilience. It is not only about coping with the impacts of the COVID 19 pandemic but also about the need for synergy of mitigation and adaptation measures in the context of climate change and the transition to a low- to the zero-carbon development paradigm. Last but not least, it can be pointed out that the 15-minute city model will also contribute to reducing inequalities between different parts of cities, which is one of the consequences of poorly regulated suburbanization processes. The paper is structured in several parts. In the introductory section, we look for common features of the concept and its theoretical framework within various traditions and paradigms of geographical thought. We then analyse its basic functions and dimensions that are considered when planning this concept in the current conditions of urban life. We also address specific applications in world metropolises while pointing out that the concept is not rigid and can still be adapted to local natural, historical, socio-economic conditions and intraurban structures. In the last section, we present the first examples of implementing the 15-minute city ideas in Slovak cities.

Key Words:
The 15-minute city concept (FMC), intraurban structures, walkability, resilience, urban life planning, Slovak cities, sustainability.

INTRODUCTION

The COVID-19 pandemic has become an accelerator for change in almost every area of our lives. One of them that has been significantly affected has been urban mobility. At the same time, according to Moreno (2021), this global threat has paradoxically helped reveal a fundamental fact of this century: the power of our cities. When urban life came to a halt, everything stopped. Residents were forced to change their life rhythms and travel habits in the face of the fear of contagion. The post-pandemic era also brings constant new challenges in researching human behaviour in commuting to work or schools to a new geo-social context and its anchoring in space-time. One response to changing mind-sets in daily commuting and meeting one's health or social needs may be the concept of the 15-minute city, whose central idea is the walkability of public amenities, workplaces and public spaces from the place of residence (Abdelfattah et al. 2022, p. 331). In this context, walkability should be understood as the extent to which the physical environment of a city positively influences pedestrian traffic (Moura et al. 2017).

In our review paper we intend to initiate a discussion on the possibilities of implementing this concept in the conditions of Slovak cities. Thus, this article does not aim to bring a comprehensive characterization of the 15-minute city concept, but it has the ambition to contribute to the start of processes and change of mindset in the functioning of our cities from the perspective of geographers,

which is brought about by the post-pandemic era. As Moreno (2021) argues, the real resilience of our cities will be grounded in polycentric living, in the rediscovery of the proximity factor, with all the aspects of the city's development of short distances and regions with a multipolar form. Our research motivation is the relatively high potential of the concept to contribute to solving current problems of sustainable urban development to strengthen city resilience. This is not only about coping with the impacts of the COVID 19 pandemic but also the need for synergies between mitigation and adaptation measures in the context of climate change and the transition to a low- to the zero-carbon development paradigm. Last but not least, it can be pointed out that the 15-minute city model will also contribute to reducing inequalities between different parts of cities, which are one of the consequences of poorly regulated suburbanization processes that are well-documented also in the Slovak geographic literature (e.g. Matlovič and Sedláková 2004, 2007, Ot'aheľ et al. 2020, Havryliuk et al. 2021; Šveda and Šuška eds. 2019, 2020). From the perspective of feminist geography, this is, for example, the green widow syndrome, which is characteristic of a group of young women on maternity or parental leave living in suburban residential areas with minimal opportunities for social contact (Sýkora 2002).

The paper is structured in several parts. In the introductory part we look for common features of the concept and its theoretical anchoring within the traditions and paradigms of geographical thought. We then analyse its basic functions and dimensions that are taken into account when planning this concept in the current conditions of urban life. We also address specific applications in world metropolises, while pointing out that the concept is not rigid and can still be adapted to local natural, historical, socio-economic and spatial conditions. In the last section, we present the first examples of the implementation of the 15-minute city ideas in Slovak cities.

THE THEORETICAL FRAMEWORK OF THE 15-MINUTE CITY CONCEPT

The basic philosophy of the 15-minute city concept is based on the knowledge of human spatial behaviour, spatial and temporal perception. The origins of the study of human behaviour in the spatial and temporal dimension can be found primarily within the analytical platform of behavioural geography, which is part of the positivist paradigm of modern geography in the 20th century. According to behavioural geographers, people do not understand the surrounding space in the same way. Such unequal perception is the result of ongoing mental processes reflecting the amount and organization of information available to an individual person (Matlovič and Matlovičová 2015, 2020).

According to R. Colledge (in Matlovič and Matlovičová 2015, p. 129), the object of interest of behavioural geography is:

"spatial behaviour related to space manifest actions in everyday situations (e.g. going to work, shopping, education), which are related to data on distance, direction of movement, deviations from direction, frequency of trips, time interval between events, the degree of their repeatability, which are recorded and analysed on the basis of their occurrence in space. The analysis of behaviour in space focuses on the causes of that apparent behaviour to understand the processes of decision making, choice, spatial cognition and mapping, acquisition of spatial skills, risk aversion, uncertainty, habits, seeking and learning, emotional states, relationships, representations of knowledge, values and beliefs."

In the second half of the 20th century, according to Ira (2001), geography understood everyday activities as the primary factors of spatial differentiation and devoted itself exclusively to the study of the functional organization of space. Such a focus on space prompted T. Hägerstrand to include time, finitude, people, and liminality considerations in geographical research (Buttimer 1976 in Ira 2001). Taking these features into account, the foundations of behavioural geography are credited to T. Hägestrand and the Lund School of time geography was formed in the 1960s (Ellegard 2018).

According to Madajová and Šveda (2013), the time geography has provided sophisticated approaches that provide a systematic conceptual framework that allows the everyday activities of individuals to be captured, analysed and represented in a multidimensional complex of social and spatial interactions. In his publication T. Hägestrand (in Ira 2001) defined a set of basic conditions that influence people's everyday life:

- the fact that every situation is inevitably rooted in past situations,
- the limited size of the space (limited space available for certain activities at certain times),
- limited ability to fit into a space (limited number of people able to fit into a certain space),
- the fact that moving between points in space consumes time,
- the fact that each activity has a duration,
- the limited ability of humans (and other living and non-living entities) to participate in more than one task at a time,
- the finite length of each human lifetime,
- the indivisibility of the human being.

According to Madajová and Šveda (2013), the time geography is not just a specific theory or a narrow area of interest, but an approach that creates a broad theoretical base that not only allows us to uncover relationships essence of which is escapes to us when we try to study objects in isolation, selectively, but

also to combine knowledge from distant fields of science and from everyday practice (Lenntorp 1999). The time geography is also based on the rule that each step (event) in a stage of a person's everyday life has not only a spatial but also a temporal attribute and can be represented by a network diagram in a four-dimensional space - a two-dimensional map on the horizontal and time on the vertical (Matlovič and Matlovičová, 2015).

The time geography, according to Ira (2001), although on the one hand, it analyses human life descriptively in the context of the physical environment, on the other hand it does not sufficiently reflect the conditions of individual and social life and is dominated by a physicalist view of the human being, who is not perceived as an acting subject. Precisely, because of its failure to take into account human agency and its specific needs, the time geography has faced criticism from several scholars since its beginnings (Buttimer 1976, Baker 1979, Gregory 1985 in Madajová and Šveda 2013).

As a reaction to the overly physicalist view, the humanistic stream of the Lund School, which was carried by the so-called chronogeography, which includes in its research all possible forms and types of human perception of time and space, has been gaining ground within the time geography since the turn of the 1970s and 1980s. The understanding of time as homogeneous, universal, linear and abstract was abandoned and replaced by local, heterogeneous, meaningful and fragmented time. This period saw the emergence of a number of empirical studies, usually based on the social-behavioural foundation of classical time geography, whose main areas of interest were the study of individual mobility, transport accessibility, or regional transport systems (Madajová, Šveda 2013; Osman et al. 2020).

Based on the main principles of chronogeography, the so-called chrono-urbanism, which Osman et al. (2020) understand as a trend interested in the relationship between time and space in urban environments (urban time), has been formed, especially in European countries. According to Moreno et al. (2021), chronourbanism approaches are in line with studies highlighting the importance of urban rhythms for understanding the quality of life in the city, whereby space is only relevant if it is linked to the temporal dimension. The relationship between time and space in urban environments has also been addressed by Massey (2004). Massey (in Mulíček et al., 2015) describes the city as an open spatio-temporal system of social relations composed of subsystems, linking different activities and groups, emphasizing that most urban activities are not carried out by the decision of the individual alone. It suggests the role of the city as a space characterized by a plurality of place and time, with a certain potential to unify these different timespaces. According to Lopez (in Valderrama et al., 2020), the concept of chronourbanism is directly based on the ideas of T. Hägerstrand and his time geography, which also speaks of the different ways in which people use space during the day and, in particular, of the unequal ways in which individuals

and different groups use space. This underlines the importance of the relationship between distance in space and time for understanding territory and society. The city is thus polyrhythmic and polychronic. Different residents and visitors to the city have different rhythms of daily life, and at the same time different places in the city are used differently during the day depending on the schedule of activities. This implies the need for a shift from urban planning to urban life planning (Abdelfattah et al. 2022, p. 331). Valderrama et al. (2020) confirm that chronourbanism is one of the most progressive initiatives for a new understanding of urban life as a whole. Based on the concept of chronourbanism, the approach to an optimal quality of urban life involves a reformulation of the relationship between space and time in the citizen's everyday life. It is primarily about reconciling the requirements for sustainable urban functioning, but also new rhythms of life with other ways of living, working and spending leisure time, which requires the transformation of the mono-functional central urban space towards a polycentric city (Moreno, 2016; Lechowski 2021). To achieve such a goal, it is necessary, first of all, to strive to revitalize the services mentioned above within short distances, that is, in a close space, so that the time required to reach them by active mobility (on foot or by bicycle) oscillates within 15 minutes. Specifically, this means using existing areas more and better, so that the urban space becomes a meeting point where the social interaction needs of the population are met (Valderrama et al., 2020). Weng et al. (2019) have also contributed to the discussion on the concept of the 15-minute city, especially in the context of their research on urban neighbourhoods in Shanghai. They put emphasis on the measurement of walkability, which they conducted across three age groups (children, adults, seniors) in order to identify differentiated parameters of walkability. This study also provides a methodological guide for measuring walkability in which multiple methods were applied - modified Walk Score metric, spatial analysis (bivariate local Moran's I statistic) and spatial regression. They also indicated a further direction of research in which they proposed to pay attention to the study of 15-minute walkability in relation to persons with health disadvantages or persons affected by social deprivation. The aim, according to them, is to eliminate barriers and build 15-minute walkable neighbourhoods in a way that promotes the health of the population and reduces social inequalities. Another example of an empirical study is the work of Caselli et al. (2022), in which the authors applied a GIS-based model to measure the 15-minute walkability of amenities in the Cittadella District in Parma, Italy. Similar approaches are represented by the works of Ferrer-Ortiz et al. (2022) on Barcelona and Gaglione et al. (2022) on Naples. Accessibility of urban green areas is also highlighted in recent studies (e.g. Farkas et al. 2022).

The concept of a polycentric city is not new. Harris and Ullman (1945) presented a spatial development model of a city around multiple nuclei, drawing on the example of Chicago. The 15-minute city is a specific case of the multiple nuclei

model. The city is no longer divided, in accordance with the ideal of the Athenian Charter, into spatially separated and relatively functionally homogeneous areas associated with basic human activities (housing, work, leisure, transportation), but consists of a network of relatively functionally self-contained neighborhoods that provide individuals with a sense of connectedness and satisfaction. The walkability and connectivity of housing conditions this to retail and daily services, office and co-working spaces, and open recreation areas and public green spaces. The problem of implementing the 15-minute city model can also be situated in the context of adaptation processes of intra-urban structures. This issue has been discussed in our country, especially in the transition from the socialist to the post-socialist city (Matlovič 2004, 2014). In the context of our considerations, our concept is also adaptable to the transition to the 15-minute city model, considering the specific conditions of Slovak cities. In this case, we understand the adaptive transformation of intra-urban structures as a metaprocess involving the gradual adaptation of intra-urban structures per the 15-minute city model. This metaprocess involves transformation processes of intra-urban structures with a differentiated degree of complexity. Thus, the adaptive transformation is represented by complex, partially complex and elementary transformation processes that differentially manifest themselves in the effect on three partial intraurban structures (morphological, functional and socio-demographic) that form the spatial superstructure of the city. Complex processes affect all partial intra-urban structures, partially complex processes are reflected in two partial intra-urban structures and elementary transformation processes are reflected in one of the partial intra-urban structures. The changes in the transition to the 15-minute city model are highly complex in nature; therefore, we can expect changes in all intra-urban structures. At the same time, this significantly limits the potential for their occurrence in relation to the individual typical parts of Slovak cities, which are the centre (old town), inner city, residential districts, housing estates, and the peripheral (suburban) zone. The city centre largely fulfils the ideal of the 15-minute city. In some cases, it requires a revitalization of the residential function. In the inner city, there are relatively good conditions for implementing FMC approaches in relation to the revitalisation of brownfields, i.e. mainly old industrial and port areas. Neighbourhoods require relatively less invasive interventions. When densifying their development, consideration should be given to reinforcing commercial and office areas that will provide new jobs for their inhabitants. Residential neighbourhoods are complicated to adapt to the 15-minute city model. A similar problem occurs in large residential areas in the suburban zone. The opportunity is for new spatial development on the edges of the morphological city (greenfields).

DIMENSIONS OF THE 15-MINUTE CITY CONCEPT

The French-Colombian academic C. Moreno, a specialist in the intelligent management of complex systems, advocated a type of urban layout where locals can access all their essentials at distances that would take them no more than 15 minutes to walk or cycle (Allam et al. 2022). According to Manifesti and Park (2022), the philosophy of the 15-minute city concept is not an entirely new planning strategy but rather a culmination and updating of earlier urban planning paradigms such as the Garden City E. Howard's (1898), or C. Pery's (1929) neighbourhood unit. According to Allam et al. (2022), the 15-minute city concept seeks to bring about a paradigm shift in the way in which early urban planning focused primarily on the efficiency of traffic flows for vehicular traffic. According to Moreno (2021), it is an innovative approach based on a systemic and comprehensive medium- and long-term vision of the city that delivers a better quality of life for residents. Three important aspects come to the fore in this urban transformation: the development of social relations and the creation of commonly accepted values, the transformation of urban infrastructure, and the use of the technological revolution, especially digital technologies.

According to Moreno et al. (2021), the six essential functions whose effective accessibility within 15 minutes will bring a higher quality of life include housing, work, commerce, health care, education and entertainment. Manifesty and Park (2022) consider the most challenging function to fulfil to reach the place of work within 15 minutes. Several decades of segregation between places of employment and housing has led to increasing dependence on automobiles. In the post-pandemic era, proximity has become a critical feature for integrating jobs into daily life.

In order to integrate the 6 basic urban functions, according to Moreno et al. (2021), a planning network consisting of 4 basic dimensions (Fig. 1) is necessary: density, proximity, diversity, and digitalization. These dimensions were identified after observing the challenges faced by different cities around the world during the pandemic period. City dwellers faced myriad challenges, especially in terms of access to basic necessities that are often sparsely distributed, whereas if these cities prioritized these 4 dimensions, many of the challenges could have been overcome.

The first dimension - spatial and temporal proximity or geographical proximity, i.e. the location of people, services and activities close to each other, is one of the main ways people will gain access to spatially distributed opportunities in the urban environment, thus renewing the urban concept of proximity. Proximity-focused strategies, which differ from accessibility-focused strategies, introduce people's access to a wide range of services important for quality of life as a basic principle of spatial planning (e.g. health facilities, schools, social services, leisure, culture and entertainment facilities), and this list is indicative rather than exhaustive. Achieving proximity to these services entails a high degree

Fig. 1 Four key dimensions of a 15-minute city
Source: Manifesty and Park (2022, p.3)

of decentralisation of services at the local level, which ultimately leads to the levelling of disparities between urban districts (Pozoukidou and Chatziyiannaki 2021). Ultimately, this proximity to essential services allows residents to benefit from better service provision in both commercial and public facilities, as the planning model allows for multi-modal use of essential infrastructure Moreno et al. (2021). For example, in Paris, where Mayor Hidalgo has adopted this new concept, schools have an extremely important role as centres of local life, with traffic to be significantly reduced and schools to become green urban oases, open to residents on weekends. It is also important to have perfect identification in the public space, which shapes local identity. This is especially the case for highly legible maps of the immediate surroundings, with details of what is within a 15-minute walk. These maps are available virtually every turn - at kiosks and bus stops- and are primarily aimed at the community location, not the tourist. This is very important in the context of digital exclusion, an increasingly significant problem in global metropolises. A large number of residents do not have the ability or competence to use various applications that facilitate functioning in a city that is dynamically developing under the smart city idea (Kubicki 2021).

Regarding the second dimension of density, the concept promotes the idea of a compact city where its inhabitants would use sufficient resource capacity, which makes the concept different from the conventional concept of urban planning where density is viewed solely in terms of quotas of the built environment (Allam et al. 2022). Optimal density will help a 15-minute city to be socially sustainable by placing an optimal number of people in neighbourhoods, allowing sustainability to be achieved at the economic, social, and environmental frontiers (Manifesty and

Park 2022). This means that when planning a city that is sustainable, it is paramount to consider the optimum number of people that an area can comfortably support in terms of urban service provision and resource consumption (Moreno et al. 2021).

Diversity in the context of the above framework and the advancement of the 15-minute city concept is twofold. Firstly, the need for mixed neighbourhoods which are primary in providing a healthy mix of residential, commercial and entertainment elements and secondly diversity in culture and people, thus looking at it in terms of multiculturalism. Having mixed neighbourhoods is key to maintaining economically viable urban fabrics, ensuring adequate housing for all urban residents, promoting inclusiveness, encouraging sustainable practices, and fostering a sense of connection and familiarity. The participation of all citizens in local processes and the so-called bottom-up dynamics developed through citizen participation in the spatial planning process - from vision formation to the selection and implementation of local projects - is also an essential element (Allam et al. 2022; Moreno et al. 2021; Pozoukidou and Chatziyiannaki 2021).

Digitalization, in its various forms, as the last dimension, not only helps achieve the three dimensions of the 15-minute city mentioned above, but also actualises their goals. Digitalization is a means to speed up all things by combining digital literacy with the movement of people; for example, a bike-sharing system allows a citizen who does not own a bike to rent one in seconds. The main purpose of digitalisation is to enable easier access to healthier modes of transport by using the concept of the Internet of Things, where devices and smart technologies are connected at a local level (Manifesty and Park 2022). Also, digital solutions such as the use of smart cameras and sensors can be used to census the usage of bike paths or parks and based on the data collected, adopt the most optimal strategy to maximize the usage of people's needs (Allam et al. 2022, Ilies et al. 2014, 2018). At the forefront of any such innovative approach must remain the concern to improve citizens' quality of life, as opposed to a technocentric approach to cities and the search for smart solutions (through precise algorithms for each square meter of territory). In the same way, in the revolution of the involvement of digital technologies in the life of our places, we must not forget the development of urban life, the rediscovery of nature and biodiversity, and the reclaiming of precious and lived time within a new definition of proximity (Moreno 2021).

POSSIBLE ATTEMPTS TO IMPLEMENT THE 15-MINUTE CITY CONCEPT AND ITS ALTERNATIVES IN THE WORLD

The 15-minute city concept is not only a response to the unsustainable process of urban sprawl, which has brought about a heavy dependence on car travel, mainly due to underdeveloped urban infrastructure and the lack of basic services in these emerging places. Uncontrolled urban sprawl is considered detrimental to urban liveability and sustainability of cities, as it increases urban travel time,

which is also associated with an increase in private car use and more frequent traffic congestion, ultimately affecting air and environmental pollution in our cities (Graells-Garrido et al. 2021). The COVID-19 pandemic has equally revealed the fragility and vulnerability of cities in their current configuration and the need to adopt innovative measures based on the provision of a range of essential services, as close as possible to their inhabitants while using, in particular, health-safe pedestrian and bicycle transport. The urban neighbourhoods have taken centre stage during the pandemic as the only places where basic activities can be fulfilled (Pozoukidou and Chatziyiannaki, 2021).

Also because of these emerging issues, a growing number of city leaders worldwide are beginning to embrace the idea of the 15-minute city. An example is the new agenda of the International Global Coalition of Mayors for Climate Change and Sustainability (C40 cities), which explicitly points to one of the main goals of creating 15-minute cities (Crooks and Chen 2021). The pursuit of sustainable and smarter cities is urgent because cities contribute more than 60% of greenhouse gas emissions, creating pressure to redefine current urban policies, particularly in the area of mobility (Allam et al. 2022).

The basic philosophy of the 15-minute city concept is also beginning to be adopted by global organisations, which are implementing it in their policy documents. The UN is calling on European cities to promote walking and micro-mobility in their cities based on the principle of three levels of decision-making defined by the words - avoid, displace and enhance, concretely (Balleto et al. 2021; Unece 2020):

- Avoiding the need for car transport: planning more compact places with closer services.
- Shift to other modes of transport: walking and micro-mobility cycle.
- Improving means of transport: technologically improve means of transport to be energy efficient with low emissions.

The most preferred modes of transport for the 15-minute city concept are walking and cycling, as they promote healthier lifestyles and a more sustainable environment. Public transport was also favoured during early discussions about the concept, but the COVID-19 pandemic in early 2019 forced people to become more isolated from each other and reduced people's reliance on public transport as their primary mode of transport (Manifesty and Park 2022).

Among the first strong promoters of the 15-minute city concept was the Mayor of Paris, A. Hidalgo, whose electoral strategy "*Ville du quart d'heure*", ahead of the successful 2020 elections, included key ideas based on the 15-minute city concept. Particularly because of the strong political support, Paris has become a real research laboratory for the implementation of this concept. Paris also has specific characteristics that can help to facilitate the implementation of the different

steps. It has a very compact urban area with a high population density of over 20 000 people per km^2. Streets and neighborhoods have a strong urban identity, a developed network of services, and an extensive complex of parks and other places to relax (Crooks and Chen 2021; Kubicki 2021, Ilies et al. 2014, 2018, Badiali et al 2018). Key aspects of change in Paris include proximity and solidarity among residents, their participation, and an emphasis on green solutions. This will require a massive decentralization of services, a reduction in motorized traffic, an increase in bicycle paths, an increase in local shops and green spaces for recreation, and multiple uses of space (Nieuwenhuijsen 2021). Paris, for example, reclaimed several public spaces during the pandemic that were initially dominated by cars. During the pandemic, the city allowed cafés and bars to take up to 3 parking spaces and create a summer terrace. (Kubicki 2021).

Variants of the 15-minute city concept have also appeared in scholars' papers. Capasso Da Silva, et al. (in Moreno 2021) have introduced the idea of planning a city where basic services are accessible within 20 minutes by walking, cycling or public transport. The main differences between the 15 and 20 minute concepts include the lack of emphasis on the need for sustainable social interactions and participation of urban residents. In the case of the 20-minute city, the emphasis is more on the availability of employment opportunities than on the need for proximity to basic amenities and services. Another important difference is that, in meeting the 20-minute commute requirement for opportunities, there are increasing demands for higher land take and more resources in the planning patterns of such urban neighbourhoods. For example, the 20-minute city principle is integrated into the City of Portland's Complete Neighbourhood strategy in the City's plan. The goal of the strategy is for 90% of residents to be able to walk or bike and cover all of their needs except work within 20 minutes. In the City of Melbourne's long-term strategy, a 20-minute neighbourhood is defined as a neighbourhood providing people with the majority of their daily needs met within 20 minutes by walking, cycling or taking a trip on local public transport and is intended to help improve health, reduce travel and reduce transport costs and congestion (Fig 2). The plan does not give a specific physical size of the neighbourhood, but the estimated distance that a healthy individual can walk in 20 minutes is an average of 800 m (Pozoukidou and Chatziyiannaki 2021).

An example has already appeared in the world where several versions are combined. Singapore is one of the first cities to introduce its own version of a 15-minute city by combining 20-minute and 40-minute neighbourhoods with the release of its latest master plan implemented by 2040. The basis of this concept is that citizens should reach the nearest neighbourhood within 20 minutes and reach their workplace or commercial centre within 40 minutes by active mobility e.g. walking, cycling, e-scooter (Figure 3). Achieving the first goal is possible by bringing more urban facilities (schools, clinics, parks, retail parks) closer to where

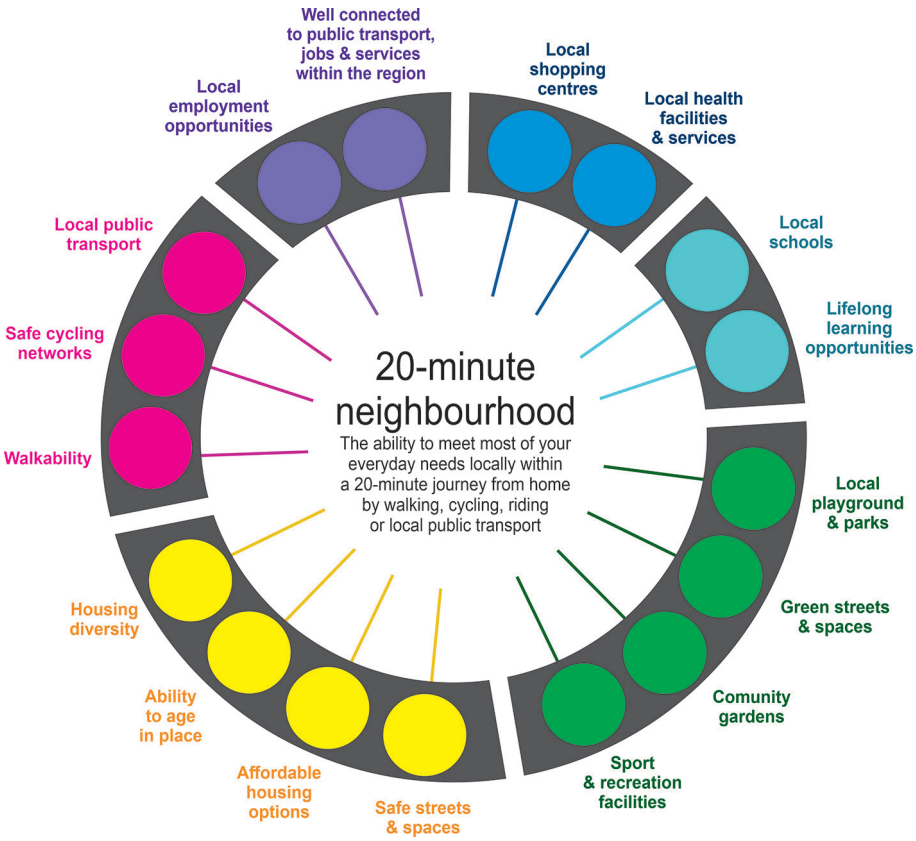

Fig. 2 Urban-social functional requirements for a 20-minute neighbourhood in Melbourne
Source: Pozoukidou, Chatziyiannaki (2021, p.14)

people live (Badiali et al. 2018, Ilieş 2014). Achieving the 40-minute limit is to be achieved primarily through improvements to transport infrastructure and policies for active mobility. The concept of developing a 15-minute city is not just about bringing urban facilities closer to places of living, but involves a multi-level and multi-dimensional process, a change of mind-set and the introduction of new lifestyles in people, and such a change can take years (Manifesty - Park 2022)

As we can see from the three model examples mentioned above (Paris, Melbourne, Singapore) this concept is not rigid by nature. It is designed with the intention of adapting it to individual cities. In implementing it, its historical development, morphology, social polarisation or spatial disparity must be taken into account. At the same time, individual challenges and problems vary from city to city and state to state. For example, people living in New York City may be able to get most of their daily needs within a 15-minute travel time, while people living

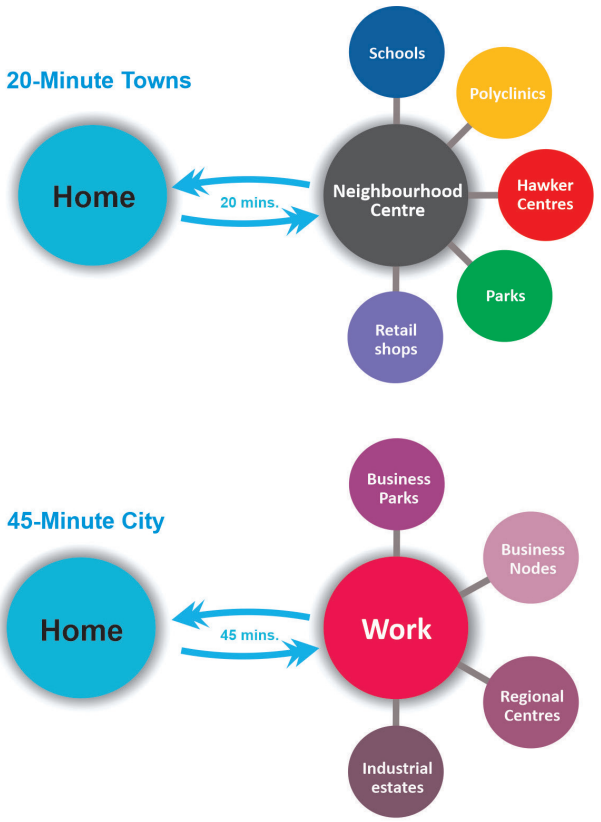

Fig. 3 Main goals of residents for the 15-minute city subvariants implemented in Singapore
Source: Manifesty, Park (2022, p. 9)

in small and medium-sized cities need more time to secure necessities, especially where public transport is absent. In this case, it is also worth noting that within a 15-minute radius, a cyclist would cover a considerable distance compared to residents who may choose to walk. Therefore, the proximity dimension for cyclists would be defined differently than the dimension for pedestrians. What is the ideal size of a 15-minute city? How does its size differ from the mode of transportation used? We cannot yet demonstrably answer these questions, as there is still no consensus among researchers and practitioners as to what is the reference measure (benchmark) for quantifying a 15-minute city. However, it is important to stick to the point, which is that proximity-based planning is crucial in the process of urban transformation in the post-pandemic era (Crooks and Chen 2021; Neumannová 2022; Moreno et al. 2021).

POSSIBILITIES FOR THE DEVELOPMENT OF THE 15-MINUTE CITY CONCEPT IN SLOVAK CONDITIONS

Proximity-based planning is penetrating the Slovak environment at a slower pace. The attention of urban planners, architects and city planners is focused on planned new urban districts and housing estates rather than on the comprehensive integration of 15-minute city ideas into entire cities, as we described in the previous chapter in the case of Paris.

According to the urban planner Z. Ladzianska (in Hudec 2021), the historical part of Bratislava, as well as its peripheral districts Podunajské Biskupice, Rača, Jarovce, Rusovce, Devínska Nová Ves, Lamač and others, which have naturally grown with the capital city, already function within certain boundaries on the principle of 15-minute cities. This is precisely on the basis of the fact that in the previous period they functioned as separate territorial units and most of them provided all the necessary infrastructure and amenities. The problem, however, is the emerging development areas, where there is a growing dependence on the car due to inadequate public amenities and transport infrastructure.

One of the first examples of implementation in new development areas is the planned creation of a multifunctional zone in the Janíkov dvor area in Petržalka, which is to be built on the principle of a 15-minute city. In terms of the concept of adaptive transformation of intra-urban structures, this is a development on the edge of the morphological city. The area of the designed territory where the construction is to take place is 33 100 m^2 (Fig. 4). This area was chosen mainly because of its connection to the future tram line, as well as suitable natural and spatial conditions for the construction of a P+R (Park and Ride) car park, rental housing, a care service, a kindergarten, amenity services, the creation of an urban bio-corridor (greenways), or for a fenced dog run. Prior to the actual architectural and urban planning competition, a presentation of the plans was made to the citizens living in the area. Direct participation was important in terms of identifying missing needs. The most acute shortage was considered by the current residents to be the lack of pre-school and primary school places. The next requirements in order were a preference for gastro outlets, particularly for lunchtime meals, a community centre, or GP services. The issue of the quality of public spaces in the area also resonated strongly. Residents would also like to see playgrounds for older children, a work-out zone, sufficient seating and a water feature to cool the area (Metropolitan Institute Bratislava 2021).

The selection of the site as a suitable location for the implementation of the 15-minute city ideas was also due to its convenient traffic predisposition. The Petržalka housing estate itself has sufficient oversized space for building new cycle routes as well as existing cycle corridors. In contrast to the most preferred options in the original concept - walking and cycling - the authors of the plan want to use the potential of the planned double-track tram line of the Bratislava public

Fig. 4 Janíkov dvor area as an example of an urban area meeting the conditions of a 15-minute city
Source: Metropolitný inštitút Bratislava (2021, p. 9)

Fig. 5 NESTO neighbourhood planned according to the 20-minute city concept
Source: Nesto (2022)

transport system, which will also include stops in this zone, when building this zone. The project itself is at the very beginning, an architectural competition was announced at the end of 2021, and the winning design should be known in June 2022 (Metropolitan Institute Bratislava 2021).

Another example that plans to adopt the ideas of one of the sub-variants of the 15-minute city concept in its locality is the construction of the Nesto urban district, which is backed by a private developer. Again, this is an example of development on the edge of a morphological city. The idea is to provide residents within a 20-minute radius with a place not only to go to school, nurseries, playgrounds, sports facilities, medical facilities, sports grounds, places to relax, but also a place to work. The construction of such a neighbourhood is a response to the proliferation of urban satellites, which, fail to provide residents with what they need. The City neighbourhood should fulfil all three functions, based on the original concept - housing, entertainment and leisure, and work - within walking and cycling distance. It should be located in Petržalka close to the border with Austria with good cycling connections to the international EUROVELO 6 network as well as the planned railway stop to Vienna (Nesto, 2022).

CONCLUSION

The aim of the review paper was to initiate a discussion on the possibilities of implementing the FMC concept in the conditions of Slovak cities. We pointed out that this concept has a relatively high potential to contribute to the solution of current problems of sustainable urban development to strengthen the resilience of cities. It is triggered not only by the need to cope with the consequences of the COVID 19 pandemic but also responds to the need for synergy of mitigation and adaptation measures in the context of climate change and the transition to a low- to zero-carbon development paradigm. Last but not least, we also pointed out that it can contribute to reducing inequalities between different parts of cities, which is one of the consequences of poorly regulated suburbanization processes.

We have pointed out its theoretical anchoring within the currents of geographical thought, among which we have highlighted behavioural geography, the time geography and the concept of chronourbanism. We also see potential in the application of the concept of adaptive transformation processes of intra-urban structures. We have pointed out the basic functions and dimensions that are taken into account when planning this concept in the current conditions of urban life. We have also discussed attempts at concrete applications in world metropolises (Paris, Melbourne, Singapore). We have stressed that the concept is not to be understood rigidly. It must be adapted to local natural, historical, socio-economic and spatial conditions. In the last section, we pointed out the first signs of the implementation of FMC ideas in Slovakia, using the example of two development projects in Bratislava (Janíkov dvor and Nesto).

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