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Exploring residential developments built from 1960 to 1980 in Kraków in the context of the 15-minute city concept

Abstract

The 15-minute city concept is gaining traction as urban planners worldwide seek solutions to combat climate change and create more pedestrian-friendly environments. Its core idea is that residents should have access to essential services within a short walking distance – typically 15 minutes. During the communist era, many residential developments were designed as “structural housing units” – self-contained residential areas that included all basic facilities (such as services, leisure, and transport) within a 500-meter radius. This research aims to compare these two visions.

The study examines pedestrian accessibility to selected services in three residential developments in Kraków, Poland, built between 1960 and 1980, and evaluates whether these developments meet the requirements of the 15-minute city.

First, amenities from selected categories were mapped. Then, access paths were analyzed to determine the longest routes from residential buildings to the nearest facility of each type. Combining these two aspects provided insights into the spatial and functional characteristics of each development.

The results indicate that most of the amenities are accessible within a 15-minute walk, suggesting that these developments share many features of 15-minute city components. This finding reframes the legacy of communist-era housing estates, positioning them as valuable elements of modern urban structures. The analysis could serve as a useful guideline for city planners engaged in complex modernization projects or for private investors seeking to identify and address gaps in urban functionality.

Key words: 15-minute city, urban planning, walkability, communism, residential developments

Introduction

Research problem

A 15-minute city is an urban planning concept rooted in “chrono-urbanism”, whose main assumption is that every inhabitant should have access to facilities meeting their basic needs within a short walking distance (typically 15 minutes) (Moreno et al. 2021). During the communist era in Poland, many residential developments in large and medium-sized cities were designed as structural housing units (Pol. *struk-*

turalna jednostka mieszkaniowa): [...] *self-contained residential developments with all the basic facilities (such as services, leisure and transport) within a 500-meter radius* (Szafrńska 2016, 33).

This study aims to compare these two visions. It examines pedestrian accessibility to selected services in three residential developments located in Kraków (Poland) and seeks to determine whether they align with the principles of the 15-minute city.

Current relevance and purpose of the research

The estates selected for analysis exhibit typical characteristics of architecture and urban planning from the communist era. They are multi-family housing complexes composed of repetitive apartment blocks, accompanied by a basic range of services. Similar developments from the communist period can be found throughout urban landscapes across

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Poland. At the beginning of the 21st century, seven to eight million Poles lived in such neighbourhoods, accounting for approximately one-fifth of the country's population (Basista 2001).

Today, although still habitable, these estates face an uncertain future. After 1989, with the emergence of new residential areas shaped by the free market, the perception of post-communist housing estates has significantly declined, despite their many advantages (Szafrńska 2016). This could represent the first step towards degradation, similar to what has occurred with comparable developments in Western Europe. Are the housing estates from the 1960s, 1970s, and 1980s a problematic legacy or a place of great potential?

One key characteristic that distinguishes developments built between the 1960s and 1980s from modern ones is their multi-functionality. These developments were designed as structural housing units (a concept derived from Clarence Perry's neighbourhood unit model) and were intended to meet all the basic needs of their residents. This is particularly relevant today, as the ideas of walkability and pedestrian accessibility are experiencing a significant resurgence through the rise of the 15-minute city concept and its derivatives.

The purpose of this research is to examine selected residential developments in the context of the 15-minute city concept. We aim to assess their potential by closely evaluating their functionality and walkability. Do these developments offer all the amenities necessary to meet the basic needs of their residents? If so, are these facilities within a 15-minute walking distance? Perhaps the 15-minute city and the structural housing unit are simply different realizations of the same fundamental idea – that a well-designed city should allow its inhabitants to complete their daily tasks without leaving their neighbourhood.

Theoretical background and state of the art

15-minute city – its origins, historical connotations and implementations

The 15-minute city is a concept first introduced in 2016 by Carlos Moreno, a professor of urban planning at the Sorbonne. The main principle behind this idea is that residents should have access to all essential amenities within a 15-minute walk (or bike ride). The goal of this concept is to create more sustainable and user-friendly cities by reducing traffic, air pollution, and carbon emissions, while promoting pedestrian and bicycle mobility. The key features of the 15-minute city are:

- Proximity – Short distances between homes and essential amenities encourage physical activity and social interaction.
- Diversity – A wide range of cultural and recreational opportunities motivates residents to stay active and engage with their community.
- Density – High population density supports more efficient land use and encourages walking as the primary mode of transportation.
- Digitalization – Online services such as e-commerce and telemedicine further reduce the need for commuting (Fronczak 2023).

The concept of the 15-minute city draws from various urban theories, including the garden city, eco-urbanism, and the neighbourhood unit introduced by Clarence Perry in 1923 (Khavarian-Garmsir et al. 2023). Known by different names, this similar idea is currently being implemented in cities worldwide, from the “city of a quarter of an hour” in Paris to the “20-minute neighbourhood” in Melbourne and the “15-minute community-life circle” in Shanghai. Several researchers have examined different implementations of the 15-minute city concept or its derivatives. Denise Capasso Da Silva, David A. King, and Shea Lemar studied the case of Tempe, Arizona, where city planners prioritized accessibility using a 20-minute threshold (2020). Luis A. Guzman et al. measured the geographical proximity of services and facilities in Bogotá, Colombia, and described how the 15-minute city concept impacts social and spatial inequalities (2021). Lee-Anne Khor et al. proposed the 20-minute city as a key element in the future plans for metropolitan Melbourne, discussing the benefits and challenges of such a model (2013). In our research, we use the 15-minute city framework to assess the existing urban fabric, focusing on residential developments from the 1960s to 1980s.

Structural housing unit

The housing developments analyzed in this research were designed and constructed during the period of the People's Republic of Poland (Polska Rzeczpospolita Ludowa), the communist era in Polish history that lasted from 1944 to 1989. During this time, the construction of multifamily housing was exclusively managed by the public sector and organized by the central government through housing cooperatives (Basista 2001). In the 1970s, new housing developments in Poland began to be planned as structural housing units (*strukturalna jednostka mieszkaniowa*) – functionally and spatially distinct multi-family residential estates with basic services, recreational facilities, and transportation infrastructure within a 500-meter radius. The term was first introduced in 1974 as part of the urban planning norm and became an official guideline for residential development across Poland (Szafrńska 2016).

Assessing walkability and proximity of services

Different approaches to assessing walkability are currently being developed. Alexandros Bartzokas-Tsiompras and Efthimios Bakogiannis created a 15-Minute-Walking-City index, which they used to evaluate the walkability of 121 metropolitan areas in Europe (2022). Min Weng et al. proposed a method for measuring walkable neighbourhoods based on the Walk Score metric and applied it to Shanghai (2019). Donghwan Ki et al. developed a novel walkability index that, using Google Street View and computer vision algorithms, focuses on pedestrians' walking satisfaction (2023).

Few studies have been conducted on the concept of the 15-minute city in the Polish context, especially when compared to the volume of research from Western Europe or Asia. However, there are some notable exceptions. Aleksander Noworól et al. analyzed the proximity of services in

Kraków (2022). Aleksander Małachowski, Maciej Dąbski and Waldemar Wilk examined whether the availability of public services affects property prices, using Warsaw as a case study (2020). Wojciech Bartoszczuk, Agnieszka Cieśla and Katarzyna Rędzińska assessed selected neighbourhoods in Warsaw in terms of access to basic public services and green spaces (2024). Damian Poklewski-Koziół, Karolina Dudzic-Gyurkovich and Carlos Marmolejo Duarte investigated walkability measures, comparing the newly built Garnizon development in Gdańsk with urban districts in Western Europe (2023).

This research differs from the studies presented above in its approach to assessing walkability. Instead of relying on straight-line distances to facilities, we based our results on actual access routes, taking into account urban barriers.

Methods

The analysis included three residential developments in Kraków: Nowogrzegórzecka, Krowodrza Górka, and Oświęcienia (Fig. 1). The table below presents key data for the housing estates analyzed (Table 1).

To determine whether residents of the analyzed neighbourhoods can meet their basic needs within a 15-minute walk, it was necessary to first define what is meant by “basic needs”. For this, we used the “essential urban social functions” outlined by Moreno, the creator of the 15-minute city concept: living, working, commerce, healthcare, education, and entertainment (Moreno et al. 2021). However, some adjustments were made. In this study, “living” serves as our reference point, rather than being categorized as a specific facility. The category of “working” was excluded, as these developments were planned during a time when large industrial plants were the primary sources of employment. Thus, it was not ideal to place work and residential areas in close proximity. Additionally, analyzing workplace proximity would have required surveying residents to identify their places of employment – an interesting direction for future research. However, this aspect was not included in the cur-



Fig. 1. Location of chosen developments:
1 – Nowogrzegórzecka, 2 – Krowodrza Górka
and 3 – Oświęcienia in relation to the city centre (A)
(elaborated by D. Cenda)

Il. 1. Lokalizacja wybranych osiedli:
1 – Nowogrzegórzecka, 2 – Krowodrza Górka
i 3 – Oświęcienia względem centrum miasta (A)
(oprac. D. Cenda)

rent study. “Entertainment” was divided into two categories: “Community and Culture” and “Recreation”. Facilities in these categories share the role of fostering community engagement, social well-being, and, respectively, cultural or physical development.

After these adjustments, we decided to map amenities in the following categories:

- Education – nurseries, kindergartens, primary schools, high schools.
- Commerce – general stores, restaurants.
- Community and culture – churches, libraries, seniors’ clubs, culture houses.
- Healthcare – health centres.
- Recreation – sports facilities, parks and playgrounds, allotment gardens.

Nurseries and kindergartens were analyzed twice: first, including all facilities, and second, focusing only on public institutions. This decision was made because private

Table 1. Developments’ specification and comparison
(elaborated by D. Cenda based on own measurements and archival design documentation; Włodarczyk 2014)

Tabela 1. Charakterystyka i porównanie osiedli
(oprac. D. Cenda na podstawie własnych pomiarów oraz archiwalnej dokumentacji projektowej; Włodarczyk 2014)

Development	Nowogrzegórzecka	Krowodrza Górka	Oświęcienia
Time of design and construction	1957–1969	1968–1976	1985–1988
Area [ha]	15.9	42.2	22.8
Number of residential buildings in the original layout*	22	36	27
Residential buildings’ height distribution [stories]	9 × 5 3 × 7 3 × 11 7 × 12	10 × 5 26 × 11	5 × 419 × 5 3 × 12
Distance to city centre [km]	1.8	2.5	4.7
Dimensions [m]	400 × 450	630 × 830	× 730

* Buildings constructed later, filling in the gaps in the original development, were not considered.

Note: The rest of the data comes from visual inspection or measuring dimensions on developments’ maps.

institutions in Poland are often costly and not affordable for the majority of the population. In the commerce category, small or specialized shops (e.g., bakeries, greengrocers) were excluded. Only large and medium-sized general stores were considered. A “culture house” refers to a public facility where various activities (e.g., dance classes, arts and crafts, language lessons) are organized, typically for youth and children. In the health category, only general health clinics offering specialists in various fields were analyzed. Individual medical practices were excluded. Regarding playgrounds, only larger facilities, often linked to parks, were considered; smaller or private playgrounds were not included in the analysis.

It is important to note that what is considered basic or secondary amenities can vary from person to person, particularly when taking into account different age groups and lifestyles (Kobylarczyk 2018). This research makes a generalization in this regard, assuming that all inhabitants require the same facilities to the same extent.

The facilities were identified through onsite visits and online research (primarily using Google Maps). They were located within the development and its surrounding area (ranging from 300 to 500 m from the development’s boundaries, depending on the density of available amenities and urban barriers). The analysis was conducted in the second quarter of 2023, reflecting the actual situation during that period.

Next, each type of facility was analyzed, and the longest access paths to any residential building within the development were identified and marked. These paths were described both in terms of distance (in meters) and travel time (in minutes). The same analysis was repeated for each type of facility across all the analyzed developments. The described methodology is illustrated in Figure 2.

The lengths of the routes were determined by measuring the polylines marking the walking paths on the map.

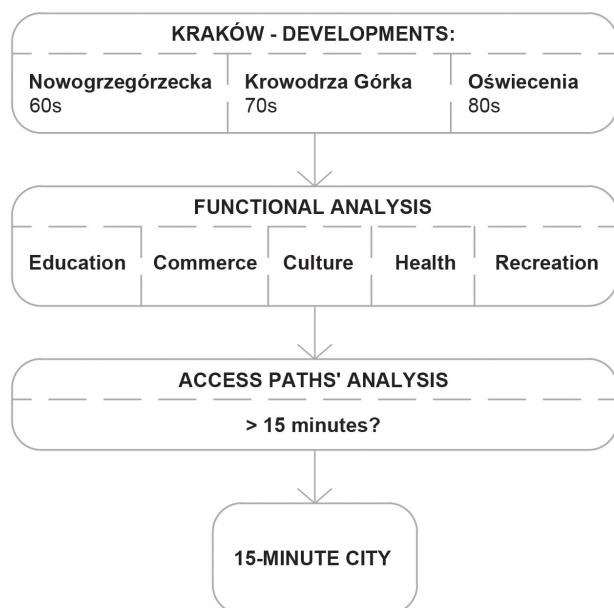


Fig. 2. Research structure and methods (elaborated by D. Cenda)

Il. 2. Metodyka i struktura badań (oprac. D. Cenda)

Travel time was calculated based on onsite visits and map analysis in AutoCAD, with the assistance of Google Maps (using the “Walking” tool). In our analysis, we assumed an average walking speed of 5 km/h (as used by Google Maps) and basic mobility to navigate urban barriers such as stairs and high curbs. However, it is important to note that these parameters may pose challenges for certain groups of residents, such as the elderly, disabled individuals, or parents with young children (particularly those in strollers). Research indicates that different groups of residents – adults, children, seniors, and individuals with impaired mobility – exhibit significant variations in their walking capabilities and accessibility needs (Moura, Cambra and Gonçalves 2017). For these groups, further mapping of the analyzed developments would be necessary to assess how these obstacles impact the length of access routes.

Results

Below we present the results of the functional analysis of the housing estates. The maps show the existing amenities within these areas, as well as in their surroundings, categorized according to the previously defined groups. Each housing estate is presented in a separate diagram (Figs. 3–5).

The furthest access paths were measured for 16 types of facilities across 3 developments, resulting in a total of 48 analyses. Below, we present a graphical example of one of these analyses (Fig. 6), along with a summary of all the results (Table 2).

Results exceeding the 15-minute limit are highlighted and underlined. Facilities that could not be reached within a 25-minute walk were marked with a “–” as this was considered the maximum acceptable walking distance. As shown, most results fall within the 15-minute limit – 35 out of 42 (83%). Interestingly, even when we set a 10-minute limit, the majority of facilities still fall below it – 74% of all facilities and 67% of public ones. Only three results exceeded the 15-minute threshold, and just two were marked as inaccessible within the given range.

Regarding specific categories, 100% of commercial and healthcare facilities are within a 15-minute walk, 92% of educational facilities, and 89% of recreational ones. The lowest results were found in the “Community and Culture” category, where only 75% of facilities were within the 15-minute limit, and only 33% were within 10 minutes. The shortest walk was to reach a general store: 6 minutes for both the Nowogrzegórzecka and Krowodrza Górka developments, and just 4 minutes for the Oświęcienia development.

Each development has its strengths and weaknesses in terms of the results achieved. Nowogrzegórzecka (Fig. 7) has the lowest average time (8.87 minutes), with consistently short access times, except for one missing facility (the seniors’ club). Sports facilities and kindergartens are particularly well-located, being accessible in under 5 minutes. The “Community and Culture” category is the most poorly represented, with all facilities located more than 10 minutes away, outside the development.

Krowodrza Górka (Fig. 8) also has a relatively low average access time (9.18 minutes), with only one facility (high school) located beyond the 15-minute reach. The best

Fig. 3. Map of amenities
– Nowogrzegórzecka development
(elaborated by D. Cenda)

II. 3. Mapa dostępności usług
– osiedle Nowogrzegórzecka
(oprac. D. Cenda)

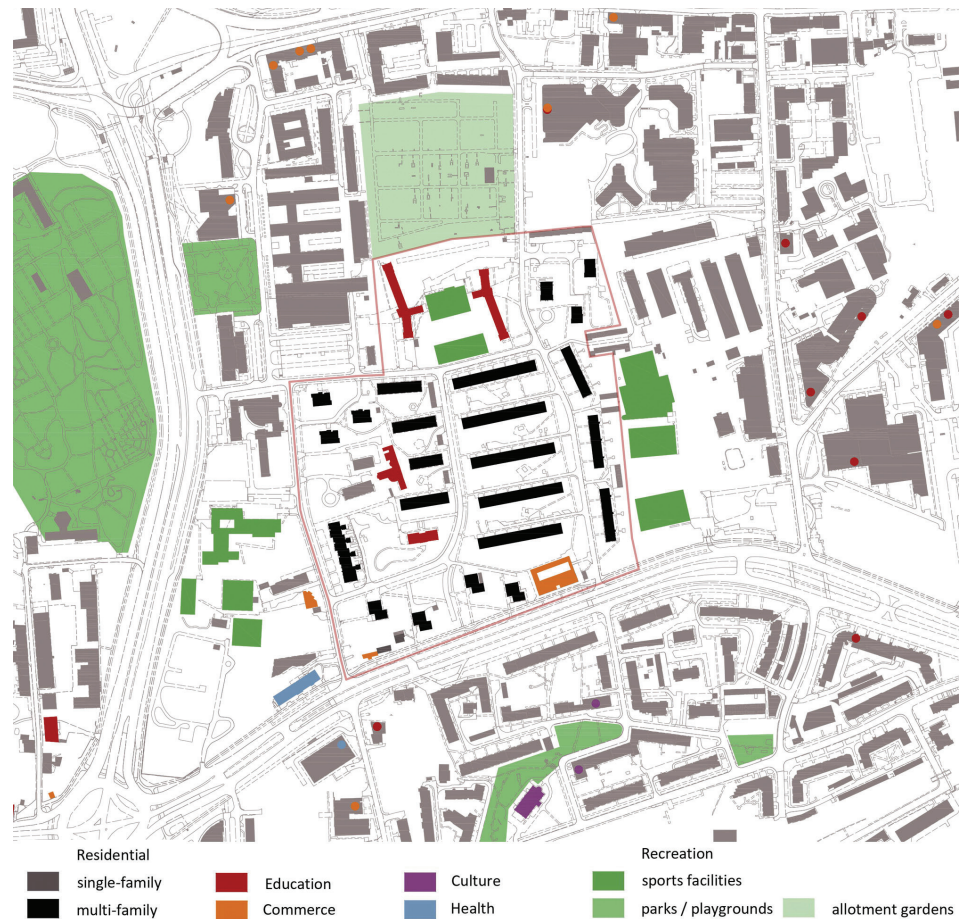


Fig. 4. Map of amenities
– Krowodrza Górka development
(elaborated by D. Cenda)

II. 4. Mapa dostępności usług
– osiedle Krowodrza Górka
(oprac. D. Cenda)



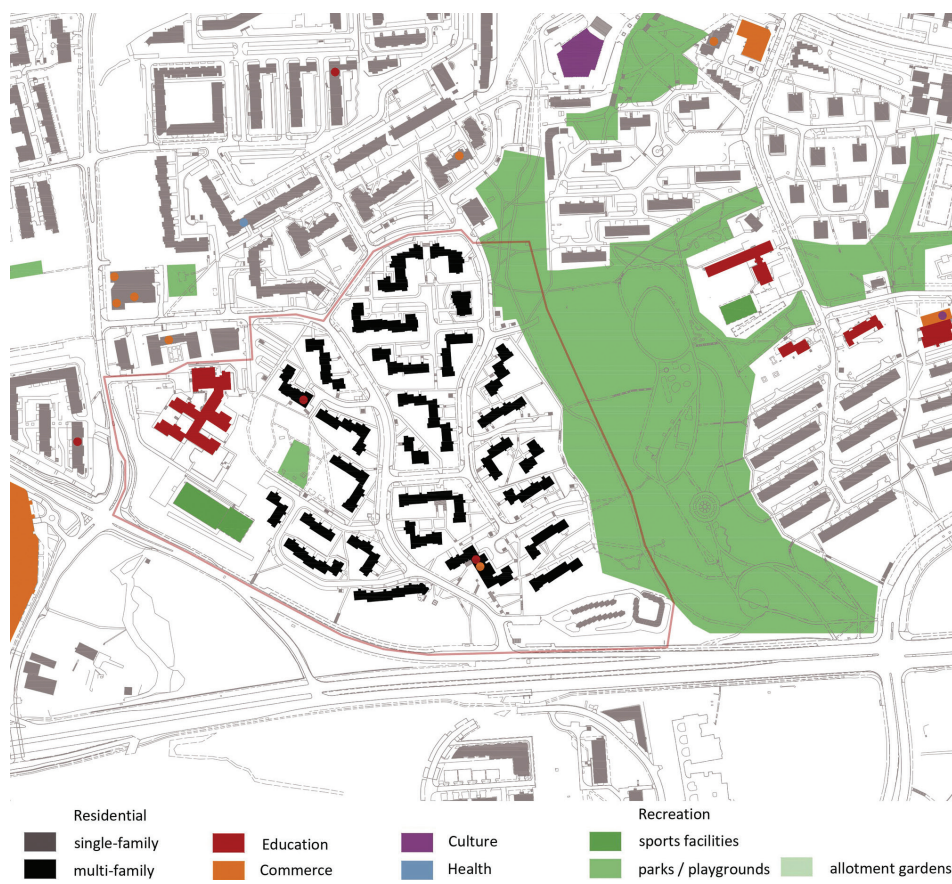


Fig. 5. Map of amenities
– Oświecenia development
(elaborated by D. Cenda)

Il. 5. Mapa dostępności usług
– osiedle Oświecenia
(oprac. D. Cenda)

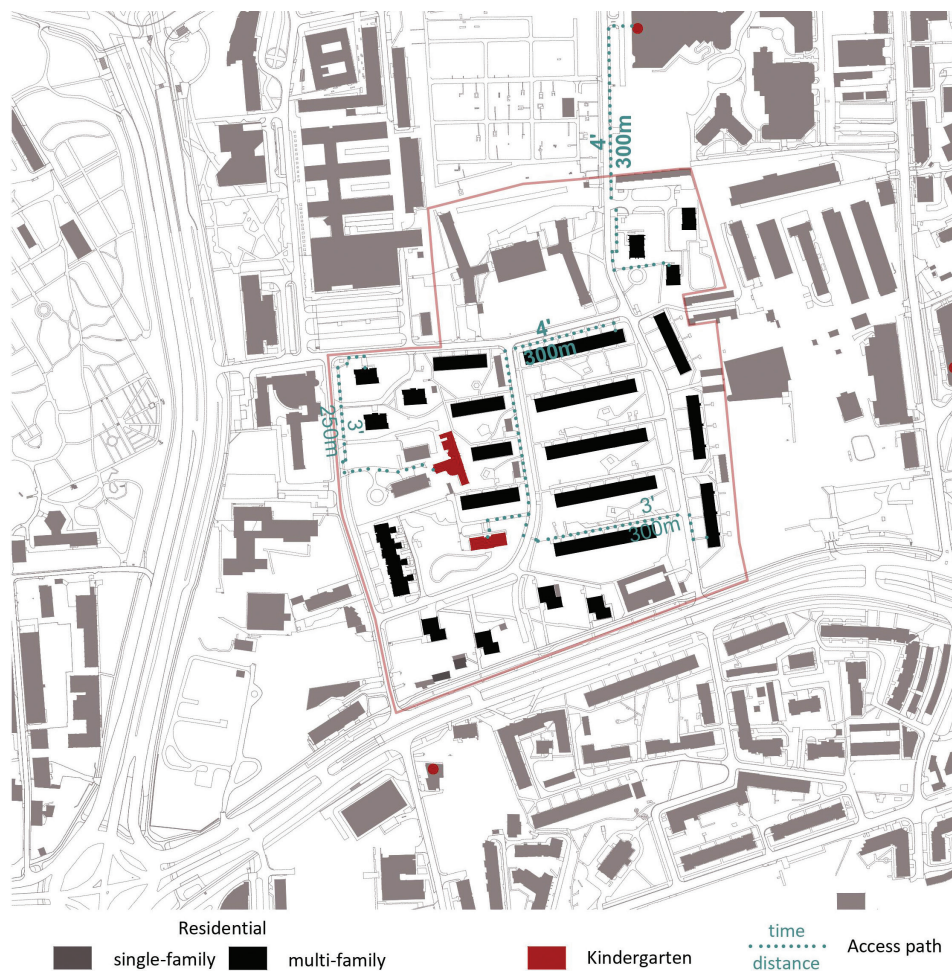


Fig. 6. Exemplary access path
analysis – kindergartens in
Nowogrzegórska development
(elaborated by D. Cenda)

Il. 6. Przykładowa analiza
dróg dojścia – przedszkola
na osiedlu Nowogrzegórska
(oprac. D. Cenda)

Table 2. The furthest walk to each type of facility, in minutes (elaborated by D. Cenda)
 Tabela 2. Najdłuższe drogi dojazdu dla poszczególnych obiektów, w minutach (oprac. D. Cenda)

Category	Facility	Development		
		Francesco Nullo	Krowodrza Górka	Oświęcenia
Education	nursery	6/11*	8/12*	6/12*
	kindergarten	4/8*	6/7*	7/7*
	primary school	7	7	8
	high school	6	20	13
Commerce	general store	6	6	4
	restaurant	8	5	9
Community and culture	church	10	13	11
	library	10	10	16
	seniors' club	–	8	16
	culture house	11	13	12
Healthcare	health centre	10	9	9
Recreation	sports facility	4	6	8
	park and playground	8	7	3
	allotment gardens	8	10	–

* Only public facilities.

Note: Results exceeding the 15-minute limit are shown in bold font.

result was observed for gastronomy, with a restaurant within a 5-minute walk from every point in the development. There is a slight shortage of public nurseries, and only one church and one cultural center, which resulted in relatively higher access times for these facilities. It's worth noting that Krowodrza Górka is the largest of the analyzed developments, meaning that it takes time to even travel from one end to the other. Nevertheless, in most cases, at least one facility from each category is located within the development itself.

Of all the developments, Oświęcenia (Fig. 9) has the most missing facilities – it takes 16 minutes to reach the library or seniors' club, and allotment gardens are absent. It also has the highest average access time, at 10.37 minutes. However, two types of facilities stand out with exceptionally good results: a general store is just 4 minutes away,

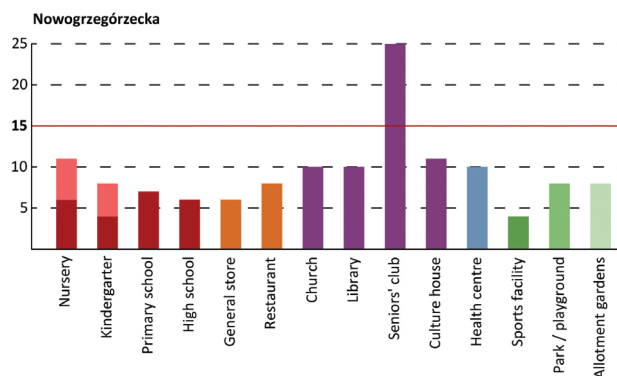


Fig. 7. The furthest walk to each type of facility – Nowogródzka (elaborated by D. Cenda)

II. 7. Najdłuższe drogi dojazdu dla poszczególnych obiektów – osiedle Nowogródzka (oprac. D. Cenda)

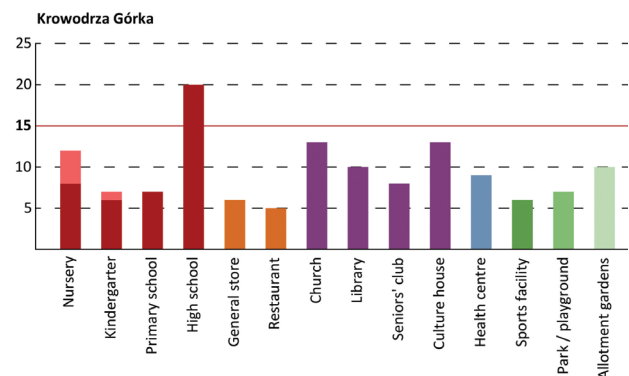


Fig. 8. The furthest walk to each type of facility – Krowodrza Górka (elaborated by D. Cenda)

II. 8. Najdłuższe drogi dojazdu dla poszczególnych obiektów – osiedle Krowodrza Górka (oprac. D. Cenda)

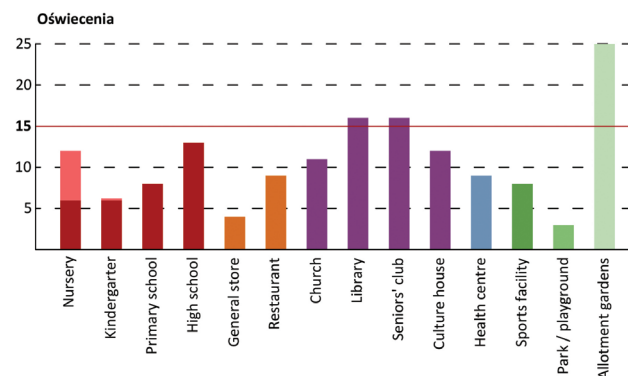


Fig. 9. The furthest walk to each type of facility – Oświęcenia (elaborated by D. Cenda)

II. 9. Najdłuższe drogi dojazdu dla poszczególnych obiektów – osiedle Oświęcenia (oprac. D. Cenda)

and a park or playground is only 3 minutes away. It's worth noting that this development benefits from its proximity to the nearby Mistrzejowice, which is rich in public amenities, particularly in terms of cultural and educational facilities.

Conclusions

The results indicate that the analyzed developments could be considered components of a 15-minute city, with only minor adjustments needed. Most of the access times are within 15 minutes. Additionally, it is important to note that the missing facilities (seniors' clubs, library, high school, and allotment gardens) are not considered basic necessities. One could argue that these amenities may not be used daily by residents (e.g., library), or they may only be needed by specific age groups (e.g., high school or seniors' club). More essential amenities, such as general stores, parks, and kindergartens, are all within a 15-minute walk, with the average access times for these facilities closer to the 5-minute range.

These results appear optimal, as research indicates that only 50% of people are comfortable walking 400 m for grocery shopping, and this figure drops to just 20% at a distance of 600 m (Kesarovski, Hernández-Palacio 2023). Even among Nordic populations, generally considered to be physically active, research has shown that the majority (68%) are only willing to walk distances of up to 1 km, equivalent to approximately 12 minutes (Hjorthol, Engebretsen and Uteng 2014). The concepts of 10-, 15-, or 20-minute cities often assume uniform maximum distances for all facilities. However, this is an oversimplification. Studies suggest that some amenities, such as grocery stores, should be within a 5-minute walk, while others, like educational facilities, can reasonably be located up to 15 minutes away (Logan et al. 2022).

Although each development has an average result well under the 15-minute threshold, an interesting pattern emerges: the older the development, the better the results. This may be because older neighbourhoods are situated more centrally, in areas that are already well-equipped with amenities. Another, perhaps simpler, explanation is that older developments have had more time to improve their functionality, even if they initially faced some deficiencies.

Given the favourable results, one might question whether the 15-minute city standard is ambitious enough for a mid-sized European city. The analyzed developments demonstrate potential to provide an even higher level of convenience for their residents. With an average access time of 9.47 minutes and only 26% of facilities exceeding the 10-minute threshold, these neighborhoods could realistically aim to meet the criteria of a 10-minute city. Achieving this would require only minor enhancements to their functionality.

Summary

This research reveals a striking similarity between the design of developments built in the 1960s–1980s and the

principles of the 15-minute city concept. This connection holds significant potential, particularly today, as the importance of proximity and walkability is once again at the forefront of urban planning. These developments could be considered early examples of 15-minute city components, offering valuable opportunities for exploration and experimentation. By studying them, we can refine the concept further and establish guidelines for future implementations. This is especially relevant in Poland, where the 15-minute city concept has yet to be fully embraced.

The presented methodology serves as a replicable assessment tool that can be applied to other areas. It is suitable for evaluating both existing urban structures and planned developments. However, its effectiveness relies on a detailed analysis of existing urban barriers and pedestrian pathways.

The multifunctionality of the analyzed developments offers a significant advantage over their modern counterparts. This characteristic highlights their potential as areas deserving complex modernization efforts aimed at enhancing their strengths (such as urban layout and functionality) while addressing their weaknesses (such as monotonous architecture, aging infrastructure, and lower technical standards). This research could serve as a guideline for augmenting functionality in these neighbourhoods in cases of planned modernization initiated by public entities or housing cooperatives.

For better or worse, the era of centrally planned residential developments is long past. Today, most of the analyzed areas are either fully developed or in private ownership. The construction of public facilities has become more complex and less common. However, the private sector can also benefit from this research, as such analyses highlight areas lacking specific amenities (such as private nurseries or restaurants), presenting potential opportunities for profitable investments.

Future research could be expanded by analyzing a larger number of developments across various cities or countries. It would also be valuable to compare developments built between 1960–1980 with more recent ones. How do the functions offered in modern residential areas compare to those from the communist era, both in terms of scope and quantity? Has the shift from centrally managed to privately developed housing resulted in better functionality for residents?

This research confirms that the analyzed developments can be interpreted as components of a 15-minute city. They were built with a similar principle in mind – that residents should have access to all the facilities they use daily within a short distance. In communist-era urban planning, this was defined by physical distance; today, it is framed by the time of the journey. At the time of their construction, car-oriented design seemed impractical, as few people owned cars. In today's world, pedestrian accessibility has once again become crucial and warrants further study.

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Streszczenie

Krakowskie osiedla mieszkaniowe z lat 1960–1980 w kontekście koncepcji miasta 15-minutowego

Urbaniści z całego świata poszukują sposobów walki ze zmianami klimatycznymi oraz tworzenia otoczenia przyjaznego dla pieszych. Jednym z nich może być zyskująca na popularności idea miasta 15-minutowego. Jej głównym założeniem jest dostępność podstawowych udogodnień w zasięgu krótkiego spaceru (najczęściej do 15 minut). W okresie komunizmu w Polsce wiele inwestycji mieszkaniowych miało być projektowanych jako jednostki mieszkaniowe – wydzielone strukturalnie osiedla mieszkaniowe ze wszystkimi podstawowymi udogodnieniami (usługi, rekreacja i transport) dostępnymi w promieniu 500 metrów. Celem niniejszych badań jest porównanie tych dwóch wizji.

Przeprowadzone badania skoncentrowano na dostępności pieszej wybranych usług w trzech osiedlach mieszkaniowych położonych w Krakowie, zbudowanych w latach 1960–1980. Miały na celu sprawdzenie, czy analizowane obszary spełniają wymagania komponentów miasta 15-minutowego.

W trakcie prac przeprowadzono analizę funkcjonalną w celu zlokalizowania udogodnień z wybranych kategorii. Następnie wykonano analizę ścieżek dostępu, aby określić najdłuższe trasy pomiędzy budynkami mieszkalnymi a najbliższym obiektem danego rodzaju. Połączenie tych dwóch analiz dało wiedzę na temat właściwości przestrzennych i funkcjonalnych każdego osiedla.

Na podstawie otrzymanych wyników można stwierdzić, że większość analizowanych udogodnień jest dostępna w zasięgu 15-minutowego spaceru. Dowodzi to, że przedmiotowe obszary mają wiele cech wspólnych z komponentami miasta 15-minutowego. Pozwala to spojrzeć na komunistyczne osiedla z innego punktu widzenia – jako na cenne elementy współczesnej struktury miejskiej. Ten rodzaj analizy może służyć jako wytyczne dla urbanistów w przypadku kompleksowych modernizacji lub dla inwestorów prywatnych do identyfikacji funkcjonalnych braków.

Słowa kluczowe: miasto 15-minutowe, urbanistyka, miasto przyjazne dla pieszych, komunizm, osiedla mieszkaniowe

