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15-MINUTE CITY – FROM CONCEPT TO PRACTICAL DIMENSION. COMPLEXITY OF HOUSING ESTATES: A PROPOSAL FOR A MEASURING TOOL

Abstract: The constant development of cities leads to many changes, including negative ones. These include overpopulation, urban sprawl, unequal access to goods and services as well as environmental pollution and, consequently, a deteriorating quality of life. One of the new approaches to the concept of city development is Carlos Moreno's concept of the 15-minute city. The success of any concept depends on many factors, but above all on the possibility of its implementation under given conditions. Determining the effectiveness of the approach requires empirical verification. This paper presents a proposal to measure the effectiveness of the implementation of some of the components of the 15-minute city concept and those related to the supply of services in each residential area.

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Key words: 15-minute city, availability of services, housing estates, compactness and comprehensiveness

INTRODUCTION

Housing is a basic need of every person. From the point of view of spatial development of cities, housing is one of many functions of settlement units related to the quality of life. From an economic point of view, it is a specific commodity subject to market rules. This approach makes it possible to highlight three different factors in the struggle to achieve goals – satisfaction of needs, spatial and functional order, and economic profit. For different historical periods there were (and still are) certain specific guidelines or concepts of housing development – such as *the Athens Charter*, the new urbanism (Solarek 2011; Trudeau 2013; Garde 2020) and the compact city (Burton 2000; Jenks, Burgess 2000; Ahlfeldt, Pietrostefani 2017; Korur 2020). One of the latest approaches in this regard is Carlos Moreno's concept of the 15-minute city. For each concept, several questions should be asked, above all about the effectiveness of the proposed solutions and the possibility of their im-

plementation. This article presents a proposal to measure that effectiveness and the service functionality of housing estates (theoretical functionality, subjective functionality and comprehensiveness).

The starting point in the most of urban concepts has been the assumption – even if unspoken – that it is enough to design the relevant space appropriately. However, it is important to take account of the human factor, i.e. the users of such space, who have different needs and expectations of space, and different habits relating to the realization of needs and the use of services. It is necessary to consider whether it is possible to implement the concept of a 15-minute city in the infrastructural sense as well as in the behavioural sense.

HOUSING AND HOUSING ESTATES AND THEIR PLACE IN SCIENTIFIC RESEARCH

For many decades, housing issues have been the subject of academic works by authors of various disciplines – such as architects and urban planners, sociologists, economists, socio-economic geographers and lawyers (Jewdokimow 2011; Szafrńska 2016). This fact alone suggests different ways of addressing the relevant issues and different ways of defining concepts. An example of research in the field of housing is D. Clapham (2002), whose studies focus on housing policy, housing economics, spatial diversity of housing resources and inequalities in access to housing. Within the framework of geographical sciences, housing research in a broad sense is carried out within the geography of population and settlement, including within the geography of cities or social geography. As A. Lisowski (2008) points out, studies of settlement units focus primarily on verifying certain ideas and assumptions of spatial planning.

The complexity of issues related to housing and the function of housing means that studies are carried out on different scales. For example, J. Dzieciuchowicz, B. Stolarczyk and A. Suliborski (1972) define housing conditions by means of the housing substance, which they divide into internal (equipment and size of dwellings and population) and external (concentration of buildings and services). According to E. Szafrńska (2016), contemporary studies of housing in Polish socio-economic geography include the following issues:

- a) housing stock;
- b) conditions of residence;
- c) living conditions in cities;
- d) perception of living space;
- e) socio-spatial structures of the city; and
- f) the economics of the housing market.

Issues related to housing in terms of socio-economic geography can be presented in the spirit of different research orientations – structuralist, radical, behavioural and humanistic. The proposal of a research tool in this paper is based on the behavioural orientation. It concerns the needs of residents and the degree to which they are satisfied in their place of residence. Fundamental to this proposal is the concept of man (the inhabitant) as a person of value (*homo psychologicus*) (Walmsley, Lewis 1997) whose decisions are the result of many factors and not only, nor primarily, rational factors.

THE 15-MINUTE CITY – AN OUTLINE OF THE CONCEPT

In 2016 Carlos Moreno proposed his approach to urban planning and development, focusing on the design of housing estates that meet a group of needs within a walking distance of 15 min-

utes¹. This approach was popularized during and after the SARS-cov-2 pandemic. According to the author of the concept, the centre of urban planning should be people and their needs, with a resulting move away from the need to use a passenger car. A key feature of the urban space is the possibility of walking to important places (walkability). According to C. Moreno, this is intended to help achieve a higher quality of life. An additional effect is expected to be a return or reinforcement of social interactions.

The concept of the 15-minute city was presented three years before the outbreak of the SARS-cov-2 pandemic, but it was the pandemic that highlighted the importance of a new approach to urban planning. Moreno's proposal is also consistent with other contemporary beliefs about urban planning and fits into the concept of a compact city. Contemporary approaches, including references to the Moreno's concept, are also characterized by a desire to plan multifunctional spaces in cities, which is intended to be a response to urban sprawl and uncontrolled suburbanization (Chmielewski 2011).

Table 1. Dimensions of a 15-minute city

Dimension	Characteristic
Proximity	• considers the temporal and spatial aspect → speed and without involving money or spending time in traffic jams • limiting the distance to 15 minutes is also intended to reduce exhaust emissions • the result is a saving of time that can be spent on other needs • proximity is a factor determining the formation of neighbourhood / social ties
Density	• the number of people that should inhabit the area to ensure an adequate quality of life and appropriate use of existing infrastructure • the aim is to avoid under-utilisation of existing spatial resources
Diversity	• physical and social aspects – neighbourhoods should be constructed according to the principle of “mixed use”, where basic functions and services are easily accessible and visible in the space; such neighbourhoods should make it possible to meet housing, commercial, local government, health, education, and entertainment needs • the area should fulfil six functions: residential, work, commercial, care, education, and entertainment space; this dimension also applies to the structure of the population living in each part of the city; this structure should be diverse
Ubiquity (digitalization)	• the ability to provide higher security thanks to the use of modern technologies (sensors, monitoring)

Source: own study based on Moreno, Allam, Chabaud, Gall, Pratlong (2021).

The presented concept is based on 4 dimensions – proximity, density, diversity and digitalization (Table 1). The first refers to spatial and temporal proximity. The possibility to use different services within a time range of up to 15 minutes is intended to reduce the need for transport, particularly private transport. Density refers to the number of people living in an area, but in the context of services available in that area. Both the over- and under-population of such services offered are undesirable. It is important to adequately provide the area with services, which helps to achieve a high quality of life, but also to avoid a situation where facilities are underused. Another dimension of a 15-minute city is diversity, which means the need to plan areas with mixed use, to meet multiple needs in one place. The last dimension – digitalization – refers to providing citizens with security through the use of modern technologies.

¹ See i.a. Guzman, Arellan, Oviedo, Aristizabal 2021; Moreno, Allam, Chabaud, Gall, Pratlong 2021; Pozoukidou, Chatziyiannaki 2021; Abdelfattah, Deponde, Fossa 2022.

15-MINUTE CITY AND THE POSSIBILITY OF IMPLEMENTING THE CONCEPT IN POLISH CONDITIONS

The key element of any urban concept is its ability to implement it in given conditions. C. Moreno postulates the planning of spaces that will enable to meet needs in 6 categories – living, working, services / supplying, education / learning, entertainment / enjoyment and health (or, more broadly, care (Table 2)². In order to achieve the objectives of the 15-minute city concept or similar, it is necessary to assess the feasibility of implementing specific solutions or achieving the objectives at the spatial planning stage and, above all, to determine which elements can be implemented by local authorities and which elements cannot be influenced by local authorities. Currently, in Polish conditions, housing development is mainly created due to private investors (developers), who carry out their investments on the basis of applicable regulations. One of the important formal factors shaping residential development in Poland is the local zoning plan, but it is not mandatory. If such a document exists, it is possible to determine in advance what type of housing development may be built in the area covered by the plan, as well as what the structure of land use will be and whether service areas will be created.

Table 2. Components of a 15-minute city and the possibility of implementation of the concept in Poland

Living	• basic service and social needs
Working	• lack of ability to influence jobs – local authorities can create space for new investments, but have no real impact on the number of jobs and the employment of local residents • a resident may be guided by location when looking for a new job, but the specifics of the labour market usually do not allow the choice of location
Services	• ability to influence the infrastructure itself – availability of service premises (local zoning plan, developers / limited impact on the structure of services (exclusions in the local plan)
Learning	• availability of premises for pre-school institutions depending on the local zoning plan and developers • public and private institutions; primary education – regionalisation, the creation of new institutions along with the development of housing, secondary education – no regionalisation, the choice of school is not always dictated by the proximity of the place of residence (profiles, types of schools, preferences)
Enjoying	• similarly to services, the availability of premises depends on the developer and the local zoning plan, but the plan can significantly reduce activities (such as those which are harmful to residents due to noise); types of entertainment services
Caring	• public and private, usually a response as in primary education

Note: The categories contained in the table in the first column are those proposed by Carlos Moreno, while the second column includes comments by the author on the possibilities of decision-making in this area in Polish conditions.

Source: own study.

Modern urban concepts postulate the proximity of work and residence, aimed at reducing the need to use transport, especially private transport. However, the question is how to achieve such proximity. It seems that the best way is to plan office (service) areas close to residential buildings, but such physical proximity does not guarantee an effect in the behavioural sphere. In addition, the level of mobility in the labour and housing markets should be taken into account. Changes in employment are more likely to occur than in residence, particularly when the housing market is dominated by owner-occupied housing. On the other hand, rented apartments increase mobility in the labour market, but a good offer of rental apartments or even a housing programme as part of the state's housing policy is a prerequisite. Currently, in Polish conditions, there is still an attachment to private ownership of flats.

² See also: C. Moreno, 2020, *Urban and territorial transitions*, the presentation for Entrepreneurship Territory Innovation Chair with IAE Paris – Sorbonne Business School, Paris 1 Panthéon – Sorbonne.

The third dimension is services. As with the housing function, their presence is the result of the provisions (or lack thereof) of the local spatial plan. However, it should be stressed that the scope for influencing the structure of services is also limited. Under current conditions, it is not possible to impose a certain type of activity, which is regulated by the rules of the free market. The supply of services is also related to the availability of premises and the costs of doing business. A frequently observed phenomenon in new housing developments, where some of the premises are commercial premises, is a large succession of services or a structure of services dominated by one type of service (e.g. cosmetic services), which causes a shortage of other types of services.

Education is the fourth dimension of a 15-minute city. The local government is responsible for meeting educational needs and this is the so-called own task of the municipality³. For primary education, there is regionalisation, meaning that a pupil is provided with a place in a primary school close to his / her place of residence. The distance to the nearest primary school should be within the range of 3 to 4 km depending on the age of the student, and beyond this distance the local government must provide transport to the students⁴. It can therefore be considered that the organisation of primary education is largely consistent with the concept of a 15-minute city. It is different with regard to secondary education. First of all, there is no longer any regionalisation, and when choosing a school the pupil takes into account the type of school, its profile and educational offer – location issues do not always play a key role. For secondary schools, it is therefore difficult to achieve the proximity effect of a 15-minute city and, consequently, the use of public and private transport cannot be reduced.

The last two dimensions are entertainment and healthcare (or, more broadly, care). These are very broad categories and, as with previously described services (because they are also specific types of services), it is difficult to shape their location and structure. In addition, the existence of a public and private market in health care should be taken into account. Non-commercial services – such as parks or outdoor gyms – give a greater opportunity to shape the offer. However, much depends on the details of local plans, as well as the will and vision of local actors.

COMPLEXITY OF RESIDENTIAL HOUSING STRUCTURES – A PROPOSAL FOR MEASURING

Today, the main form of housing organization is housing estates. The origins of housing estates date back to the 19th century, and the interest in a new form of housing organisation was a result of the Industrial Revolution, the growing number of urban dwellers and deteriorating living conditions (Table 3).

In Poland, housing estates began to develop more quickly in the 1920s. In the 20th century, this was a response to the growing demand for housing in increasingly populated societies. The works of Helena Syrkus (1976) and Barbara Brukalska (1948) (social housing estates) stand out in this field. Increased demand for housing also occurred after the Second World War and then – not only in Poland – many prefabricated housing estates were created.

According to the J. Dzieciuchowicz model (2011), the components of the housing environment include residential areas, residential buildings, housing construction, housing management and residents (Fig. 1). It is important to consider the definition of the spatial scope, although this can be problematic given the existence of many terms referring to multi-family housing. A common term is a housing estate, but its universality does not guarantee a uniform understanding of the term. Nowadays, this concept can be understood differently, or at least it leads to some terminological reflection.

³ See: Art. 7. *Ustawy o samorządzie gminnym z dnia 8 marca 1990 roku* [Municipal Self-Government Act].

⁴ See: Art. 39. *Ustawy Prawo oświatowe z dnia 4 grudnia 2016 roku* [Education Law].

Table 3. First housing structures of the housing estate type

Year	Author	Characteristics
before 1850	Robert Owen	square quarters of residential buildings located separately to service buildings
1852	Titus Salt	the patronal estate – located near factories, equipped with greenery, schools, churches and other services
1898	Ebenezer Howard	city-garden – self-sufficient housing structures, equipped with garden, social and cultural services, playgrounds, schools, housing mixed with green areas
1923	Clarence A. Perry	neighbouring unit – housing structure, the size of which depended on the capacity of the primary school, equipped with centrally located services, including green areas and with limited traffic

Source: own study based on Kania (2010).

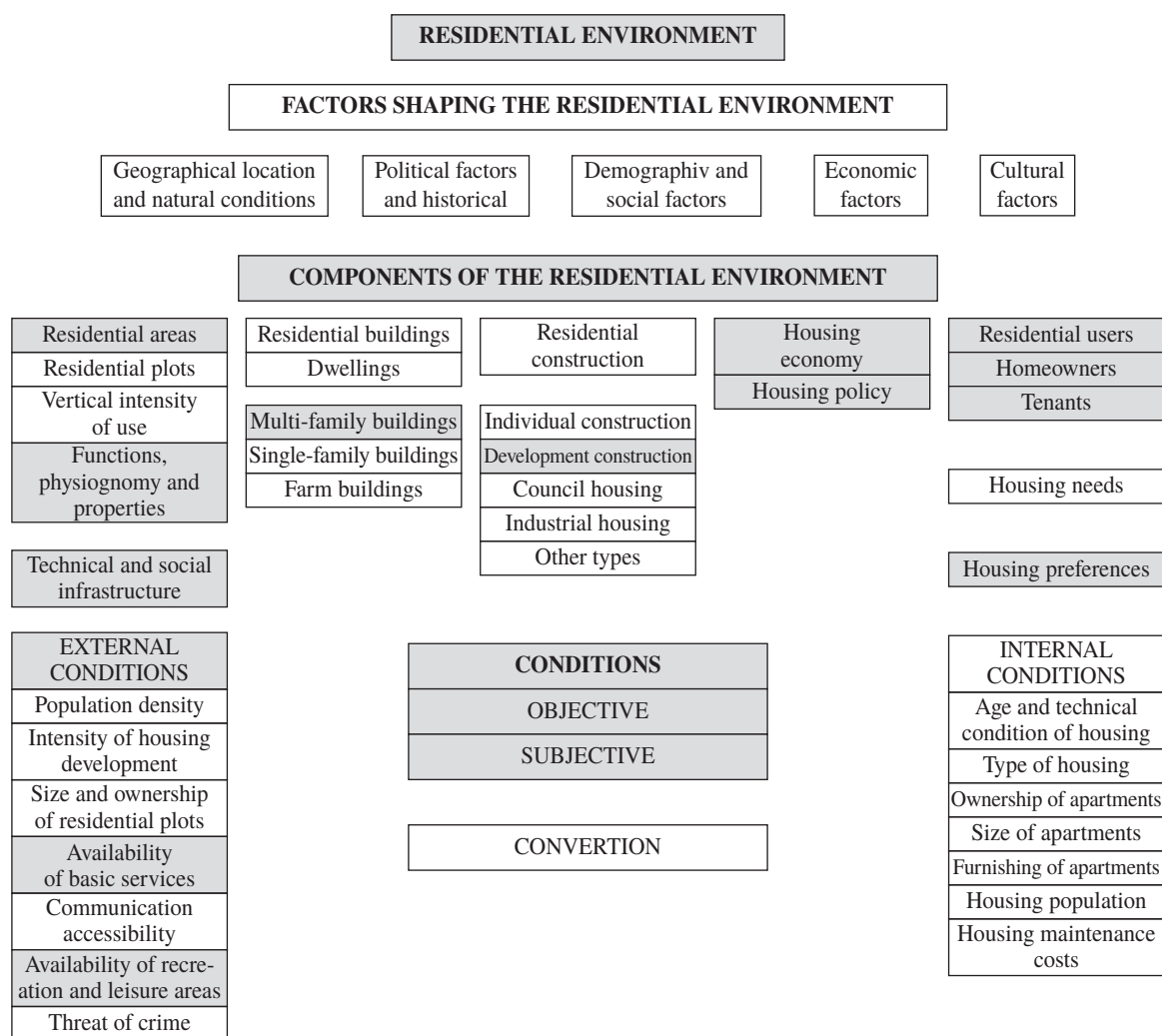
Classically, a housing estate is considered to be a complex of residential buildings together with an open space and certain minimum services. The plural (complex) used in this definition should be underlined. According to W. Skowroński (2008, p. 84), the housing estate is “densely built-up residential areas in the city, constituting a group of multi-family buildings together with service facilities and green areas related to the service of residents”. This definition refers to the parameters of the housing estate (density), the type of housing unit (city), the type of housing (multi-family) and the functions of the land (dwelling, services and green areas).

Today – in Polish conditions – the concept of a housing estate is also used with reference to residential investments covering only one block or 2–3 blocks without accompanying adequate infrastructure. Due to the availability of land, as well as legal and market conditions, large housing estates similar to those built in the 1970s and 80s are rare. In the second half of the 20th century, a housing estate came to be defined as “spatially separate groups of buildings, comprising more than 2,000 dwellings... planned and financed by the state or with the participation of the state” (Musterd, van Kempen 2005, after: Szafrńska 2016, p. 12). Currently, in Polish cities there are settlements that meet this definition, but also those that do not – for example, newly created housing estates are mostly privately owned (developer estates). For the purposes of this study, the aforementioned definition of W. Skowroński has been adopted and, based on the model of the residential environment of J. Dzieciuchowicz, a housing estate will include or refer to the following elements:

- residential areas, their functions and physiognomy;
- technical and social infrastructure;
- availability of basic services;
- availability of places of recreation and rest; and
- multi-family development of the developer type.

Urban planners, architects, sociologists, psychologists and geographers are interested in issues related to the organization of housing. Housing estate studies can focus on different views of the relevant space. One example would be the real space, by which one can understand the physical elements of space, its composition and structure. Another would be the perceived space, that is, the space that is perceived and evaluated. Within the perceived space, cultural, emotional and imaginary space is distinguished (Kostrowicki 1997). This division allows us to understand the living space in a formal, objective, but also subjective sense related to perception (what is perceived) and evaluation (how it is perceived).

It is generally accepted that housing estates should be able to meet many needs in the immediate vicinity of the dwelling. In this way, they should ensure an adequate quality of life. It should be remembered, however, that planners can only influence the structure of services in a given place to a certain extent; to a large extent, this structure is shaped according to free market rules. On the other hand, the assumption that supply creates demand for services should be treated with great caution.

**Figure 1.** Model of the residential environment

Source: Dzieciuchowicz 2011.

The presented measurement tool negates this assumption, i.e. it is recognized that the use of services at a given location cannot only be the result of proximity (physical accessibility), but depends on many other individual factors.

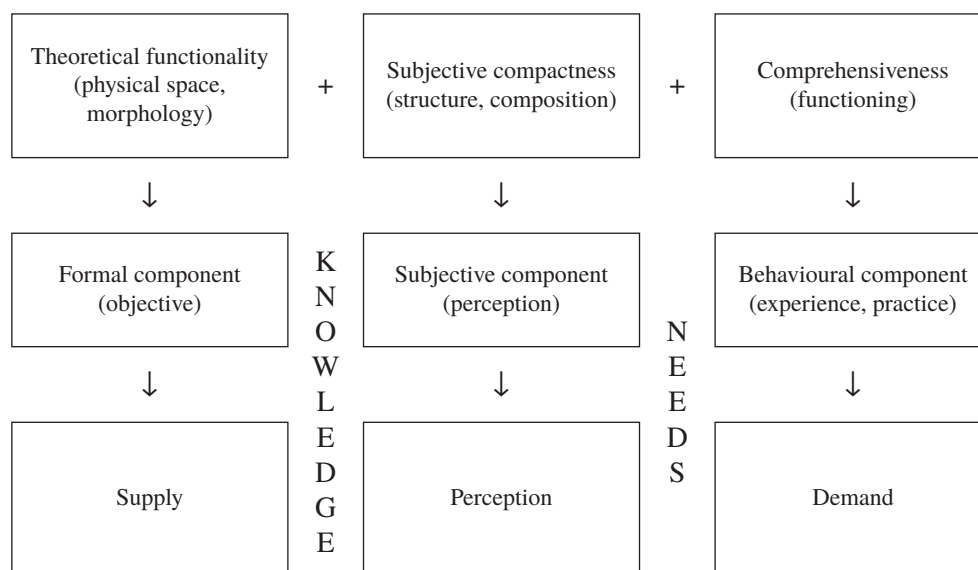
Properly designed and implemented according to certain rules, a housing estate should offer residents a certain set of services (*formal component*). In order to be able to use these services, a basic requirement must be met – residents must know the location of the services (*subjective component*). The most important element that will determine the success of the project is the actual use of services at home (*behavioural component*) (Tables 4 and 5).

The residential development project itself and its implementation constitute a formal (objective) component, which allows for the determination of the theoretical functionality of the relevant space, being related to the supply of services. The subjective component is related to the residents' knowledge about the supply of services, which translates into the perception of space. The perception, together with the experiences of the residents, translates into a behavioural component, which will determine the comprehensiveness of the housing estate. Ideally, residents should be aware of the space in which

Table 4. Components of a properly functioning residential area – functional aspect

Component	Characteristic
Formal component (objective)	theoretical functionality, set of specific services in the housing estate within walking distance (possibly access by bicycle or similar means of transport)
Subjective component	knowledge of residents about the development of a housing estate – knowledge of facilities and service points serving daily needs
Behavioural component	actual behaviour of residents – use of facilities and service points in the area of housing estate

Source: own study.

Table 5. Functional compactness, compactness and comprehensiveness of housing estate

Source: own study.

they live and use the services available in the neighbourhood without having to satisfy the same needs outside the residential area.

The theoretical functionality, subjective compactness and comprehensiveness of a housing estate may occur in differing intensity and configuration (Table 6). This comparison allows for an assessment of the housing development under study and to determine to what extent the goals of the 15-minute city concept are implemented.

Residential areas that do not include any of the three components should be considered relatively undesirable, although it should be noted that such residences are also being created. They tend to offer residents residential and communal space, but rarely green areas or space for recreation and services. As a result, residents need to leave their place of residence in order to make purchases or use other services to a greater or lesser extent every day. Such housing estates typically generate traffic and add to the general use of the transport network.

The second type of housing estate is that which is seemingly functional. This means that a residential area offers residents a set of services to meet their daily needs. In the formal sense, such housing estates can be considered as properly planned. However, the inhabitants do not have full knowledge of

Table 6. Assessment of housing estates – possible scenarios

Housing estate	Theoretical functionality	Subjective compactness	Comprehensiveness	Assessment
Monofunctional	no	no	no	completely undesirable situation
Seemingly functional	yes	no	no	largely undesirable, but partly changeable
Compact	yes	yes	no	largely undesirable, but partly changeable
Comprehensive	yes	yes	yes	ideal situation

Source: own study.

the inhabited space or may have a strong habit of meeting needs elsewhere, as a result of which they do not use the services in the immediate vicinity.

The third type consists of a compact housing estate, being one which is equipped with appropriate services and the residents are fully aware of the offer, but do not use them at home. There may be many reasons for such a situation – the wrong set of services, the inadequate quality of services, or – in the opinion of the resident – better opportunities to meet needs outside the housing estate. In such a situation, the goal of designing space according to the concept of a 15-minute city is also not achieved.

The last and most desirable type of housing structures is a complex housing estate, being one whose inhabitants actually meet their basic needs at home. To achieve this, the housing estate needs to be equipped with certain services, people need to know about them, and the supply needs to respond to the needs of the people.

Table 7. Complexity of residential housing estate – proposal for operationalization

Component	Operationalisation
Theoretical functionality	Inventory of residential structure, identification of particular types of services (shopping, education, health, leisure and recreation, others – see table 8)
Compactness	According to the inhabitants, are there certain types of services in the area of residence? What is the perceived saturation of the studied area with particular services?
Comprehensiveness	Which services do residents use in their area of residence and which outside the housing structure under study? What are the reasons for using selected services outside the housing structure?

Source: own study.

The identification of the individual components is carried out using the following procedure (Table 7). Functional content can be determined by an inventory of the space and identifying particular types of services in the areas of shopping, catering, education, health, recreation and others (Table 8). The compactness and comprehensiveness of a housing estate can be determined by a questionnaire survey conducted among residents (Table 9). In the first case, residents respond to the question as to which types of services exist in a given area (including an assessment of the number of facilities). In the second, residents indicate the services they use inside and outside the housing estate. The reasons for using selected services outside the housing structure are also identified.

Table 8. Types of services in housing estate

Service group	Types of services
shopping	convenience store, discount grocery, grocery supermarket, butcher shop, bakery, pastry shop, wine shop, liquor store 24h, vegetable grocery, bookstore, haberdashery, stationery shop, drugstore, pet store, organic food store, home appliances store, toy store, bazaar/market, sports nutrition store
eating	chain cafe, non-chain cafe, pub, restaurant, fast food bar, confectionery
educations	public nursery, private nursery, public kindergarten, private kindergarten, public primary school, private primary school, library, foreign language school, driving school
health	pharmacy, pharmacy 24h, optician, public dentist, private dentist, public clinic, private clinic, veterinarian
leisure	outdoor gym, gym, fitness club, culture house, playground, children's playroom, park, swimming pool, team playgrounds
other services	key duplication point, shoemaker, gas station, post office, car workshop, car wash, pet hairdresser, hairdresser, manicure, other beauty services, massage salon, parcel machine, ATM machine, school, bicycle repair point, mobile operator point, tattoo salon, church, laundry, used clothing container, electrical waste container

Source: own study.

Table 9. The scheme of research

Step 1	INVENTORY OF SERVICES			
	Types of services	Number of services	Service deployment	
Step 2	QUESTIONNAIRE STUDY			
	Knowledge of services	Use of services	Reasons for using services outside the estate	Required services
Step 3	HOUSING ASSESSMENT			
	Theoretical functionality	Compactness	Comprehensiveness	

Source: own study.

CONCLUSIONS

The goals of the 15-minute city concept focus on equipping the space with suitable objects and points located in close proximity to places of residence. The aim is to reduce the need to travel by car. However, it should be noted that equipping the space with facilities and service points does not necessarily translate into behaviour or change the behaviour of residents. Human behaviour is the result of many objective and subjective, formal and informal factors. Space and its development are of course a factor in the behaviour and decisions of residents, but they are not the only factor. A good place to live should be equipped with suitable facilities and service points to meet the needs of residents, but not every way of planning a housing estate can achieve the desired effect. In order to be able to assess whether a given residential area functions properly in this respect, it is necessary to assess not only its development (formal component), but to understand the attitudes (subjective component) and behaviour (behavioural component) of residents. An assessment of all three elements is required to determine the functionality of the selected housing estate.

The proposal presented in this article to measure the degree of realization of the goals of a 15-minute city is based on the behavioural orientation known in studies of socio-economic geog-

raphy. This proposal focuses primarily on learning about the resources of the residential space, their perception by residents, and the degree of utilization. Such a study would enable an analysis of the needs of residents in terms of the scale of the housing estate (and not only the apartment and residential building itself), their behaviours, and their motivation, which – subsequently – would give a complete picture of the functioning of the housing estate in the context of the goals of a 15-minute city.

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