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Implementation of Solutions Reducing the Number of Cars in Polish Housing Estates—Based on the Experience of the Vauban Estate in Freiburg, Case of the City of Wroclaw

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Abstract: The number of cars in Polish housing estates is steadily increasing. Cars park in allocated parking spaces, but also occupy roads, pavements, and even green spaces. As the European experience shows, many countries have had this problem and have been looking for a solution. Due to the fact that Polish cities are at the beginning of the process, which limits the importance of individual transport, all good practices are a valuable source of information. The purpose of this article is to present the possibility of implementing solutions to limit the number of cars in Polish housing estates based on the experience of the Vauban housing estate in Freiburg, Germany. This housing estate was created with the great participation of the local community and one of its postulates was to reduce the use of cars. The methodology involved several consecutive steps. The first stage of the work was a review of the literature on the subject of low-carbon housing. Vauban was chosen as a model project with a sustainability of 20 years. Design solutions to reduce car traffic were analysed. The data collected were transformed into hard (numerical) and soft (descriptive) data, then systematised and catalogued. Based on these guidelines, a model of an estate with a reduced number of cars was created. The final stage of the research was the implementation of the model. The model formulates the most important aspects related to the location of a car-free housing estate and allows one to indicate its potential location in the city. It is a valuable tool for opening up a broad discussion on urban planning, location, and the future of car-free housing estates. The results of the study should be interpreted at two levels: land use and location. The results of the analyses allowed parameters and guidelines to be defined. These guidelines provide a guideline for the development of car-reduced housing estates in future cities. The second set of conclusions concerns the location of a potential car-reduced housing estate. The area of the potential site is shown using the city of Wroclaw, Poland, as an example.

Keywords: urban design; spatial planning; universal design; parking policy; car-free housing; car-reducing housing

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1. Introduction

The mobility of European cities' inhabitants has changed considerably over the last few decades. Ever since cars took to the roads, cities have been subservient to them. The first motorways that led to high-tech cities were impressive, the number of cars registered in cities was a source of pride for city administrators, and the parking space itself grew. The European Union has an average of 567 passenger cars per 1000 inhabitants (2017—535, 2018—545, 2019—555, 2020—560, 2021—567). The trend of the average value of the car indicator for the EU is increasing. Luxembourg has the highest ratio in the EU (698 per 1000 inhabitants). Poland is second (684 per 1000 inhabitants) and Romania the lowest (396). Unfortunately, as the number of cars increased, so did the problems of congestion and air pollution [1]. Today, the large number of cars in residential areas is inconvenient for all users: drivers looking for a parking space, pedestrians who do not feel safe, and

cyclists travelling in between. Society longs for a pedestrianised, safe city. Problems related to the mobility of residents can be considered from the perspective of different sectors and areas. In this study, the author has focused on the problem of cars in a housing estate. The author of this paper, together with a team of researchers, analysed the parking policies of 379 Polish cities with a population of more than 10,000 in 2016 (the total number of cities in Poland is 1013). The available regulations were catalogued: transport policy, parking policy, and city resolutions on parking. When analysing the collected material, three groups of cities could be identified [2]. Group one—cities with a parking policy, a strategy in the form of resolutions, and expert opinions to solve the parking problem in the city (8% of all cities surveyed). Group two—Cities where the only regulation is a paid parking zone. There are 152 of these cities (38% of all the cities surveyed). Group three—Cities that do not have a parking regulation for the city or a paid parking zone. There are 214 of these cities (54% of all respondents). These are mainly cities with a population between 10,000 and 20,000.

Parking policy in relation to residential areas in Poland most often requires minimum parking indicators for new developments. Developers are required to provide the number of parking spaces specified in the local spatial development plan. This solution has drawbacks. First, residents are unwilling to buy parking spaces if they have the option of free on-street parking. Secondly, developers are reluctant to build parking because it makes development more expensive. Parking is a problem for the planner, the developer, and the user. The society's attitude to car ownership and parking has changed considerably over the decades. In the middle of the last century, the car was a luxury item. Due to the relatively small number of cars in the city, parking was not a problem. From the beginning of the 1970s, parking became a noticeable but not dominant element of the Polish urban landscape. In the case of large housing estates, car parks were planned and built at the same time as housing. The projects of large housing estates also included land reserves for additional car parks when the number of cars would increase. In the vast majority of cases, additional parking was only left in the planner's guidelines and the land was developed and used for other purposes related to the development of housing and services. The author's research [3] examined the problem of car parking in the urban planning of contemporary housing estates in terms of planning, implementation and the future. On the basis of the analyses, which covered several decades, three phases were identified (Figure 1). These phases represent a model for the development of parking in a housing estate, using Poland as an example. These stages are intensification, optimisation, and minimisation.

Figure 1. The model for the development of parking policy in Poland after 1971.

The intensification phase was the first stage in the dynamic growth of the Polish car park, linked to the high level of urbanisation of the country. The intensification phase began in 1971 when the decision was taken to produce the Fiat 126p on a national scale. This foreshadowed an increase in the number of cars in residential areas, which would lead to an increase in the importance of parking spaces. The year 1971 was also the beginning of a decade in which dozens of housing estates were built in Polish cities.

The optimisation phase covers a period of nearly twenty years. The Spatial Planning and Land Development Act (1994) and its new version of 2003 can be seen as a symbolic beginning. Most important for this phase is the requirement to determine the number of parking spaces in relation to multi-family residential areas. This involves determining the minimum number of parking spaces in relation to the number of residential units. Details

of the development of roads, pavements, and car parks are included in the Local Spatial Development Plan. The minimisation phase begins in the middle of the second decade of the twentieth century. This is a time when the motorisation rate in Poland is close to 600. This means a chronic shortage of parking spaces, increased air pollution, and worsening traffic congestion. However, restrictive regulations are beginning to appear in the local spatial development plan. They specify not only a minimum, but also a maximum number of parking spaces, require that parking areas be landscaped, or prescribe the location of underground car parks. The presented model for the development of housing area parking lots was visible in all stages of the research, such as literature analysis, planning regulations, parking area development, and residents' opinions. In this paper, the author examines the issues related to the last phase, i.e., minimisation. The purpose of the paper is to develop a model for the implementation of car reduction solutions in Polish housing estates, based on the experience of the Vauban housing estate in Freiburg, Germany. The process of creating the Vauban estate was supported by a high level of citizen participation. They discussed their needs with city officials and architects. One of the demands was to be able to live in a safe area with a reduced number of cars. Planning and organisational efforts have been consistently worked on for several years. Car traffic is limited, residents follow the rules, and the number of cars is stable. This phenomenon prompted the author of this paper to analyse the planning solutions and the research trip in detail.

2. Literature Review

2.1. The Growing Number of Cars in European Cities

The large number of cars (Figure 2) affects traffic congestion, the quality of public spaces, safety, and air pollution. The use of the car as the main means of transport is increasingly being questioned in the literature [4–7]. Efforts to reduce the number of cars in cities have been described and summarised by researchers Ralph Buehler, John Gerike, Regine Götschi, and Thomas Pucher [8]. They compared travel patterns in Munich, Berlin, Hamburg, Vienna, and Zurich after 1990. In all cities, the number of cars decreased, which was made possible by coordinated transportation and spatial planning efforts.

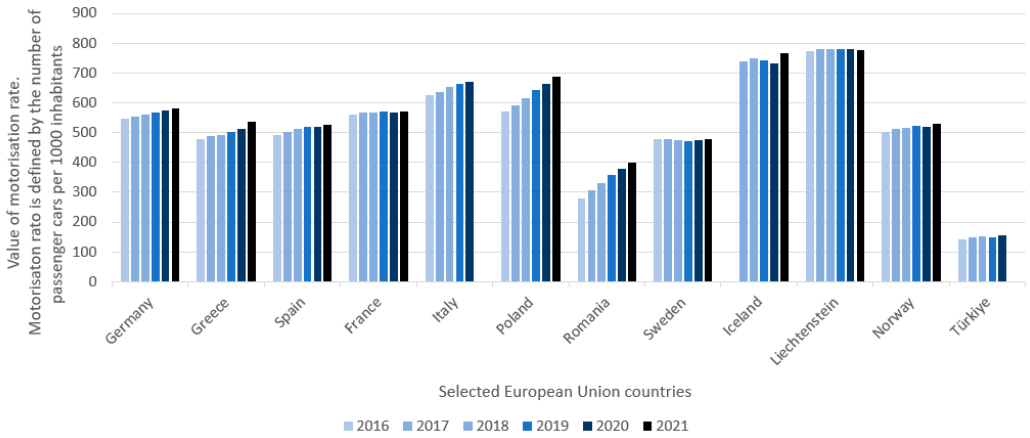

Figure 2. Motorisation rate in UE, 2016–2021, motorisation rate is defined by the number of passenger cars per 1000 inhabitants.

The package of measures implemented in each city was slightly different. German cities focused on promoting cycling, while Zurich and Vienna expanded public transport. The number of cars in Berlin, Zurich, Vienna, Hamburg, and Munich in 1980, 1990, 2000 and 2010 was compared. The number of cars was found to decrease in all cities except Munich. Several years later, a study of car-free housing estates showed that the percentage of car-free households in Germany and Switzerland is gradually increasing [4], continuing the positive trend of making cities car-free. In Germany, the proportion of car-free households increased from 18% in 2008 to 22% in 2017 [9], and in Switzerland from 19% in 2005 to 22% in 2015. This is largely due to the large cities, where the number of car-free households is

higher than in the suburbs, e.g., 57% in Berne, 53% in Zurich, 51% in Berlin, and 43% in Hamburg. These statistics mean that the younger generation is less likely to use a car than the previous generation and is more likely to use public transport, walking, and cycling. The results of studies carried out in Greek cities are consistent with those carried out in Western Europe [10]. To make the transition to satisfactory and sustainable mobility in car-dependent cities, the reduction in car use should be accompanied by benefits for residents. These benefits include improved public transport, convenient walking and cycling, and an integrated system of public transport modes [11–13].

2.2. Parking Issues in Residential Areas

There are too many cars to accommodate in residential areas. Parking is problematic almost everywhere. Parking policies that provide parking spaces for cars at homes, workplaces, shopping centres, schools, recreational areas, etc. have increased the use of private cars [14]. The organisation of parking is a key challenge for more sustainable urban mobility [2,14–16]. One of the formal barriers to the development of car-free housing is the minimum parking requirement. In many countries, including Poland, planning regulations require a defined number of parking spaces to be provided. There are examples in the literature where this requirement has been removed or modified [17–19]. Minimum parking requirements are often criticised for creating excess parking, degrading urban form, reducing housing affordability, and promoting car dependency [19,20]. Recently, cities have begun to review these indicators. The results of a study in Sweden [21] showed that reducing parking requirements may be an effective policy to reduce car ownership. A theme that runs through many of the issues surrounding the parking problem is all the costs, discussed in detail by Donald Shoup in his book: The High Cost of Free Parking [22]. He and subsequent researchers draw attention to the material and immaterial costs of the problem [23]. They point out that we will never achieve balanced parking by offering free parking on the street and paid parking. Solving parking problems requires a holistic approach. A parking space has a market value and a specific price. This price is either included in the cost of the development, or is an extra charge that the resident has to pay to use it, whether they accept the arrangement or not. The main determinants of parking choice are two variables: cost and time [24]. Parking charges are an important factor in the parking policy itself, as price (along with distance) is one of the most important factors influencing travel decisions [25]. An analysis of parking costs and their impact on car ownership has been carried out by Dutch researchers [26], who confirm that cheap parking near residential areas reduces the cost of car ownership and therefore increases the demand for car ownership. A similar conclusion was reached by John Golias, George Yannis, and Michel Harvatis [27], who analysed the determinants of choice between on-street and off-street parking. Residents are reluctant to give up their cars and ownership of the parking space itself is important in the perception of the property. Kirschner and Lanzendorf [15] identified several types of measures that should be analysed as part of a parking policy, such as maximum and minimum parking requirements, physical separation of residence and parking space, and limit of available parking in public spaces. All of these are part of the concept of car-free development.

2.3. The Car-Free Housing Concept

A car-free housing estate is an urban planning concept in which residents make a conscious decision not to own a car in exchange for other benefits [28]. Such developments can be seen as an expression of sustainable mobility. It accumulates and implements a series of steps to promote alternative means of transport and pro-environmental solutions. Through the project, urban planners are trying to return to a people-centred rather than car-centred urbanism. These activities refer to the popular 15 min city and the new forms that conurbations should have in order to make urban growth sustainable [29]. In a sense, the free car-free housing estate is a vision of the future after the car [4,30] emphasises that the free car-free housing estate is the next stage in the development of the post-car city.

Transport policies in many cities largely exclude or restrict traffic in different areas (such as city centres). There are also a number of solutions that can be considered as intermediate elements of the low-car concept, such as home zones, traffic-calmed zones, pedestrian areas, and urban event spaces where traffic is temporarily restricted. A detailed analysis of nine car-free developments in two countries, Germany and Switzerland [2], shows that residents prefer four types of strategy to enable themselves to live without a private car: they use bikes and public transport; they prefer short distances; they prefer to trust their community; and they value the spatial environment. Research by Baehler and Rerat [2] clearly shows that almost all residents (94%) say that they live without a car of their own choice. Residents tend to be highly educated, with average incomes, and half of the households are families. Most residents are guided by strong social and environmental values. Ecological values are also mentioned by Foletta and Henderson [31] in their discussion of the 'low car (bon) community'. Their research refers to a community that manifests its ideas about reducing carbon emissions as follows. The concept of a car-free estate is facilitated by a car-sharing system. Car-sharing schemes have become popular in many cities and the introduction of the scheme itself leads to a reduction in the number of cars owned [32,33]. Car sharing is a promising solution for sustainable transport.

2.4. Reducing Car Traffic, Health, Spatial and Social Context

Reducing car traffic in the city contributes to positive changes in health, urban space, and social relations. A smaller number of cars means a safer and healthier space. It is important to emphasise that engine emissions have a major impact on health and air quality when considering human health. WHO to upgrade air quality standards levels in 2021 [34]. Experts agree that air pollution is one of the leading risk factors for human health [35]. It has far-reaching health effects and financial costs for the medical sector. Air quality is directly related to global warming caused by human activity. It is estimated that by 2050, 62.5% of the world's population will live in cities [36]. Therefore, we can expect urbanisation processes in the coming decades. This problem must be considered in both a global and a local context. From an urban planning perspective, it is important to reduce the urban heat island phenomenon. It is important to introduce more green areas into the city, reduce electricity consumption, introduce green-blue infrastructure, etc., and reduce traffic areas (especially impervious paved areas). In a sociological context, it is interesting to note what psychologists, sociologists, and urban planners think about motorisation. Contemporary psychologists [37] and urban planners [38–40] agree that driving reduces our levels of happiness and satisfaction. The most powerful component that affects the happiness of city dwellers is social connectivity. Relationships are not created by long car journeys and moving between the car park and home. Urban planners pay attention to spatial aspects such as meeting places, shady areas, and public spaces. It is important to design in a way that creates a relationship between people. Not between cars.

3. Materials and Methods

The purpose of the research was to formulate theoretical guidelines for the implementation of solutions to reduce the number of cars on housing estates in Poland (Figure 3). The study was mainly based on the experience of the German Vauban estate, supplemented by a review of the literature. A model describing the characteristics of a reduced car estate was developed on the basis of one estate, the Vauban in Freiburg. The research presented in this article is the first phase of a study that the author intends to extend to other cities in the future. The Vauban estate is interesting because it is not a utopian idea, but a real investment that has been operating according to specific rules for 20 years. This led the author to conduct field research and present the estate not in a descriptive form, but in terms of parameters and guidelines used in urban planning and architectural design. In the methodology of the articles, the creation of the model includes research steps: (2.a.) Study visit to the Vauban estate and (2.b.) Definition of parameters and urban indicators that describe the estate.

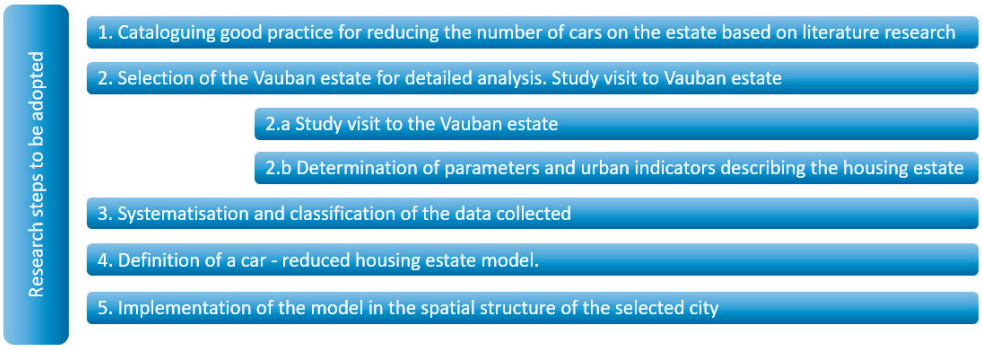

Figure 3. Diagram describing the following research stages.

The first stage of the work was a review of the literature on the subject, which consisted of cataloguing the most recent practices in car-free and car-reduced housing estates. Among many examples, Vauban was selected as a model project with a sustainability of 20 years. The theoretical research was complemented by a study visit and meetings with city representatives. Design solutions to reduce car traffic were analysed (determination of urban indicators, distance from the bus stop, number of car-sharing vehicles, bicycle lanes, etc.). The data collected were transformed into hard (numerical) and soft (descriptive) data, then systematised and catalogued. On the basis of these guidelines, a model of an estate with a reduced number of cars was created, including the most important quantities and indicators. The final stage of the research was the implementation of the model in the spatial structure of the selected city. The method used in the work made it possible to identify locations where car-free housing estates could realistically be developed. At the city level, there are similarities and differences between the cities of Freiburg and Wroclaw. The main difference is the value of the motorisation rate. In the context of the country: for Germany, 583, for Poland, 684. In the context of the city: for Freiburg—382, for Wroclaw—740. It should also be noted that the motorisation rate in Germany has been stable for several years. In Poland, it is increasing. Similarities include the morphological characteristics of both cities. In addition, both cities are important economic and academic centres in the region. Their populations are in the hundreds of thousands. Both are located in the same climate zone, within a few dozen kilometres of a geographical barrier in the form of mountain ranges. Both cities have local governments that implement environmentally friendly solutions. However, an important difference is that Freiburg is a city with experience in this area. Solutions such as restricting traffic in the city centre, promoting cycling, low-emission, and passive housing have been implemented in the city for several decades. The city of Wroclaw is at the beginning of this journey. That is why analysing the solutions adopted in Freiburg is so important for other cities.

4. Results

4.1. Vauban Estate—Background, Spatial Structure, Mobility Recommendations

The Vaubaun Estate was built on the site of a former barracks in the southern part of the city of Freiburg, West Germany (Figure 4). The estate, which covers an area of 41 ha, is 3 km from the city centre. This distance can be covered in 10 min by car, 20 min by public transport, 12 min by bicycle, and 35 min on foot. The short distance encourages the use of other modes of transport than the car. The development is an innovative example of sustainable brownfield development. The site was used by the French army after the Second World War. After the army left in the early 1990s, the city decided to buy back the vacant land from the federal government. It was decided to use the area for housing. A master plan was drawn up in 1992 and approved by the city in 1994 [41]. The Vauban housing estate was built between 1998 and 2013 with much input from the local community. Vauban is a bottom-up initiative of the residents [42] in which the involvement of the residents through various organisations was very intense. Residents set the priorities and discussed with the city the requirements for the future housing estate. The aim was to

transform a derelict area into a compact, pedestrian-friendly, car-free, and carbon-neutral neighbourhood. Vauban is the architect's laboratory (Table 1). The city's processes were observed throughout the world [43]. The Vauban society forms a specific local community. Its social structure was heterogeneous. It is inhabited by people of different wealth, origin, and age. The estate includes housing for the elderly, families, and students. The diversity of types of buildings in terms of energy [44] is the result of continued political support combined with progressive social changes. Low-energy buildings, passive houses and plus-energy houses have been built here.

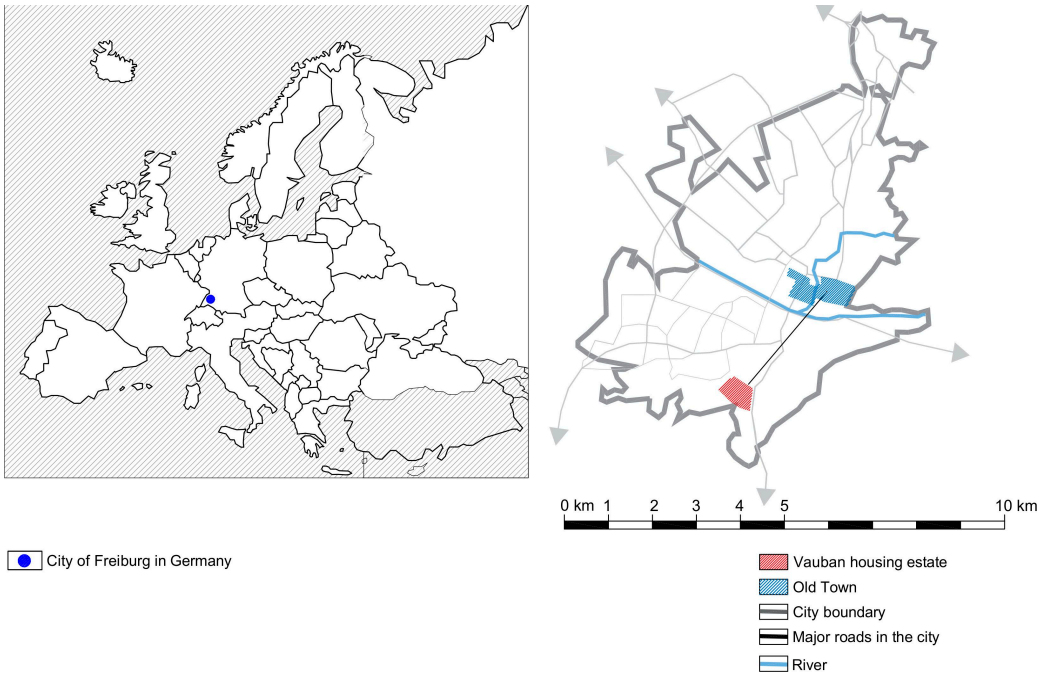

Figure 4. Location of the city of Freiburg in Europe and the Vauban estate.

Table 1. Indicators characterising the Vauban estate.

No.	The Indicator *	The Value
1	Total area	41
2	Residential area	16.4
3	Industrial area	1.6
4	Public green spaces	12.4
5	Population	5500
6	Population density	124.9
7	Motorisation ratio	200
8	Parking indicator	0.4
9	Development intensity	0.79

* The value of the total area, the residential and industrial area is given in hectares (ha); Population is defined by the number of inhabitants; Population density is defined by the number of persons living in one hectare of residential area; Motorisaton rato is defined by the number of passenger cars per 1000 inhabitants; Parking indicator is defined by the number of passenger cars per apartment.

- The spatial structure of the estate. The spatial structure of the development is a cohesive unit. The multi-family buildings are surrounded by green spaces and walking paths, and services are located within a short walk. Several important elements, such as housing, services, and green spaces, should be discussed in detail.
- Housing structure. The Vauban Estate is populated by people of different backgrounds, ages, and needs. One of the designers' aims was to create a mixed housing estate, including apartment blocks, student accommodation, and housing for the elderly. The profile of the population has not changed significantly since the estate was built. Many

of the houses are shared. Residents buy a share in the cooperative and together manage the building and the communal area. The Vauban idea is to combine different people, places and functions: for example, in one neighbourhood you will find condominiums, social housing, offices and housing for the elderly.

- Commercial and public services. The service system is very extensive. It includes: grocery shops, drugstores, libraries, cafés, restaurants, and small services (e.g., hairdressers, beauty salons). These are mostly located on the main street along the tram line. An important area is the market square, where a local produce market is held every Wednesday. On the other hand, educational services include one school and five kindergartens.
- Green structure. There are many green areas within the estate. The areas between the buildings in the central part of the estate were designed by various landscape architects. An impressive stand of trees, some of which are existing and some of which were added, provides both protection from the sun and encourages the presence of various species of birds on the estate.

4.2. Transport System of the Vauban Estate (Pedestrian, Cycle, Public Transport)

The estate forms a compact unit in terms of communication (Figure 5). A key aspect of Vauban's urban design was creating a 'short-distance neighbourhood' [29] that allows the use of alternative modes of transport. The roads dedicated to cars are fluidly linked to cycle and pedestrian routes. The Vauban estate is accessible to residents by public transport. The walk distance to tram stops is less than 500 m. Residents can easily use the car-sharing system. There are 45 parking spaces along the streets where carpooling cars are parked. The bicycle system is very well organised, with bicycle shelters at the entrance of each building, and it is also possible to rent a cargo bike or a bicycle for transporting children. The motorisation rate for Freiburg is 382 cars per 1000 inhabitants. For the Vauban housing estate, it is around 200 cars per 1000 inhabitants, with around 40% of the households in Vauban stating that they do not own a car [45] This explains why the rate is so low. For comparison, the figure for Europe is 567 and for Germany 584 [46].

Figure 5. Communication and parking diagram for the Vauban estate.

Reducing the number of cars was one of the residents' postulates during the participatory activities prior to the project (such as energy efficiency and community building). The streets between buildings are not completely free of cars, but rather free of parking [30].

There are areas within the estate where parking is provided (off-street or underground) and areas that can benefit from purchased parking in multi-storey car parks. These form the basis of the estate's parking system. Most of the area is excluded from parking. Residents can park in front of their houses for a while to unload their purchases, but they are required to park their cars in the car park. Three car parks were planned during the planning project, but as the estate developed, it became clear that two would be sufficient. The reservation for a third car park was kept. It is currently a green space. In practice, there is little traffic, the streets are quiet, and the number of cars on the roads is minimal.

4.3. Creating a Model for a Reduced-Car Estate Based on the Experience of the Vauban Estate

Many researchers working on the problem of reducing the number of cars in housing estates point to two problems, regardless of the geographical location or the legal context. Literature and experiences from different cities, as well as a detailed analysis of the Vauban estate combined with a study visit, allowed the author to formulate the main features of a reduced estate. The model is a replicable framework that can be applied in Polish cities, and its implementation will allow the identification of potential locations for car-reduced housing (Figure 6). The model considers both hard data, expressed by a number or indicator, and soft data, used to define directions for further development.

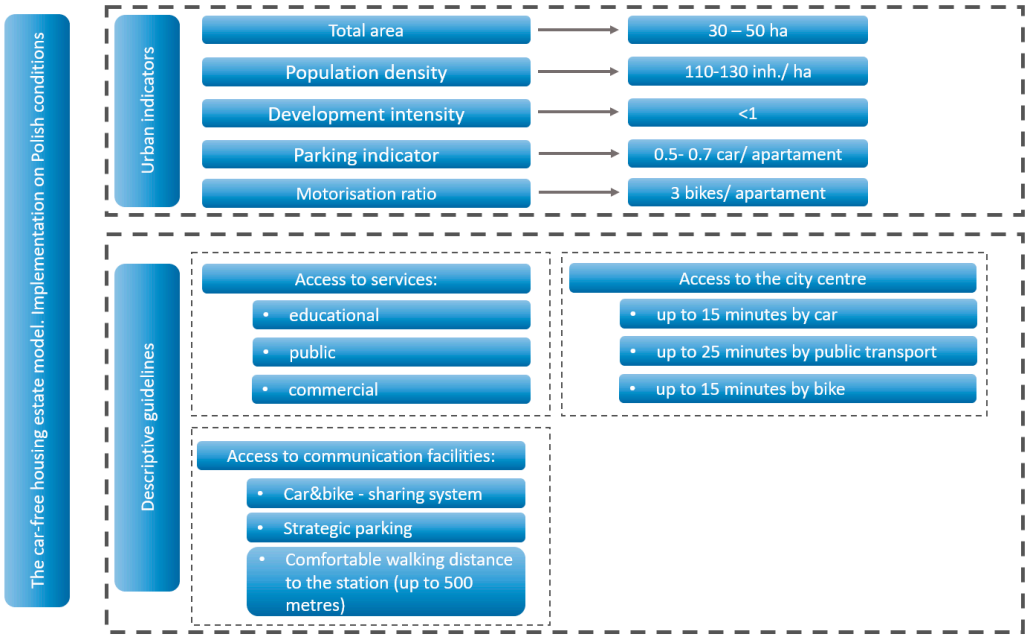

Figure 6. Indicators and guidelines for a reduced —car estate model.

The number of cars in European cities is increasing, as confirmed by statistical data. As presented in the literature review, some cities are trying to control this trend by implementing a variety of benefits and restrictions for residents. The focus of this paper was to analyse the land use and location of car-free housing estates, using the example of Vauban in Germany. This is one of many elements that influence carbon neutrality and parking policy. The research carried out identified two main issues. The parameters and guidelines for the development of a car-free estate are described in the model. These can be used by city decision-makers to guide the development of other car-free developments. Using the practice of the city of Freiburg as an example, it is possible to determine the potential location of a car-reduced housing estate in the city of Wroclaw. Three options are presented (Figures 7 and 8).

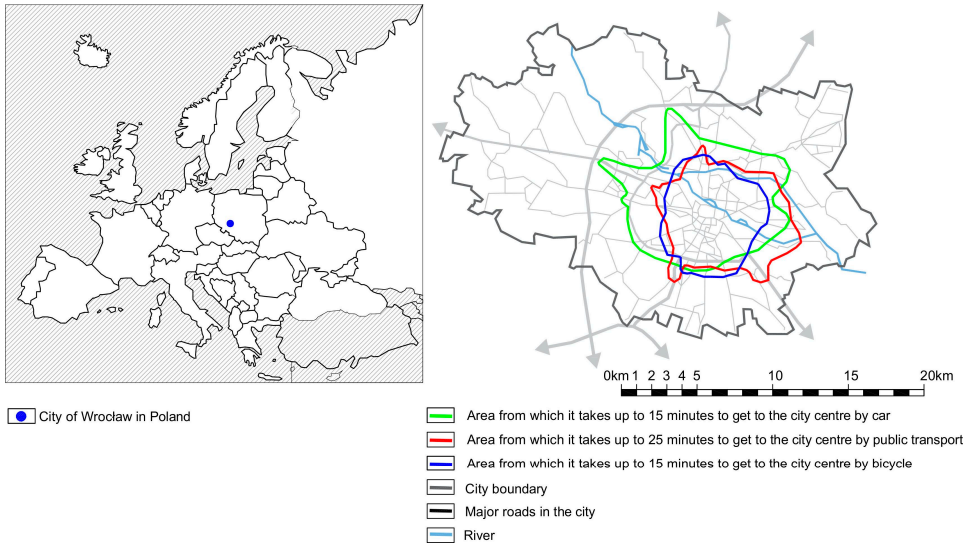

Figure 7. Areas accessible on foot, by car and by bicycle in the European city of Wroclaw (Poland).

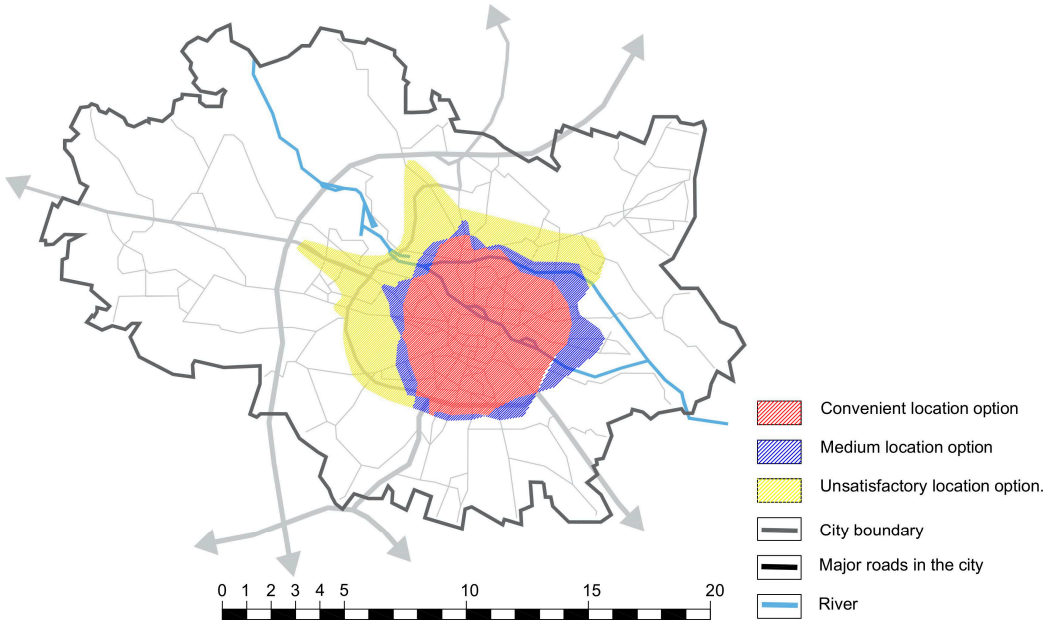

Figure 8. Three options for the location of the estate car with reduced number of cars.

4.4. Confrontation of the Model of a Reduced-Car Estate with the Spatial Structure of a Polish City

For the city of Wroclaw in South West Poland, the location of a housing estate reduced by cars was simulated (Figure 7). The distance from the city centre was defined as up to 15 min by car, up to 25 min by public transport, and up to 15 min by bicycle. As accessibility areas do not overlap, three location options were identified (Figure 8):

- Convenient location option—Condition—Three distance criteria met
- Medium location option—Condition—Any two distance conditions met
- Unsatisfactory location option—Condition—meets one location condition

The 'convenient' option is particularly important in terms of location. Good transport links, a well-developed network of cycle paths, and the possibility of using public transport offer the opportunity to create a car-free development. The area identified as the most suitable for creating a housing estate with a reduced number of cars (convenient location option) is in line with the spatial policy of the City of Wroclaw. This area coincides with the zone where the city limits car traffic, develops an efficient transfer system, and requires

the lowest parking indicators. The results are in line with European trends, e.g., Vienna or London. There is a strong correlation between the availability of public transport and the ownership of household cars. The better the public transport system, the lower the number of cars in an area.

5. Discussion

The parking policy [17] for residential areas in Poland follows the popular system in Europe of defining minimum parking indicators for individual areas. According to this concept, residential areas are self-sufficient and balance their needs on their own land. In Poland, planning decisions regarding car parking are made at the local level on the basis of local spatial development plans. Each city decides on its own mobility policy. Part of this strategy is a parking policy that defines regulations for areas and indicators. It should be noted that the parking problem has received increasing attention in recent decades. There is a part of the regulation that, in addition to defining minimum parking indicators, specifies the maximum number of parking spaces and the composition of the parking, and requires the development of green areas [3]. Occasionally, regulations allow parking to be located outside the development and make it dependent on accessibility by public transport. Although this trend is relatively new in Poland, it can be explained by the experience of other European countries. The final stage in the challenging implementation of the post-car-city idea is the establishment of a car-free or car-reduced housing estate. Polish cities are starting to reduce the number of cars in the city, which is why the experience of other countries is so important.

6. Conclusions

The Vauban estate is an example of good practice in the planning and management of a housing estate. This applies both to the process of creating the estate in collaboration with residents and to its management. Countries with a wealth of experience in eliminating urban traffic are a source of knowledge for cities at the beginning of their journey, such as Wroclaw. The implementation of solutions to reduce the number of cars in Polish housing estates—based on the experience of the Vauban Estate—provides guidance at various levels of detail. The developed model provides guidelines that can be used in many areas, both locally and nationally. At the global level, human health and climate change are important issues. Cities are trying to implement measures to slow down this process. One measure is to reduce car traffic in cities and promote non-car modes of transport such as cycling, public transport, and walking. At the local level, decision-makers and local authorities are particularly important. Legislative changes are needed to allow car-free or car-reduced housing. In the current legal situation, the creation of such settlements in Poland would be impossible. The challenge for urban planners will be the design of complete housing estates that will have a range of services and transport facilities in addition to housing. Residents of such a development will not need a car. On the other hand, the challenge for housing estate managers will be maintaining the established idea. This requires cooperation between the municipality, town planners, and architects. The author plans to continue to investigate the topic of car-free housing estates presented in the article. The model will be implemented in more cities and this compilation will make it possible to compare different areas and cities. The results of the research should be seen as a contribution to the discussion of reducing the number of cars in housing estates. Perhaps, the guidelines developed will make it possible to implement a car-free estate in an urban landscape in the future.

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