

# From the Garden-City to the Idea of Sustainable Development: a Case Study of the Garden Tri-City Near Warsaw

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## Abstract

*The conception of a garden-city assumes creation of an organized unit in functional and spatial terms ensuring harmonious relations among economic growth, protection of the natural environment and catering to different kinds of social needs. Thus, this former city model is deeply rooted in the contemporary idea of sustainable development. The article aims to describe a research procedure that would allow a determination of the degree of implementation of the garden-city concept in relation to contemporary cities. Moreover, the paper presents a comparative analysis of selected garden-cities in the context of the sustainable development idea. Historical, social, environmental and economic factors were analyzed as well as the functional-spatial structure and strategic documents of the cities. The entities investigated were shown to be the Polish interpretation of the garden-city idea and local rules include requirements concerning the principles of sustainable development.*

**Keywords:** garden-city, spatial planning, sustainable development, spatial order, city model

**JEL:** A13, O13, O21, N90, Q01, R00

## Introduction

Housing and development problems of cities at the end of the 19th century significantly influenced the assumptions of the garden-city. This concept combined the favorable features of the city and the village offering houses, jobs and cultural-recreational possibilities at the same time. The term “garden-city,” formulated by Ebenezer Howard (1898, 1902), was an independent city unit embedded in greenery, surrounded by agricultural areas and with a convenient connection to the city center. Multifunctional garden-cities created an organized space, coherent and harmonious. Thus, this historical city model is deeply rooted in the contemporary idea of sustainable development—it is conducive to economic growth, leads to greater social cohesion and increases the quality of the natural environment. Often criticized and described as utopian, Howard’s conception gained many followers and was implemented numerous times. However, in the practice of city-planning and in socio-economic complex reality, his vision was variously interpreted.

The article aims to present a research procedure that would allow for the determination of the degree of implementation of the garden-city concept in contemporary cities. Therefore, an attempt has been made to answer the question of to what extent and to what degree the selected garden-cities realize Howard’s conception and sustainable development assumptions. This paper conducts a comparative analysis of Warsaw’s suburban Garden Tri-city (GTC): Brwinów, Milanówek, and Podkowa Leśna in the context of this idea. Spatial, social, environmental and economic factors were analyzed as well as strategic documents of cities.

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## 1 Sustainable development in spatial planning and urban planning

The conception of sustainable development was popularized in 1987 in the report “Our Common Future,” prepared by the World Commission on Environment and Development operating at the United Nations. This report describes such development as one “that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.” As follows from the above definition, sustainable development rests on several basic assumptions (pillars):

- needs and the necessity to meet them
- social justice in the intra- and inter-generational aspects
- limitations imposed on management methods by the natural environment

Therefore, sustainable development should consist in the appropriate and conscious modelling of relations among economic growth, the environment (not only natural, but also superficial, created by a human) and meeting different kinds of human needs deciding to a great extent about the quality of life (Petrisor and Petrisor 2013). It is not to be an impediment to economic growth but denotes a new approach to development and opposes at the same time the traditional one while preserving a high level of prosperity (Domański 2005). Undoubtedly, such development must be well thought-out and planned, however, one should acknowledge difficulties connected with the operationalization of the conception formulated in such general terms (Mierzejewska 2009).

Sustainable development is a basic and statutory principle, next to the spatial order, which should guide spatial planning and development. Pursuant to the act, “spatial order should be understood as the shape of the space that creates a harmonious wholeness and takes into account functional, socio-economic, environmental, cultural and compositional-aesthetic requirements in ordered relations.”<sup>1</sup> While sustainable development is understood as “socio-economic development in which the integration process of political, economic and social activities take place, sustaining the environmental balance and the persistence of basic environmental processes in order to ensure the possibility of meeting fundamental needs of particular communities or citizens both of the present generation and future ones.”<sup>2</sup> These are very general statements, and the act does not specify which spatial planning objectives should be taken into account so that spatial development could be conducive to the implementation of sustainable development.

The numerous models and conceptions of sustainable development presented in the literature (Kronenberg and Bergier 2010; Matuszczak 2009; Rosicki 2010; Skowroński 2006; Zegar 2003) indicate the need to introduce a certain order. Mierzejewska (2015) proposes 2 classifications (tab. 1). The first one includes these models and conceptions which refer to the issues of 1. a spatial city form, both in local (within the administrative borders of a city) and regional terms (in an urban functional region) as well as the approaches combining both these aspects (local and regional), and 2. the quality of life in a city, especially in the context of social justice and a sustainable urban economy. As the basis for the second classification, she adopts other criteria, which allows selection of 2 groups of models indicating at the same time certain trends in research concerning:

- organizing the internal structure of a city in terms of both the spatial-functional and socio-economic structures, and
- organizing the relations between a city and its region.

It should be stated, however, that the objectives of spatial sustainable development, especially those with a high level of generality, coincide to a large extent with the objectives of spatial management determined by Malisz (1984).

Creating so-called green cities is an opportunity for sustainable urban development. Architects pay increasingly more attention to the significant link between this idea and the urban-planning conception of a garden-city (Hulicka 2015). Jabareen (2006) in his research indicates seven criteria of design concepts, thus identifying 4 models of sustainable urban forms (tab. 2).

1. See: Ustawa z dnia 27 marca 2003 r. o planowaniu i zagospodarowaniu przestrzennym [Act of March 27, 2003 on planning and spatial development]. DzU z 2003 r. nr 80 poz. 717, Article 2.

2. See: Ustawa z dnia 27 kwietnia 2001 r. — Prawo ochrony środowiska [Act of April 27, 2001 — Environmental Protection Law]. DzU z 2001 r. nr 62 poz. 627, Article 3.

**Tab. 1.** Classification criteria of selected models and conceptions of sustainable development

Models and conceptions	Approximate year of study	Classification 1		Classification 2	
		Spatial city form	Quality of life and city economy	Organizing internal structure of city	Organizing relations between city and its region
		Spatial-functional	Socio-economic		
Eco-city	1975	✓		✓	
Self-reliant	1976		✓		✓
Compact city	1980	✓		✓	
Green city	1980	✓		✓	
Redesigning a city	1990	✓		✓	
Externally dependent city	1990	✓			✓
Fair shares city <sup>a</sup>	1997	✓			✓
Slow city	1998				✓
MILU <sup>b</sup>	2000	✓		✓	
New urbanism	2000	✓			
Smart growth	2000	✓		✓	✓
Community garden	2000		✓		✓
Just city	2000		✓		✓
XXQ city	2008		✓		✓

Source: Own study based on Mierzejewska (2015)

<sup>a</sup>equitable balance

<sup>b</sup>Multi-Functional and Intensive Land Use

**Tab. 2.** Sustainable urban form matrix: assessing the sustainability of urban forms

Design concepts (criteria)	Neotraditional development		Urban containment	
	Compact city	Eco-city	Compact city	Eco-city
Density	2	3	2	2
Diversity	3	3	2	2
Mixed land use	3	3	2	2
Compactness	2	3	2	1
Sustainable transport	2	3	2	1
Passive solar design	1	1	1	3
Greening—ecological design	2	1	1	3
Total score	15	17	12	16

Source: Jabareen (2006)

Note: 1—low score; 2—moderate score; 3—high score.

Following the matrix of the sustainable urban form, Jabareen (2006) states that various city models contribute to sustainable development in various ways. He claims that an ideal, sustainable urban form according to the conception of the sustainable urban form design is one with high density, proper diversity together with compactness with a mixed land use and its construction is based on sustainable transport, ecologization and passive solar energy.

## 2 Genesis and theoretical basis for the conception of a garden-city

A garden-city is an urban-planning conception of healthy and green housing estates designed in a satellite system in relation to an already existing urban organism established in the second half of the 19th century. In Europe it was popularized at the turn of the 20th century with a view to solving the problem of the excessive development of 19th-century cities and it raised concerns about the quality of their inhabitants' lives. The conceptions proposed by Howard stem from Owen's

philosophical premises on the creation of healthy working villages. These ideas were already known. Baghdad in the Persian language means a garden-city, and its plan from the 7th century fully justifies its name (Mann 1993). Leonardo Da Vinci (1452–1519) proposed a satellite development of Milan (5 000 houses for 25 000 inhabitants in an urban unit).<sup>3</sup> Similar attempts were made in America, in Adelaide, Christchurch (1850), Chicago (1870) (Siewniak and Mitkowska 1998). In 1972, English architect Papworth suggested building the “rural city” — Hygeia along the Ohio river, in Kentucky, USA. It was an attempt at a new organization of the urban space with a large proportion of garden areas, yet it was not implemented. However, a theoretical urban-planning conception was successfully implemented — that of Garnier’s “industrial city,” published in 1917 and considering the share of garden spaces (Giedion 1968). At the same time as the garden-city conception, new approaches to the role and distribution of urban greenery were formulated. The first was a citywide pattern of gardens in the form of a single green belt created and popularized in the first half of the 19th century. This model was developed into a multi-belt pattern, presented in 1904 by French urbanist Henard (Majdecki 2010). Contemporary interpretations of garden-cities are — e.g., green cities and in the future there will be technologically advanced vertical acropolis (Wowrzeczka 2014) which may prove Howard’s conception to be timeless and universal (Baranowska 2007; Szczepańska 2011).

A garden-city is the conception of a city with an area of 2 450 ha, of which 400 ha was to be a built-up area, and the remaining 2000 ha surrounding the city — a green background designated for agricultural land. The founder was to be a cooperative association forming a commune. A city was supposed to have 5 500 plots. Plots with an area of 250 m<sup>2</sup> for single-family houses would be leased for 99 years, whereas plots for the construction of schools, churches, libraries, theatres and other public utility facilities as well as for the industrial plants — for 999 years. The lease income after paying the depreciation costs of land acquisition was to be spent on the arrangement of streets, sewage, water mains, etc. and the construction of non-residential buildings. The centrally located city was to be joined by the network of streets with the national road network, with a railway line tangent to the city with its branch going to industrial plants. A newly-established garden-city was to be a satellite, relieving an existing large mother city; the assumed number of city inhabitants was to be 30 000 and 2 000 for agricultural land as the final size of the whole settlement unit. After this size is achieved, the task of the deglomeration of a mother city was to be taken by satellite garden-cities built on similar principles. The city center was to be designated for a central park (about 60 ha) with distributed public buildings around it, such as city hall, a museum, a theatre, a library, a concert hall, and a hospital. The park was to be surrounded by a Crystal Palace — a covered promenade with a winter garden and shops. The city should consist of 6 districts and each of them was to have: a zone of houses with gardens, a school, a playing field, a playground and a church. An external zone was designated for an industrial zone (e.g., small factories, plants and manufactories) and then allotment gardens, forests and agricultural land with distributed farms. Orphanages, retirement homes, centers for hearing-impaired and blind people as well as farms for epileptics were to be situated at the outskirts of a city. Howard described and illustrated with details his conception of a garden-city emphasizing that the diagrams presented (although very suggestive) are only schematic, and the proper plan of a city can be drawn up only after selecting a location and examining its area and conditions (Wróbel 1971).

Howard’s conception aroused numerous controversies which paradoxically created favourable conditions for the project accompanied by very good marketing. The idea of a garden-city is based on the “Three Magnet” theory which, according to Böhm (2006), can be regarded as a pioneering application of the SWOT method (strengths, weaknesses, opportunities, threats). Howard wished to combine the advantages of living in a city and in a country, eliminating the disadvantages at the same time.

Howard’s idea is the starting point for the later urban-planning conceptions. It is worth mentioning that its author was neither an urbanist nor an architect, and he took interest in the city on account of social problems. The implementation of this utopian vision attracted top architects. During

3. [In the journal European practice of number notation is followed — for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). — Ed.]

Howard's lifetime two garden-cities were created: Letchworth (designed by Urwin and Parker, in 1903) and Welwyn (designed by de Soissons, in 1919) and his postulated action of constructing new cities produced better results after the second World War when it was strongly supported by the representatives of the government and carried out during the formation of the welfare state. The comparison of Cracow by Howard himself to the "garden-city of natural development" can prove the flexibility in perceiving the marriage of the village and the city, and the need to adjust theoretical conceptions to specific local conditions.

### **3 Discussion about the conception — advantages and disadvantages of a garden-city**

Howard imagined that a city as a technically finished organism with controlled population growth surrounded by a green belt of life-providing areas, after rising to its peak will create new cities-satellites out of the excess of the population, independent urban organisms having their own social life. At the same time the balance between a city and a village should be maintained as well as between a family and a commune, production and demand, work and rest. It would be then a limited and planned agglomeration, unknown in the 19th-century assumptions on city-planning (Czarnecki 1964) and strongly connected with the contemporary conception of sustainable development.

Mumford (1946) wrote about the idea of a garden-city: "At the beginning of the 20th century two great new inventions took form before our eyes: the aeroplane and the Garden City, both harbingers of a new age: the first gave men wings and the second promised him a better dwelling-place when he came down to earth." He considered Howard's book a "guide to modern urban-planning." Rodwin (1956) claims that "not many ideas were so stimulating for our thinking about more reasonable and harmonious reconstruction of existing large cities." In Fishman's opinion, the creator of the garden-city idea "with a genius and patience of a great inventor, leave a new, useful instrument prepared for other aims, created a model of a new environment and a new society" (Fishman 1982). Howard rejected the planning subject to the principles of existing logic—he did not agree that an urbanist had to act in accordance with the system. Gzell (1987) called it a "therapeutic approach." Böhm (2006) discerns a significant advantage of Howard's conception consisting in the creation of order in a specific place without the vision of spreading it to the borders of urban decay. The implementation of the idea of a garden-city brought also additional advantages. One of them was provoking the discussion and drawing up of projects concerning municipal wastewater management. In garden-city designs emphasis was put on water canals, and rain barrels which was only the symptom of common urban engineering problems and of what is called nowadays a biologically active area. Another, more serious impulse caused by the idea of garden-cities lead to the development of regional planning in Europe following the United States. It also seems that thanks to the idea of a garden-city, regardless of its implementation degree, green areas were introduced to the arsenal of citygenic elements on a large scale—open areas in a city were no longer a "not-yet-built-up space," but became concepts in themselves (Czarnecki 1968). According to Leśniak-Rychlak (2015), Howard's vision, although based on the ambitious socio-spatial construction, was above all practical.

The garden-city conception had also its opponents. Le Corbusier (1931) criticizes one-family housing development, because it leads to the waste of an area and time as well as bringing up inhabitants in an antisocial spirit. Jacobs (2014) is of a similar opinion—"decentric" conceptions initiated by Howard adversely influenced large American cities contributing to the decay of the social bond among inhabitants and to the creation of the soulless and monotonous picture of metropolitan districts. Whereas Carter (1962) notices that Howard and its followers did not pay attention to the issue of the regeneration of old town centers—"regardless of how much good they would do, the harm caused by the distraction from the pressing need for the renovation of central city districts would be catastrophic." Howard is often thought to treat his garden-city as an isolated phenomenon, disconnected with reality. Giedion (1956) claims that garden-cities failed because "a partial solution is impossible; only well-thought-out and integrated planning, embracing the whole structure of the modern lifestyle in its every aspect, makes it possible to build the garden-city." According to Ostrowski (1975), the error in Howard's idea was the underestimation of the importance of the labor

force distribution in forming the structure of a settlement. Describing an idyllic smoke-free city with better life conditions and surrounded by pastures and forests, Howard wished to oppose powerful economic forces leading to the concentration of industry, administration, services and the creation of large urban agglomerations. He realized the need for the prevention of land speculation and postulated the municipalization of a city and an agricultural belt. However, a city would have to have much wider areas and ensure the stabilization of prices for the future expansion. According to Howard's idea, a subsequent garden-city was to be established in the vicinity of the first one; in reality it was built wherever it was possible to purchase land at suitably low prices (Ostrowski 1975). While Czyżewski (2001) in his anthropological interpretation of the garden-city draws attention to the “shameful kinship” of this conception — “from hygiene to eugenics” and indicates the gloomy similarity to Auschwitz development plans. He also states (though not in the case of the cities: Żabki, Młociny, and Podkowa Leśna) that the name “garden-city” was used purposefully as an advertising slogan for new investments concerning land speculation. Thus, if in England a garden-city was to stop the disorderly sprawl of a city, in Poland, almost on the contrary, it was the means for territorial development. Dobrzyński (1917) distinguished garden-cities, garden-outskirts, garden-settlements, and workers' settlements. Some Polish garden-cities have developed from summer resorts of high landscape qualities having as a result favorable climate conditions and being touristically attractive (Dymek and Bednorz 2014).

#### 4 Warsaw's suburban Garden Tri-City as a research subject

Podkowa Leśna, Brwinów and Milanówek are part of the Warsaw agglomeration (fig. 1), connected by similar historical, spatial, social and economic factors. These communes are attractive due to their “green” character, lack of industry and the protection of natural and cultural assets. In 1925 the company “Garden-City Podkowa Leśna” was established and it consisted of: S. Lilpop as the land owner, a consortium “Power and Light” and the Bank of the Union of Salary Companies. The company bought the property of Podkowa Leśna from Lilpop, and Jawornicki, a Warsaw architect and urbanist, drew up the city plan. In 1927 the first section of “Commuting Electric Railways” from Warsaw to Grodzisk Mazowiecki was opened. The number of inhabitants reached about 1 700 by the end of the 1930s, with artists and writers among them, including (e.g., Iwaszkiewicz, Hertz, Krzywicka, Skotnicki). In 1969 Podkowa Leśna gained town rights and in 1981 was entered into the register of historical buildings due to a unique urban pattern and the greenery of a garden-city (Żukowska-Maziarska 2003).

The establishment of the train stop and the passing of the first train of the Warsaw-Vienna Railway in 1845 was a strong incentive to the development of the village of Brwinów. In 1902 the land division of the Brwinów properties started, sold by Lilpop. In 1927 the commune of Letnisko



Fig. 1. Location of Warsaw's suburban Garden Tri-City (GTC): Podkowa Leśna, Brwinów and Milanówek

Brwinów was set up. The estate of houses, freely distributed in large plots, was built as part of the division. Two districts were created in Brwinów, the pattern of which resulted from the existing road system. They consisted of large villas, built most often in the so-called national style, with a classic simplified architectonic detail, inspired by the Polish gentry mansion with its typical elements: a column porch and a high broken gable roof. In 1929 it had as its guest Mościcki, the president of the Republic of Poland. Iwaszkiewicz, Bartkiewicz, and Kiedrzyński among others settled here. In 1950 Brwinów gained town rights.

In 1899, the first land division of M. Lasocki's property took place in order to create Letnisko Milanówek. In 1901 in Milanówek the train stop of the Warsaw-Vienna Railway was established. In the 1920s and 1930s Milanówek was at its height. A convenient rail connection to Warsaw, perfect climate conditions, a large complex of forests and relatively low prices of plots attracted wealthy Warsaw residents who started to build summer houses there. At first, they visited the tranquil suburban town at weekends, but later started to build grand villas and settled there permanently. During the first years the most famous summer visitor was B. Prus. In 1924 Witaczek siblings set up the Central Experimental Silk Station, transformed after the 2nd World War into the Natural Silk Plant "Milanówek." In the interwar period, the villa architecture developed, dominating up to this day in the older part of the city. During the Warsaw Uprising, Milanówek was the center of the most important bodies of the Polish Underground State and earned the name of "Little London." In 1951 Milanówek was granted town rights. In 1961 its borders were extended by the inclusion of (e.g., Nowa Wieś). In the period of the Polish People's Republic a further industrial development followed (e.g., the factory of dental and surgical tools "MIFAM" was constructed).

The need to combine efforts for the development of the three similar neighboring centers resulted in the idea of an agreement. Warsaw's suburban Garden Tri-City<sup>4</sup> is a partnership initiative: initiated during the joint cultural events in 2006, officially set up in 2010 and finished in 2017.

The Project was implemented with the cooperation of Brwinów commune—the Project Leader, Milanówek commune and the city of Podkowa Leśna with 53 partners. It aimed at raising the quality of life for residents and the establishment of the Partnership mechanisms in order to solve together the problems extending the area of a single commune. The expected outcome was the preparation of the documents: strategic ones, determining optimal development trends in the functional area, Project documentation of the key issues concerning the solutions to the water and drainage problems (including the stocktaking of water devices and a complex regulation of water management), those for increasing the intermodality of transport and the improvement of the connection with Warsaw and main national roads (including the investment and residential zones and the network of bike paths), for regenerating key green areas, solving major issues and providing social services (together with a cemetery, a preschool, a school, recreational zones, etc.) and ultimately the documents enhancing the Partnership as an institution by inviting numerous social partners.

## 5 The research method

In order to implement the adopted objectives of the research, the procedure for the assessment of garden-cities was prepared. This evaluation rests on the assumptions of Howard's garden-city concept, with categories formulated on their basis and with the assigned criteria adjusted to the contemporary reality. Three basic categories were adopted in the research:

- municipal land ownership
- limited development of an area and of the number of inhabitants
- close functional links between the city and neighboring areas (Mumford 1938)

4. The project title: "Warsaw's suburban Garden Tri-City—the improvement in the cohesion of an area of Warsaw's suburban Garden Tri-city through the cooperation in terms of social policy, shaping public space, water management and transport" as part of the implementation of the Regional Programme "Development of cities through the empowerment of self-government units, social dialogue and the cooperation with the representatives of civil society" by the Ministry of Infrastructure and Development, co-financed from the means of the EEA Financial Mechanism and national ones. Joint activities received additional funds from the European Economic Area Financial Mechanism. The value of the project is PLN 1 491 230, which makes up 60% of the qualified costs of the total of PLN 2 485 383.

Moreover, two additional categories were formulated:

- services and public utility facilities, and
- a spatial-functional structure (tab. 3).

It has been assumed, provided the equivalence of each of the five categories, that each of them can obtain a maximum 20 points. Weight was assigned to each of the criteria whose total for each category is 1 (tab. 3). Next, each criterion received points on the scale 0–3, where: 0 is a criterion not met, 1—a criterion met to a small extent, 2—a criterion met to a moderate extent, 3—criterion met to a large extent, relating to the indicators stemming from the number of inhabitants or the surface of the areas of particular utilization forms.

Values for the indicated categories and for a given city were computed by the formula:

$$(1) \quad K_i = \frac{\sum_{j=1}^n p_{ij} w_j}{p_{wi} \max} \cdot 20,$$

**Tab. 3.** Categories, their relevant criteria and weight in the assessment of garden-cities

Category	Criterion	Weight
Municipal land ownership	• Municipal buildings . . . . .	0,2
	• Municipal land . . . . .	0,2
	• Municipal management . . . . .	0,3
	• City's income . . . . .	0,3
Limited development of area and of number of inhabitants	• Surface of built-up area . . . . .	0,1
	• Surface of agricultural and forest areas . . . . .	0,1
	• Surface of green areas . . . . .	0,2
	• Population density . . . . .	0,2
	• Compactness of urbanized pattern . . . . .	0,1
Functional links between city and neighboring areas	• Isolation of urbanized areas with agricultural or forest ones (green belt)	0,3
	• Transport (e.g., railway, trams, buses, motorway, main road, bike path)	0,3
	• Food (e.g., agricultural areas, farms) . . . . .	0,1
	• Technical (e.g., sewage treatment plant, water treatment plant, dumping ground, combined heat and power plant) . . . . .	0,3
Services and public utility facilities	• Compositional (e.g., dominants and landscape connections, architectural and aesthetic assets) . . . . .	0,3
	• Administrative (e.g., city and commune administration, post office, police station, municipal police station) . . . . .	0,1
	• Educational and cultural (e.g., preschool, elementary school, high school, college, museum, library, cultural center, church) . . . . .	0,2
	• Health (e.g., health centers, pharmacy) . . . . .	0,1
	• Financial and trading (e.g., trade center, open market, bank) . . . . .	0,2
	• Technical and craft (e.g., petrol station, plant and services) . . . . .	0,1
	• Touristic, recreational and sports (e.g., tourist trail, theme path, viewpoint, tourist information center, bathing area, sports field, playground, monument) . . . . .	0,2
	• Food and accommodation (e.g., restaurants, accommodation) . . . . .	0,1
Spatial-functional structure	• Housing function (e.g., one-family housing, multi-family housing) . . . .	0,3
	• Industrial and economic functions (e.g., economic activation areas, investment areas, production plants, storage buildings and warehouses) .	0,1
	• Production and agricultural functions (e.g., orchards, meadows, pastures, cropland) . . . . .	0,1
	• Recreational-protection functions (e.g., parks, public gardens, allotment gardens, forests, environmental protection forms, cemeteries) . . . . .	0,3
	• Social functions (e.g., non-governmental organizations, social welfare centers) . . . . .	0,2

*Note:* All weights for each category sums to 1.



where:

$K_i$  — total points for the  $i$ -th category,

$p_{ij}$  — the number of points for the  $i$ -th category for the  $j$ -th criterion,

$w_j$  — the weight of the  $j$ -th criterion,

$p_{wi} \max$  — a maximum number of weighted points possible to be obtained by the  $i$ -th category (in this case 3),

$n$  — the number of criteria in a given category,

20 — a maximum number of points possible to be obtained by a given category.

The number of points for a given city (a maximum of 100 points) was computed by the formula:

$$(2) \quad PM = \sum_{i=1}^5 K_i,$$

where:

$PM$  — the total for a given city,

$K_i$  — the number of points for the  $i$ -th category.

The comparison of the points obtained in the 5th assessment category allowed determination of the implementation degree of the assumptions of a conceptual garden-city for particular cities (tab. 5, see page 90) whereas the analysis of planning and strategic documents and the comparison of the features of the investigated garden-cities with project criteria and the grading scale adopted by Jabareen (2006) made it possible to determine the character of sustainable development of the cities studied (tab. 6, see page 91).

The source of qualitative and quantitative data for particular cities was planning and strategic documents, a system of spatial information (SIP), statistical data—Local Data Bank, database website of Central Statistical Office of Poland (GUS), the Bulletin of Public Information (BIP), and also websites, internal materials of the investigated units and field studies.

## 6 Research results

Podkowa Leśna, Brwinów and Milanówek are the units about twice as small in terms of size than a conceptual garden-city, also in the case of the number of inhabitants, except for Podkowa Leśna (tab. 4). It is worth noticing, however, that only in Podkowa Leśna the share of built-up areas and also agricultural and forested terrain as well as green designed areas remain in close relation to Howard's conception. Analyzing the indicators deriving from a built-up area, the number of demarcated plots and the number of inhabitants it can be stated that they deviate from the assumptions of a garden-city. An indicator of the population density is about twice as low, whereas the compactness of an urbanized pattern is slightly smaller in relation to the indicators resulting from Howard's assumptions. Howard strove for the dispersion of development and reduction of the population density with regard to metropolitan structures which in the case of the units investigated has also been achieved. It also seems that the indicator "number of persons per plot" is fulfilled, because the contemporary family model is usually "2+2."

The cities studied fulfil the requirements of the conceptual garden-city to a higher degree (on average 75 points out of 100), and the order of these units is the following: Podkowa Leśna, Brwinów, Milanówek (tab. 5). Within the five appointed categories, analyzed cities implement clearly the criteria typical of category 3—"functional links between a city and neighbouring areas" and category 4—"services and public utility facilities." The fewest points were recorded in category 2—"limited development of an area and of the number of inhabitants." The contemporary garden-cities analyzed seem not to limit their spatial development, moreover their neighborhood is becoming an attractive place to settle. Thus, an increasing number of inhabitants and a contemporary model of consumer society will influence the necessity of a greater availability and diversification of services and the improvement in transport connections in the neighboring area.

As part of the agreement of Warsaw garden-cities, a series of analyses were conducted, which constituted the basis for strategic documents drawn up to help the sustainable development of these units. The document "A complex programme for water management regulation in the commune

**Tab. 4.** Characteristics of the analyzed units against the features of a conceptional garden-city

Feature	Garden-city	Podkowa Leśna	Brwinów	Milanówek
Total area of city (ha), including:	2 450 <sup>a</sup> (100%)	1 013 (100%)	1 010 (100%)	1 344 (100%)
agricultural and forest area	2 000 <sup>a</sup> (82%)	819 (81%)	553 (55%)	573 (43%)
built-up area, including:	400 <sup>a</sup> (16%)	118 (12%)	336 (33%)	506 (38%)
designed green area	100 <sup>a</sup> (25%) <sup>b</sup>	32 (27%) <sup>b</sup>	42 (13%) <sup>b</sup>	38 (8%) <sup>b</sup>
Number of city's inhabitants	30 000 <sup>a</sup>	3 952	12 720	16 332
Population density (persons/ha)	75	33	38	32
Number of plots	5 500 <sup>a</sup>	1 361	3 158	4 089
Plot area (m <sup>2</sup> )	240 <sup>a</sup>	867	1 064	1 237
Compactness of urbanized pattern (plots/ha)	13–14	11–12	9–10	8
Number of persons per plot	5–6	3	4	4

Source: Own study based on data published by Central Statistical Office of Poland

<sup>a</sup>Approximate values provided by Howard (1902)

<sup>b</sup>Percentage of designed green areas in built-up areas

**Tab. 5.** Characteristics of the analyzed cities against the adopted criteria of a conceptional garden-city

No.	Category	Podkowa Leśna	Brwinów	Milanówek	Average
1	Municipal land ownership	15,3	15,3	13,3	14,7
2	Limited development of area and of number of inhabitants	14,0	10,0	12,0	12,0
3	Functional links between city and neighboring areas	16,7	18,0	15,3	16,7
4	Services and public utility facilities	16,0	17,3	17,3	16,9
5	Spatial-functional structure	16,0	15,3	12,0	14,4
	Total	78,0	76,0	70,0	–

area of Warsaw's suburban Garden Tri-City (GTC)" is the basis for the effective management of water resources taking into account the protection of water relations.

The analysis performed as part of "The transport study involving all branches of passenger and freight transport in the GTC area" showed that the network of stops made this type of transport widely available, yet it lacks the appropriate infrastructure—car parks, or parking spaces for bicycles. The planned bike paths and the existing ones will create a coherent network allowing comfortable transport in the GTC area.

The "Strategy for the development of the GTC green areas together with the preparation of the stocktaking of natural resources and the conception of new plantings" aims to create a correlated, uniform green system by the appropriate choice of species, compositions, the spatial information system and small architecture. The strategy indicates the solutions and trends which will improve the state of the environmental balance and the microclimate stabilization and thus the life quality of GTC inhabitants in harmony with nature. These actions should be large-scale initiatives, with the cooperation and participation of inhabitants. Only the united care for space will allow communes to achieve satisfactory results. The education of inhabitants and the appropriate use of legal tools accessible for communes will be helpful, especially in the situation where a lot of environmentally precious land and valuable historical gardens are private. The strategy indicates that as part of constructing the joint GTC brand, a system of spatial information common for the communes is worth creating as well as the catalogue of small architecture and also the transport network connecting the communes with greenery as a characteristic feature (avenues, planting bulbs, perennials and bushes along footpaths, bike paths, roads).

"The integrated strategy for solving social problems and supporting the development of GTC civil society" determines the scope of the local social policy taking into account social welfare,

prevention and solving alcohol-related problems, social housing, public education, health care, integration and the social activity of inhabitants. “A social marketing plan for GTC inhabitants aiming particularly to increase the identification of inhabitants with their place of residence, mutual integration, activity, safety” presents the proposals of activities integrating older and younger dwellers—e.g., cultural, entertainment and sports events—and also postulates the construction of common meeting areas—e.g., squares—which would create favorable conditions to meet people and strengthen social ties. An important point in terms of the demographic situation in the GTC area is intergenerational integration and the activation of seniors by including them in the social life of the commune and the cities.

The above documents show that local authorities strive to achieve sustainable development especially in the environmental, spatial-functional and social spheres. Thus, what was taken into consideration was the formation of a coherent and harmonious spatial form, improvement in the quality of life and an urban economy, organizing the internal structure of the city and relations between the city and its region, which agrees with the criteria determined by Mierzejewska (2015). And again, in the criteria proposed by Jabareen (2006), the investigated garden-cities implement the assumptions of sustainable development within the grading scale he adopted (tab. 6).

**Tab. 6.** Investigated cities against the criteria of the conception for sustainable development by Jabareen (2006)

Design concepts (criterion)	Podkowa Leśna	Brwinów	Milanówek
Density	2	2	2
Diversity	2	2	3
Mixed land use	1	2	2
Compactness	2	2	2
Sustainable transport	2	3	3
Passive / solar design	1	1	1
Greening—Ecological design	2	2	2
Total	12	14	15

*Note:* 1 – low score, 2 – moderate score, 3 – high score

Howard in his conception of a garden-city drew attention to the need for the appropriate association between a place of residence and a workplace to reduce commuting costs which is especially important in sustainable development. These features are close to the contemporary conception of a compact-city and also to the designed rules of mixed land use and sustainable transport, although to a limited extent because it does not consider the place for (e.g., heavy industry). Looking for the implementation of the Howardian marriage of the city and the village in one-family housing surrounded by greenery may be indicative of narrowing this conception. This marriage should be perceived first of all as the surrounding of a relevant city with agricultural areas which constitutes another important factor of sustainable development and is close to the contemporary conception of a green-city and eco-city. Thus, it is consistent again with the design rule of a mixed land use and also a subsequent one—diversity. The demand for creating numerous green forms also deserves attention: a central park, a garden, an avenue and joint house gardens instead of dividing the area into miniature individual plots. This last principle is promoted in the contemporary model of a community garden.

## Conclusions

The innovation in the conception of a garden-city was treating a large city as a group of units duly equipped for specific functions and included in greater units (whole entities). As early as at the end of the 19th century, Howard put forward the idea of separating the units of different sizes subject in a hierarchical way to one another, a rule which played a significant role in the history of urban planning. He also emphasized the necessity for the municipalization of the areas of a city

and its surroundings and the appropriate association between a place of residence and a workplace to reduce commuting costs (Ostrowski 1975).

The conception formulated by Howard, although often described as utopian and in spite of having many opponents, was implemented many times. However, in the practice of urban planning and heterogeneous socio-economic reality, Howard's vision was variously interpreted. In Polish conditions at the time, it was not difficult to stop the sprawl of large cities, whereas for English society it was a matter of concern. Currently, the problem is highly topical. Space management should take spatial order and sustainable development into account, but it is difficult to enforce these two basic rules (spatial planning is based on the decisions concerning construction conditions, area development and special laws). The historical assumptions of the idea of the garden-city are inadequate today and they require verification.

The comparative analysis showed that the investigated units of Podkowa Leśna, Brwinów and Milanówek, being the Polish interpretation of the garden-city, are significantly smaller in terms of size and the number of inhabitants than in Howard's vision. But, taking into account the indicators applied, they are rooted in the assumptions of a garden-city in terms of social organization and an urban scale.

The conducted research demonstrated that the analyzed units fulfil the requirements of the conceptional garden-city to a higher degree. Within the five appointed categories, the analyzed cities implement clearly the criteria typical of the category "services and public utility facilities" and "functional links between a city and neighboring areas." Whereas the criteria within the category "limited development of an area and of the number of inhabitants" are realized to the smallest degree.

The need to combine the efforts for the sustainable development of the three similar neighboring centers resulted in the agreement of Warsaw's suburban Garden Tri-City. The review of the strategic documents prepared for this agreement showed that the local authorities of the investigated units strive for sustainable development, particularly in the environmental, spatial-functional and social spheres. It should be emphasized that the cities studied have valuable natural and cultural assets which are currently protected.

The analysis carried out indicate the similarity of Howard's early conception with contemporary models of a sustainable city — i.e., a compact-city, green-city and eco-city, realizing at the same time such project rules as: mixed land use, diversity or sustainable transportation. The question arises, however, as to how long this dynamic equilibrium can be maintained, especially in the situation of changing needs of the consumer society and in the vicinity of the quickly growing Warsaw agglomeration. The partnerships seem to be conducive to exchanging experience, contribute to mutual support and to the implementation of ideas especially in terms of sustainable development. According to Leśniak-Rychlak (2015), currently, when social inequalities are increasingly greater, when the questions about the quality and attributes of space are more often addressed, when logic other than the logic of growth and capital accumulation is increasingly urgently needed, Howard's ideas turn out to be useful again. Naturally, we will not find the current and straight answer in the conception of a garden-city, but the trend towards the category of common good and common space as well as self-regulation seems justified.

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