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Balancing Increased Urban Density with Green Spaces: The Marketing of New Housing Estates in Poland

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Abstract: This study aims to analyse the transformation of urban greenery into greenfield housing development from 2019 to 2023 in the medium-sized city of Rzeszow (Poland) by evaluating the validity of references to the greenery in advertising texts on the developers' websites. Furthermore, to assess the impact of the proposed greenery-related changes on urban green infrastructure. Through web-based research, 13 greenfield housing developments were identified. Changes in land use of areas that were allocated to urban green infrastructure were highlighted by applying GIS spatial analysis. The written and visual content analysis identified references to greenery in advertising campaigns. Finally, status relations analysis was performed to assess whether the specific advertising website presents an added ecological asset that can be considered as a nature-based solution or should be interpreted as greenwashing. The study revealed that the advertising websites for greenfield housing development constructed from 2019 to 2023 in Rzeszow do not represent an additional ecological asset, but committed greenwashing. All analysed housing estates trigger irretrievable environmental damage. The advertising material does not define the environmental indicators of the housing estates, including how the new construction would compensate for the destruction of natural habitats.

Keywords: future-oriented urban planning; resilient communities; urban density; urban green infrastructure (UGI); greenfield housing development (GHD); nature-based solutions (NbS); study of conditions and directions of spatial development (SCDSD)

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1. Introduction

Since the beginning of the 2000s, planning policies in Poland have been gradually implemented which led to the intensification of urban developments while the overall urban densities decreased. Fast-paced urban growth, although necessary to provide for much needed housing and job opportunities, led to adverse environmental, social, and economic impacts [1,2]. The urban expansion of Polish cities and towns requires significant efforts in terms of planning and infrastructure investments to curb sprawl and reintroduce nature into the urban context. However, how can we re-naturalise cities without dropping urban densities? The problem is present in medium-sized cities with a population between 100,000 and 500,000 inhabitants, which must compete with larger metropolises on parallel issues, but are less equipped with resources and often lack institutional and planning capacity [3]. Since future disruptions are unpredictable but likely, these might affect urban areas where professional planning and management is considered an opportunity for more sustainable, resilient, and healthy urban futures [4]. City managers and councils must have the knowledge and tools to respond to ever-changing threats, including climate change, future pandemics, the risk of armed conflict and long-lasting supply chain disruptions [5]. In many medium-sized cities in Poland, urban densification became a crucial strategy and pretext for decision-makers to allow for more compact

development, while introducing urban greenery (UG) back into built-up areas. However, the continuation of the structural stability and functional security of this trend is not ensured [6]. Misguided territorial planning led to the construction of numerous greenfield housing development (GHD) and further development of low density, car-dependent sprawl. In the advertising campaigns for these new developments launched by the project developers, claims are frequently made that these housing estates would deliver significant social, economic, and environmental benefits. Furthermore, advertising campaigns highlight the location within the natural landscape as positive from the perspective of an urban dweller [7]. Here, landscape values become crucial elements of marketing strategies, which do not indicate any adverse impacts of GHD that are impossible to compensate for [8].

The question of urban density is closely connected to urbanisation models and how our cities may evolve in the future. Density and compactness are two closely related but different criteria, both relevant for sustainable urban development and the transformation of cities; however, their relationship is not always well understood. While a high degree of compactness is desirable, too much density can be detrimental to liveability, health, and urban well-being [9].

New urbanisation concepts should guide the inclusion and re-introduction of greenery and biodiversity in the urban built environment [10].

In this paper, a case study of Rzeszów, a medium-sized city in Poland, is analysed and conclusions are drawn that would be relevant to practitioners and researchers alike, especially those involved in urban densification, urban and architectural design, and greenery protection. The main aim of the study is to analyse the transformation of UG into GHD from 2019 to 2023 in the medium-sized city of Rzeszow (Poland) by evaluating the validity of references to the greenery in advertising texts on the developers' websites. Furthermore, to assess the impact of the proposed greenery-related changes on urban green infrastructure (UGI). The findings are used to provide recommendations to stakeholders to protect UGI and prevent negative impacts from GHD in medium-sized cities. Therefore, the objectives of the research article are threefold: (I) to highlight the changes in land use of areas that were allocated to UGI in the city of Rzeszow from 2019 to 2023 ; (II) to analyse the use of greenery in the written and visual content of the GHD marketing websites and to evaluate whether the applied strategy represents an added ecological asset that can be considered as nature-based solutions (NbS); or these claims should possibly be interpreted as greenwashing; and (III) to provide recommendations to decision-makers for the formulation of future policies relevant to protecting UGI and in order to prevent negative impacts from GHD from negatively transforming medium-sized cities.

In Europe, 67% of urban residents live in medium-sized cities and only 9.6% of dwellers live in large metropolises that have more than 5 million inhabitants [11]. Recent discussions on institutional conditions for an effective response to the environmental, social, and economic challenges that are evident in European cities revealed that medium-sized urban areas face more difficulties when planning sustainable and resilient urban growth [5,12,13]. Medium-sized cities are less equipped with resources and often with institutional and planning capacity [3]. Although UGI is recognised and acknowledged in planning strategies, its protection is at risk of haphazard urbanisation combined with pressure of modern life standards derived from large metropolises. Thus, strategic urban management, the protection of key sites, and the provision of funds and management mechanisms for restoration and rehabilitation are crucial themes for the sustainable future of medium-sized cities [13]. Contrary to large agglomerations, too little research attention has been paid to UGI protection and the prevention of transforming UG into a built environment in medium-sized cities.

2. Literature Review

Compactness, mixed land use, density, housing diversity, sustainable transportation, and green space represent essential planning strategies that contribute to social, economic, and environmental sustainability within an urban form [14]. Context-specific governance and policy maintain a balance between these strategic elements, thus meeting the requirements of the three sustainability goals. However, the debate about urban evolution as a combination of rigorous development and planning practices indicates that implementing, improving, and maintaining all planning strategies simultaneously is difficult to achieve [15]. Stakeholders have been cherry-picking those elements that suit their needs and visions of a sustainable city [16]. In many urban areas, emerging economic opportunities overbalance social and ecological benefits when making planning and zoning decisions [14]. This phenomenon has various adverse impacts, and one of them, of interest to this study, is prioritising the construction of new housing estates at the expense of reducing natural landscapes [7]. Urban densification should be achieved through strict land use regulations aimed at revitalising brownfields to reduce land consumption in peri-urban areas, waste, energy use, air pollution, and avoid social segregation [17]. However, densification processes endanger UGI provision and protection [18].

UG includes areas in cities covered with vegetation, such as parks, urban forests, urban agriculture, private gardens, green roofs, or walls [19]. UG as a planned network of natural and semi-natural areas provides ecosystem services that support life in cities. UG improves social cohesion and inclusion [20,21], benefits life satisfaction and happiness [22,23], contributes to health by reducing stress and encouraging urban dwellers to be outdoors and walk [24], enhances biodiversity, and mitigates against adverse effects of climate change [25]. The provision of UGI is further supported by NbS, as systemic solutions that are inspired and supported by nature to provide environmental, social, and economic benefits and contribute to urban resilience [26,27]. Implementing NbS aims to bring natural characteristics and processes to the urban environment through locally inspired and resource-efficient interventions [28] that can be designed in symbiosis with urban structures [29] and to some extent compensate for the negative impacts of human activity on the natural environment [8].

UG provides cultural ecosystem services for leisure, cultural education, tourism, aesthetic appreciation, and spiritual needs [30], which constitute a large proportion of ecosystem services in UGI [31]. Previous research has established that residential satisfaction increases when the home is located in close proximity to greenery [32,33]. Natural elements, including green views from home and opportunities to access natural landscapes nearby, elicit positive emotions such as tranquility and peace, thus contributing to the well-being of residents [32,34]. The presence of parks and open space encourages neighbourhood interactions [32,35], opens opportunities to engage with nature [20], encourages physical activities [36], reduces stress and restores attention [37]. Residential satisfaction depends on the quantity and quality of UG [34], the size [38], accessibility [38], natural properties [39], biodiversity and the species composition of the green space [40]. For example, larger local greenery attracts more residents, including relatively far-away housing estates, than smaller neighbourhood greenery that more often does not meet user expectations [41,42]. Developers are aware of the role of nature in residential satisfaction; thus, plots within UG are in high demand for the construction of new housing estates [43]. The need for rapid development of multifamily housing, caused by the sharp increase in urban population, challenges land use management and increases concerns about the loss of UGI and ecosystem services [44,45]. Emerging economic opportunities for new construction often exclude green thinking [6,7]. Natural landscapes that are essential for ecological security are identified and acknowledged as UGI; however, their structural stability and functional security are not protected. There is a large volume of published studies describing the adverse impacts of new construction on natural cover, biodiversity, and the production of ecological services and goods [46–48]. Transforming UG to the built environment causes deforestation [49–51], habitat and land fragmentation [52], and loss of

allotment gardens [53]. GHD, which includes all housing constructions built on land covered with vegetation, is a common phenomenon [54]. Previous research has established that the initial and operating ecological costs of GHD are higher than those of a brownfield development [55–57]. Several cities that have proclaimed themselves "green", "innovative", "ecological", or "smart" have been criticised for greenwashing, due to the promotion of GHD as sustainable and ecological [55]. Caprotti, Springer, and Harmer (2015) examined Sino-Singapore, Tianjin, the urban megaproject in China that achieved the status of an eco-city (together with 259 other urban projects) [55]. The authors indicated that construction could cause irretrievable environmental damage that arises from the degradation of wetlands. Ecological indicators are vaguely defined within the project, which appears as an environmental—economic vision that will be difficult to validate after finishing the construction [55]. Shaw and Menday (2013) analysed Fibro Dreaming, a beach house development in Australia, and revealed that this housing estate, advertised as environmentally sustainable and integrated with nature, does not deal with the triggered environmental degradation and urban sprawl [58]. Cugurullo (2016) positioned Masdar City (Emirates) in the urban eco-modernisation context and argued that this high-tech development is more informed by market analysis than ecological studies [59]. Raco and Lin (2012) indicated that the policies and strategies, which guide sustainable urban development, are shaped by economic, environmental, and socio-political dynamics that often implement controversial changes that help to provide substantial financial income to elite groups [60].

GHD is driven by the availability of unprotected land in prominent locations and the willingness of urban dwellers to live close to nature [43]. Developers consider UG as the opportunity to build and sell apartments in desired districts, and refer to ecological values and proximity to green spaces in promotional campaigns [7,54]. Although green marketing positively influences the perception of developers and their investments [61], as well as generates a stronger intent to purchase the offered product [62], much published research has shown that advertisements produce misleading green claims [7,54]. Several studies have shown that greenwashing became a common marketing strategy in response to the growing emphasis on eco-climate issues [63,64]. Greenwashing is defined as a communication that misleads the audience (stakeholders, consumers) about environmental benefits/performance by disseminating positive information about a product, service, or organisation, without the complete disclosure of negative information on these dimensions [63,65]. Tateishi (2018) conducted a semi-content analysis of GHD ads in Nusajaya (Malaysia) to determine the dependence between the levels of green claims, deceptive green claims, and prices [54]. The study explored the relationship between green claim levels, deceptive green claims, and the level of loss of greenery. Green claims have been found to contradict each other due to initial adverse ecological costs that include cutting down vegetation and higher ecological costs in the next stages of the life cycle of the housing estate compared to similar brownfield developments. The larger the share of build-up to the project site, the greater greenwashing is practised [54]. Furthermore, developers adapt green marketing to improve market value and justify expensive prices. Gałecka-Drozda et al. (2021) investigated 73 multifamily housing advertisements in Poznań (Poland) with respect to written information and illustrations (plans and renderings) to assess whether green claims should be classified as greenwashing or NbS [7]. The study revealed greenwashing in all marketing campaigns. Some green interventions presented in the explored ads were identified as NbS (e.g., front gardens); however, elements of greenwashing were also observed. Although the study revealed examples of NbS, it has been highlighted that this concept is not well understood in urban development strategies in Poland. Thus, NbS appear implicitly in housing estate advertisements.

Little is currently known about the levels of green claims in marketing campaigns of ghd in medium-sized cities. This paper uses the case study of Rzeszow (Poland) to highlight the changes in land use of areas that were allocated to UGI in this medium-sized city from 2019 to 2023, to analyse the use of greenery in the written and visual content of the GHD marketing websites and to evaluate whether the applied strategy represents an

added ecological asset that can be considered as NbS or these claims should possibly be interpreted as greenwashing. The findings are used to provide recommendations to stakeholders to protect UGI and prevent negative impacts from GHD in medium-sized cities.

3. Materials and Methods

3.1. Case Study

The case study is a qualitative approach that allows exploring a bounded system (a case) through in-depth data collection, which involves multiple sources of evidence, for example, documents, observations, focus groups, etc. [66,67]. Through case studies, researchers gain an in-depth understanding of phenomena and their meaning [68]. This research methodology is designed as an exploratory single case study that allows the analysis of the interaction between the context and the indicated phenomenon [69] within an urban organism. At the beginning of the research, the developers' approach to taking over UGI by GHDs and implementing natural elements in these projects to compensate for environmental losses is unknown. Thus, this paper focuses on one city to study it thoroughly, as recommended by Swanborn (2010) [70]. An exploratory approach offers openness and flexibility toward the phenomenon under analysis [70]. Merriam and Tisdell (2016) indicate that insights derived from case studies can influence procedures, policy, and future research [71]. This case study aims to develop results and conclusions that can be used by practitioners and researchers alike, when making planning and design decisions to protect UG, increasing compactness and density within compact cities. The selection of candidate cases was preceded by an analysis, the development of a protocol for the analysis, and the conduct of a pilot case study, as recommended by Yin (2018) [69].

3.2. Selection of Case Studies

The overarching goal of this paper is to analyse the transformation of UG into GHD from 2019 to 2023 in the medium-sized city of Rzeszow by evaluating the validity of references to the greenery in advertising texts on the developers' websites. Furthermore, to assess the impact of the proposed greenery-related changes on UGI. The crucial criteria for selecting an urban area in Poland for the exploratory case study were: a population between 100,000 and 500,000 inhabitants (medium-sized city), the positive natural increase in 2021 (the latest available version of the Demographic Yearbook of Poland), the need for greater compactness, density, and urban greenery to create a compact urban form that was highlighted in the latest development strategies, and the presence of GHD with available advertising websites. Potential cases were explored through documentation analysis, including online sources (e.g., the websites of municipal councils, planning departments, and Statistics Poland) and city plans through ArcGIS 10.8.2 Software and Geoportal 2 Software. The natural increase was investigated using the latest available version of the Demographic Yearbook of Poland [72]. Although many medium-sized urban areas were identified, only two cities with a positive natural increase in 2021 were determined: Rzeszow and Bialystok, both located in eastern Poland and with an advanced number of GHD. Finally, Rzeszow was selected, as GHD within urban borders significantly outnumbered those in Bialystok.

3.3. Study Area and Protocol for the Case Study

The study area is located within the city limits of Rzeszow (Poland). The first stage of the research was focused on analysing the Study of Conditions and Directions of Spatial Development (SCDSD) [73] formulated for Rzeszow to identify areas designated as UG in 2020, which have then been marked on the city map in ArcGIS 10.8.2 Software. Then, field observations were conducted to explore the state of the indicated sites, select GHD for the analysis, and the developers responsible for each of them. When considering buildings of relevance for this paper, we selected new multifamily housing with individual websites that present dwellings for sale. One potential challenge of web-based research is that

internet data are not permanent [74]. When analysing online sources, it became prominent that the web data published before 2019 were not available. Therefore, the study had to be limited to these buildings, that construction started in 2019 and had been completed, or the housing estate is still under construction. The methods applied allowed the identification of 13 GHDs Finally, the specific locations of the buildings were obtained from the Geoportal 2 software. Identifying the locations enabled drawing the 3D forms of the buildings in ArcGIS 10.8.2 software to respond to the first objective of this study; quantitative data on the transformed UGI area for GHD were calculated in the Geoportal 2 software. The square meterage of multifamily buildings above ground level was quantified for the purpose of this study. Utility buildings, car parking spaces, and hardstanding were not included in this quantitative investigation.

In the second stage, the study focused on web-based research, where developers' advertising websites were explored to collect data on the number of buildings constructed within each GHD, the number of floors, the number of dwellings, the start of the investment, and the end date. Once the basic data on the identified GHDs were collected, content analysis was conducted to investigate the written information on the advertisement websites. In content analysis, many words of a text are divided into defined categories, where words or phrases assigned to one category have similar meanings to draw conclusions [75]. According to Weber [75], problems in content analysis originate from the data reduction process, where texts are divided into words that are classified into content categories. An essential prerequisite for using content analysis is the reliability that comes from the stability, reproducibility, and precision of the results of content classification over time [76]. To address the second objective of this study, a qualitative and quantitative content analysis was conducted, followed by a visual content analysis. The first-stage coding categories were defined as outdoor activities in greenery, elements of greenery, and greenery as a building element. To explore the particular word use context, the complete sentence was coded. This approach provided structured information that allowed determining whether the meaning of specific words depends on their connection to certain phrases [69]. If so, the phrase was analysed as a single semantic unit. After the first stage of coding was completed, the second stage of coding was performed to examine the frequency of greenery-related words in advertising offers. The identified greenery-related words were named *keywords*. Coding categories were based on the use of greenery-related words or phrases in the text and were examined within the first stage coding categories. Therefore, the context of word use was crucial in assigning a greenery-related word to the coding category. The number of advertising texts that include the specific keyword and the number of instances where the keyword was used in these texts were coded in the NVivo 11 software. Accurate content analysis led to the distinction of 17 coding categories that were assigned as nodes, and this software provided the number of coded references.

Once the written content analysis was finished, the graphic information was examined using the visual content analysis method. Yet, visual products and immaterial visual traits dominate our culture [77]. Pauwels (2020) argues that the online environment is a highly productive and contemporary research field where scientists can explore the visual parameters of different graphic representations [78]. Visual techniques are suitable for nuance research methods to interpret, depict, and analyse the word [79,80]. However, visual material can be presented inaccurately on the Web, resulting in the reduction of data to draw conclusions [81]. Chaplin (1994) stated that the conclusions of visual studies might be limited to the realm of ideology [82]. In this study, architects investigate visual material presented on the web to promote GHD. As architects conduct this study, the subject focus, the modes of production, and the results belong to architectural knowledge [79]. Troiani and Ewing (2021) proposed the application of visual methods for architectural purposes and indicated the potential overlap with other disciplines, including mapping, digital drawing, or computation [79]. Wagner (2020) argued for designating research-specific categories for classification and analysis of graphics [83]. This paper analysis visual material, including renderings and plans, with respect to the level of depiction of outdoor activities

in greenery, elements of greenery, and greenery as a building element. This investigation stage allowed the identification of potential NbS. Greenwashing indicators were adapted from Gałecka-Drozda et al. (2021) [7] as follows:

- GWI 1: The visual content presents unrealistic plans of green spaces: exotic plant species for the northern hemisphere, unfavourable or impossible growing conditions for the presented plant species (e.g., lack of soil, sun, or space);
- GWI 2: The visual content presents distorted greenery in the background of the housing estate;
- GWI 3: The visual content displays pre-existing trees that were cut due to the housing estate construction; and
- GWI 4: The visual content does not present greenery within the housing estate or/and in the background.

The final stage of the study analysed the interplay between the written and visual content of GHD advertising websites. Status relations analysis was conducted to assess whether text and visuals within an advertising website are consistent and complementary [84]. Specifically, correlations between written parts and visuals were investigated and assessed as equal, where the image and text are independent or complementary pieces of information; or as unequal, where the image is subordinate to text or text is subordinate to image [85]. The status relations analysis was extended by highlighting positive or negative presentation methods of greenery in texts and renderings. The positive relation was observed when the written and visual material extensively focused on greenery and indicated natural capital within and outside of the borders of GHD. The negative relation was identified when the texts and renderings presented unrealistic visions of greenery. Finally, the coherence in presenting graphic and written material was a basis for exploring whether the specific GHD advertising website presents an added ecological asset that can be considered as NbS or should be interpreted as greenwashing. The results were analysed to meet the third objective and to provide recommendations to decision-makers and the formulation of future policies relevant to protecting UGI and preventing negative impacts from GHD from negatively transforming medium-sized cities.

3.4. Brief Discussion of the Case Study's National and Urban Context

Rzeszow (50°2.4792′ N to 21°59.9406′ E) is a provincial city in Southeast Poland. The city occupies an area of 128 square kilometres, with more than 198,000 inhabitants. Rzeszow is the largest city in the Subcarpathian Voivodeship province. The natural increase per 1000 people in the first half of 2020 was 2.6%, making Rzeszow the second city in Poland with the highest birth rate [86]. At the same time, net migration to Rzeszow for permanent residence per 1000 population was the highest among provincial cities in Poland (3.6%) [86]. Rzeszow has a relatively young age profile with a median age of 39.1 in 2019, which is the lowest median age among provincial cities in Poland [86]. In 2012, Rzeszow had the highest proportion of students in higher education per number of inhabitants among all EU cities [87]. In 2020, the two public universities—Rzeszow University of Technology and the University of Rzeszow hosted together 27,500 students [88]. Since February 2022, when Russia invaded Ukraine, Rzeszow has become a strategic city that hosts refugees. Rzeszow is 100 km from the Polish—Ukrainian border crossing point in Medyka (Poland) and 170 km from the city of Lviv (Ukraine).

Rzeszow is a low-density city that consists of distinct urban and suburban neighbourhoods mainly of low- to medium-rise, with some tall buildings in the city centre. The city searches for new investment areas, mainly for housing and businesses. In 2020, building permits were issued for 4366 dwellings, and the construction of 3728 dwellings began between January and December 2020. There were 16.6% more dwellings completed in 2020 than in 2019 [86]. There are two strategies for urban growth: first, the densification of the existing urban fabric, and second, the city limits' expansion by incorporating neighbouring towns [89].

The first strategy consists of the recognition of vacant lots, which includes both greenfield and brownfield. Most greenfields within Rzeszow are not protected by law; therefore, there is no legal tool to block the issue of a construction permit [90]. Several natural landscapes have already been overbuilt with housing estates. The key greenery located in the Wisłok Valley, actively used by urban residents for sport and recreation [91], became a location of interest for developers. Part of that green area is a designation for nature conservation that is home to a wide variety of common and rare animal and plant species. The green landscapes of the Wisłok Valley and the Wisłok Lagoon are essential to the health of the city, in terms of its ecosystem services, biodiversity, and opportunities for leisure and recreation [92].

Within the second strategy, the city limits started to expand from 2006 by incorporating neighbouring towns, to acquire new investment areas, and strengthen the role of Rzeszow as a metropolitan centre [89]. The lack of legal planning tools in these districts resulted in a haphazard urbanisation dominated by detached and terraced housing built within the farmland. The areas of suburban sprawl widen the spatial divide between the location of housing and jobs, thus increasing the demand for transport. UGI is not protected, resulting in the loss of precious agricultural land and natural habitats in peri-urban areas, leading to a poorer quality of life [4].

Considering both urban development strategies and the requirement to meet growing housing needs, the ecological security of Rzeszow faces a severe situation, such as loss of biodiversity and the heat island effect that affects human health and well-being [93]. Loss of ecosystem services due to urban development reduces cultural ecosystem values, biological and life-sustaining values [94]. The impact of the built environment on urban ecosystems and their ecological processes is now considered a crucial impediment to the sustainable development of cities [95,96]. In June 2000, the Rzeszow Development Office introduced SCDSD [73], which was updated several times, most recently in March 2020. The document conceptualises the land use zoning for the key urban areas within the administrative city boundaries from 2000 and the strategic sites incorporated later (e.g., Exclusive Economic Zones). Significant areas that were incorporated after 2006 were not included in the SCDSD. Our pilot study and preliminary field observations indicated a dramatic loss of intra-urban natural landscapes that were designated in SCDSD for UG, mainly for the development of multifamily housing. In May 2022, the Rzeszow Development Office presented an updated SCDSD and called for a public discussion before implementation. The new document encompasses the entire area of Rzeszów, accepts the transformation of UG into alternative functions, and establishes vast areas of UGI on private land located within the incorporated towns. Although public administration bodies did not respect the zoning designated in SCDSD, the municipal council asserts that the new SCDSD will be strictly obeyed when issuing land development decisions, and creates a foundation for a zoning plan that will encompass the whole city. This claim triggered protests and discussions on private land use rights, the reduction in the market value of private land, and the privileges offered by the city council to large developing companies.

4. Results

4.1. Loss of UGI Due to GHD in Rzeszow

The SCDSD analysis identified areas designated as UG in Rzeszow, which have been marked on the city map in ArcGIS 10.8.2 Software using the land use function. Field observation revealed 13 GHDs consisting of 36 multifamily buildings that had construction works carried out between 2019 and 2023 (Figures 1 and 2). Table 1 presents quantitative data on the UGI area transformed into GHD in Rzeszow from 2019 to 2023. From the data in Table 1, it is apparent that the transformed area of the UGI for GHD differs significantly from 760 square metres (single multifamily building) to 6083 square metres (seven multifamily buildings). In general, 43,852 square metres (4.3852 hectares) of land designated for UGI in SCDSD were converted to GHD between 2019 and 2023.

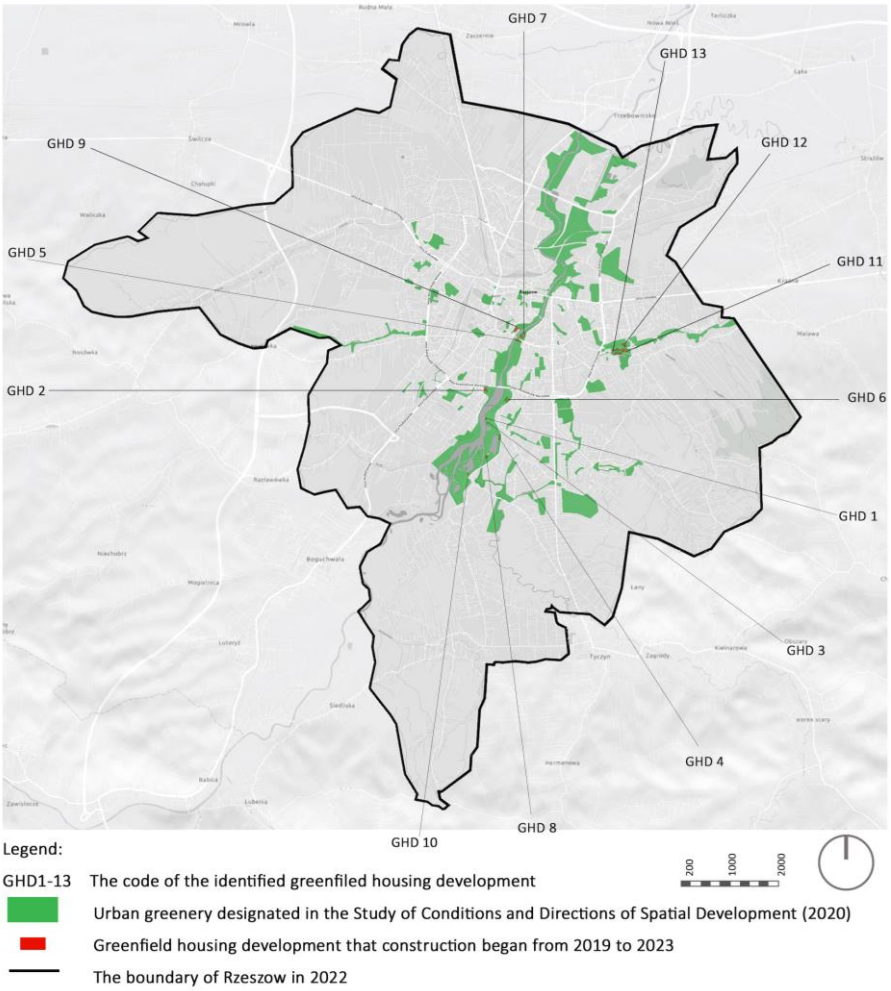

Figure 1. Map of Rzeszow: the distribution of UGI and the location of GHD that construction began from 2019 to 2023.

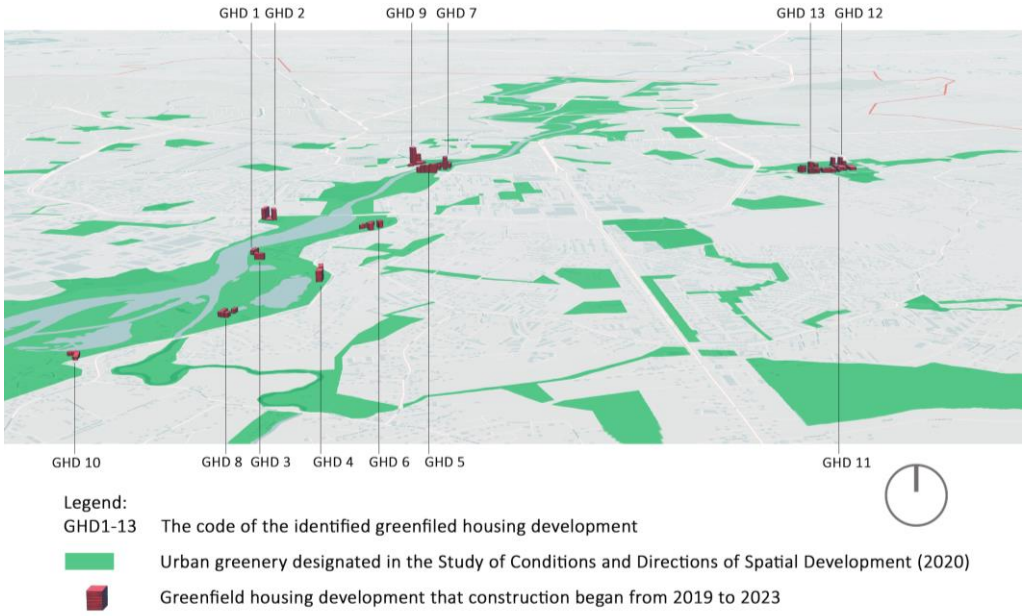

Figure 2. The distribution of GHD within UGI in Rzeszow in 2022—a perspective projection.

Table 1. Area of UGI transformed for GHD in Rzeszow (in m²).

Housing Estate Code	Area of transformed UGI for GHD [m²]
GHD1	925
GHD2	4175
GHD3	760
GHD4	4050
GHD5	1822
GHD6	2244
GHD7	5256
GHD8	1355
GHD9	5226
GHD10	1270
GHD11	10,680
GHD12	3662
GHD13	2400
SUM	**43,852**

The second stage of the study focused on web-based research to gather data on the number of buildings constructed within a GHD, the number of floors, the number of dwellings, the start of the investment, and the end date (Table 2). Construction works of 30 buildings in 11 GHDs have been finished, and six buildings in two GHDs are under construction. Identified web advertising offers of 13 GHDs declared the developers would provide 3391 new dwellings for urban residents of a meterage from 24 to 300 square meters.

Table 2. Data on 13 GHDs that construction started from 2019 to 2023 in Rzeszow.

Housing Estate Code	Construction Date	Number of Buildings	Number of Storeys	Number of Dwellings	Meterage of Dwellings [m²]
GHD1	2020–2021	1	8	71	40–80
GHD2	2017–2019	2	18-2 buildings	330	25–120
GHD3	2020–2022	1	9	61	39–114
GHD4	2022-under construction	2	15-1 building 15-1 building	112	35–91
GHD5	2021–2023	1	10–18	337	32–73
GHD6	2019–2021	6	11-2 buildings 6-4 buildings	300	29–109
GHD7	2017–2019	3	6-9-2 buildings 26-1 building	462	27–170
GHD8	2018–2019	2	5-1 building 5-1 building	80	37–120
GHD9	2020- under construction	2	18-1 building 36-1 building	292	40–300
GHD10	2018–2019	1	4	60	39–83
GHD11	2017-under construction	9	15-1 building, 10-1 building, 7-6 buildings, 6-1 building	800	38–120
GHD12	2017–2020	3	16-2 buildings, 11-1 building	264	24–85
GHD13	2019–2021	3	10-3 buildings	222	27–77

4.2. Using UGI in GHD Marketing Strategies in Rzeszow-Results of Web-Based Research

The reference to greenery was identified on each advertising website in the written information on GHD (100%). The frequency of reference to natural capital in advertising texts within the first stage category is presented in Table 3. The greenery-related word use context can be divided into two groups: greenery in the surroundings of the housing estate and greenery within the housing estate. The greenery in the surroundings of the housing estate was described as an asset in all advertising texts (100%). The references focused on existing UGI components (100% of the texts) and presented these components in the context of outdoor activities that are readily available to new residents (92.3% of the texts) or listed as UG elements that benefit the housing location (76.9% of the texts). Seven names of GHD (53.9%) refer to an element of the surrounding UG. Two names (15.4%) refer to a view of the surrounding greenery. One investment (7.7%) is named directly after the inner-city park which had its green cover reduced due to that GHD. Only the GHD4 advertising text (7.7%) pointed out greenery as a building element by claiming that nature is part of its architecture. However, the role and location of a specific NbS in the design were not specified.

Table 3. The number of advertising websites that present greenery in a written material in the three coding categories.

	Coding Category (First Stage)	Number of Advertising Texts	Number of References to Greenery
1	Outdoor activities in greenery	9	20
2	Elements of greenery	12	49
3	Greenery as a building element	1	1

When exploring references to natural capital within the housing estate, it was prominent that the sale offers refer to the new GI that has to be implemented due to the natural environment damage caused by the new development. Only one advertising text (7.7%) (GHD4) focused extensively on new vegetation within the housing estate. Written information included a list of potential plant species and recreational areas with specified functions, such as yoga, cycling, or walking a dog. The developer did not include data on the green cover prior to construction. Thus, based on written information, it cannot be assessed whether the greenery was expanded or minimised.

The second stage of the coding distinguished 17 coding categories that were assigned as keywords. Twelve advertising texts (92.3%) used keywords in the context of outdoor activities in greenery and referred to the identified keywords 20 times. Nine sales' offers (69.2%) listed keywords as elements of greenery and used the identified keywords 49 times. The data on the number of advertising texts that use specific keywords within the first stage of the coding category and the number of references to keywords in these texts are shown in Table 4.

Table 4. Results of the second-stage coding.

		Coding Category	Number of Advertising Texts	Number of References in Texts
	Outdoor activities in greenery		12	20
1	1	Beach	2	3
	2	Boulevard	1	2
	3	Cycling route in greenery	6	6
	4	Greenery	1	1
	5	Harbor	1	1
	6	Jogging route through greenery	1	1
	7	Park	1	1
	8	Promenade	1	1

	9	Recreational areas	2	2
	10	River	1	1
	11	Walking route through greenery	3	4
	Elements of greenery		9	49
	1	Beach	2	6
	2	Boulevard	1	1
	3	Cycling route through greenery	2	3
	4	Greenery	4	9
	5	Greenfield	3	4
	6	Harbor	1	1
	7	Lagoon	2	5
2	8	Lake	4	7
	9	Nature	4	4
	10	Park	3	5
	11	Plant Species	1	6
	12	Promenade	1	2
	13	Recreational areas	6	9
	14	River	5	7
	15	Trees	1	6
	16	Walking route through greenery	1	1
3	**Greenery as a building element**		1	1
	1	Greenery	1	1

"Greenery" and "recreational areas" were the keywords that were the most frequently used, with eleven mentioning each. Reference to "greenery" was made in four sale offers and to "recreational areas" was found in seven. Both terms were applied primarily within the "elements of the greenery" coding category, where "greenery" and "recreational areas" were listed as benefits arising from the location of GHD, thus relating to the existing UGI in the neighbourhood. In one advertising text (GHD4), the word "greenery" was used to establish a connection between the architecture of a housing estate and nature. However, the sales offer did not specify which types or elements of greenery will be used to develop such a link; therefore, this claim is misleading and cannot be considered as introducing NbS into GHD.

The other frequently used keywords include beach, cycling route through greenery, river, lake, park, plant species, trees, and walking route through greenery. These terms use context was outdoor activities in greenery or elements of greenery. Twelve advertisement texts applied these keywords as references to existing UGI in the neighbourhood. GHD4 extensively focused on the new GI that will serve residents and mentioned ten keywords in the context of different first-stage coding categories. The GHD4 sales offer has been identified as the one with the highest frequency of keyword coding. Table 5 presents the frequency of keyword coding in advertising texts, the total number of references and the percentage of keywords used in each first stage of the coding category.

Table 5. The frequency of keyword coding in advertising texts, the total number of references, the percentage of keywords used in each first stage of the coding category.

	Keywords	Number of Advertising Texts	Number of References in Texts	Outdoor Activities in Greenery [%]	Elements of Greenery [%]	Greenery as a Building Element [%]
1	Beach	3	9	33.3	66.7	0
2	Boulevard	3	3	66.7	33.3	0

3	Cycling route through greenery	6	9	66.7	33.3	0
4	Greenery	4	11	9.1	81.8	9.1
5	Greenfield	3	4	0	100	0
6	Harbour	2	2	50	50	0
7	Jogging route through greenery	1	1	100	0	0
8	Lagoon	2	5	0	100	0
9	Lake	4	7	0	100	0
10	Nature	4	4	0	100	0
11	Park	4	6	16.7	83.3	0
12	Plant species	1	6	0	100	0
13	Promenade	1	3	33.3	66.7	0
14	Recreational areas	7	11	18.2	81.8	0
15	River	5	8	12.5	87.5	0
16	Trees	1	6	0	100	0
17	Walking route through greenery	3	5	80	20	0

All GHD advertising websites (100%) used photorealistic renderings as the main graphic content that presented a housing estate from a human-eye view or a bird-eye view. Most renderings show greenery in a schematic, simplified manner in the form of a grass, trees of various sizes, flowers with intensive colours, and ornamental bushes. The graphic content of two advertising websites (GHD4 and GHD11) included site plans that present GI as part of the investment. The advertising websites of three GHDs (GHD1, GHD5, GHD9) provided animations that accurately showed the housing estate in the urban context.

Eight advertising websites presented greenery in the context of specific outdoor activities. The renderings show activities that use GI in the surroundings of the housing estate, including cycling (30.8% of GHD), jogging (46.2% of GHD), walking (53.9% of GHD), and boating (7.7% of GHD). Eight advertising websites show outdoor activities within the new infrastructure developed as part of housing estates investments, including cycling (15.4% of GHD), jogging (7.7% of GHD), and walking (61.5% of GHD). All sales offers presented natural capital in the *elements of greenery* coding category. Six websites (46.2%) that advertise GHD located in the Wisłok Lagoon have shown renderings that include a view of the housing estate and its surroundings, especially UGI with recreational areas along the Wisłok River. Seven GHDs (53.9%) were advertised by presenting renderings without the vicinity, of which six were not located within the UGI along the Wisłok River. In six advertising websites (46.2%), the graphic content shows *greenery as a building element*: green walls, green roofs, and trees on roofs and balconies. The number of websites that present greenery in a visual material in the three coding categories is shown in Table 6.

Table 6. The number of advertising websites that present greenery in a visual material in the three coding categories.

	Coding Category	**Number of Advertising Websites that Present Greenery in Visual Material**
1	Outdoor activities in greenery	8
2	Elements of greenery	13
3	Greenery as a building element	3

The visual presentation of greenery implemented as NbS can be recognised in the two coding categories: *elements of greenery* and *greenery as a building element*. Within the category *elements of greenery*, NbS were applied at the site plan level in the visual presentation of two GHD (15.4%) as trees that prevent extensive sun access to glass elevations and flower fields. In the category *greenery as a building element*, green walls, green roofs, and balconies were identified as potential NbS that directly support architecture and were present in the graphic content of six GHD (46.2%).

The results of the visual content analysis on GWI have shown that the most common practice is to present distorted greenery in the background of the housing estate (69.2% of GHD) which was classified as GWI 2. In most cases, the background was falsely covered with large concentrations of trees and dense vegetation along busy roads. The second practice (53.9% of GHD), classified as GWI 1, is to show unrealistic plans for green spaces. The graphic content of 7 GHDs presented large trees planted in small pots or without soil on balconies and terraces. The renderings of 2 GHDs showed facades partly covered with vegetation without access to soil. GWI 3: the visual content displays pre-existing trees that were cut due to the housing estate construction was identified in three advertising websites (23.1%). GWI 4 was revealed in one sales offer (7.7%) that did not present greenery in the background of the housing estate despite the extensive presence of UGI. No GWI was found in the two offers (15.4%). The results of the visual content analysis on the greenwashing indicators are shown in Table 7.

Table 7. GHD: the results of the visual content analysis on GWI.

Housing Estate Code	GW Indicators				No of GWI
	GWI 1	GWI 2	GWI 3	GWI 4	
GHD1	-	+	+	-	2
GHD2	-	+	-	-	1
GHD3	-	-	-	-	0
GHD4	-	+	+	-	2
GHD5	+	-	-	-	1
GHD6	-	+	-	-	1
GHD7	+	+	-	-	2
GHD8	-	-	-	-	0
GHD9	+	+	-	-	2
GHD10	+	+	-	-	2
GHD11	+	+	+	-	3
GHD12	+	-	-	+	2
GHD13	+	+	-	-	2
%	53.9	69.2	23.1	7.7	

- GWI not identified in the visual advertising material of GHD. + GWI identified in the visual advertising material of GHD.

Analysis of the interplay between the written and visual content of the GHD advertising websites with respect to existing and newly implemented greenery revealed that the visual content of the web sales offers focuses more on the presentation of greenery than the written content (Table 8). The strongest disproportion was observed with respect to the written and visual material that presents greenery as a building element. Although 53.8% of the websites showed GI as parts of facades or rooftops in the renderings, only 7.7% of the sales offers mentioned the interaction between architecture and nature in the written content. The crucial strategy to highlight the role of nature in GHD was to indicate elements of this greenery. Furthermore, 92.3% of the texts focused on listing greenery elements, and 100% of the renderings included greenery with a human-related context. Advertising material for four GHD (30.8%) was evaluated as having equal negative relations

between written and graphic content. These sales offers include abstract green claims on UGI located outside housing estates as beneficial to potential residents; however, they did not include information on greenery within housing estates. Similarly, the renderings did not present vegetation within these GHDs but showed an extensive UGI that belongs to the public recreational areas. The web offers of three housing estates (23.1%) revealed an equal positive relation between written and graphic content. An extensive focus on greenery was noted in texts and renderings and included natural elements within housing estates and in the surroundings. Natural capital was presented mainly in the context of outdoor activities in greenery and elements of greenery. Furthermore, the visual material of GHD9 and GHD11 (15.4%) presented nature as a building element. The status relation analysis showed an unequal relationship between the written and graphic content of six GHD (46.2%). For four GHD (30.8%), the attributes of greenery were loosely introduced in the texts (GHD1, GHD6, GHD12, GHD13), while the graphic material presented detailed vegetation within the housing estate, as elements of the buildings and the surroundings. The role of nature in GHD7 and GHD10 (15.4%) was not included in the written content, but UGI in the neighbourhood was recognised as beneficial for the location. The web graphic material of GHD7 and GHD10 (15.4%) showed greenery within the housing estate and as a building element; however, the surroundings of the lot were not presented.

Table 8. The status relations analysis between the written and graphic content of GHDs' advertising websites regarding the three thematic categories: outdoor activities in greenery, elements of greenery, and greenery as a building element. (+ the presence of the indicator in the website content; - the absence of an indicator in the website content).

Housing Estate Code	Status Relation Analysis						Results of the Status Relation Analysis
	Written Content			Graphic Content			
	Outdoor Activities in Greenery	Elements of Greenery	Greenery as a Building Element	Outdoor Activities in Greenery	Elements of Greenery	Greenery as a Building Element	
GHD1	-	+	-	+	+	+	Unequal
GHD2	+	+	-	+	+	-	Equal Negative
GHD3	+	+	-	+	+	-	Equal Negative
GHD4	+	+	+	+	+	-	Equal Positive
GHD5	+	+	-	+	+	-	Equal Negative
GHD6	-	+	-	+	+	-	Unequal
GHD7	-	+	-	-	+	+	Unequal
GHD8	+	+	-	+	+	-	Equal Negative
GHD9	+	+	-	+	+	+	Equal Positive
GHD10	+	+	-	+	+	+	Unequal
GHD11	+	+	-	-	+	+	Equal Positive
GHD12	+	-	-	+	+	+	Unequal
GHD13	-	+	-	+	+	+	Unequal
%	69.2	92.3	7.7	84.6	100	53.8	

5. Discussion

The first objective of the current study was to highlight the changes in land use of areas that were allocated to UGI in Rzeszow from 2019 to 2023. Research revealed that GHD in Rzeszow took 43,852 square metres (4.3852 hectares) of land designated for UGI. The advertisement material for 13 GHDs declared to provide 3391 new dwellings for urban residents of the size of 24 to 300 square metres. The second objective of this paper was to analyse the use of greenery in the written and visual content of the GHD marketing websites and to evaluate whether the applied strategy represents an added ecological asset that can be considered as nature-based solutions (NbS); or these claims should possibly

be interpreted as greenwashing. Contrary to previous studies [7,97], the advertising materials were not structured around the natural asset, but stressed the quality of architecture and the inner-city location to highlight the prestige of the housing estate. The present investigation confirmed the findings of Maruani and Amit-Cohen (2013) who revealed that landscape values are important in presenting the prestige of the housing environment in advertising campaigns [97], among other elements, including the development of gated communities [98,99], the use of foreign languages [100,101], and the creative incorporation of various symbols of prestige [101,102]. In this study, keywords related to greenery were found in all web texts; however, in most cases, they did not play a significant role in written content, but were mentioned in relation to activities available to residents or listed among other elements of the vicinity. Twelve of 13 web texts (92.3%) focused on UGI outside of GHD in the context of outdoor activities within greenfields that are provided to all urban residents by the city. Nine out of 13 web texts (69.2%) focused on listing the elements of greenery, which in the majority belong to existing UGI. Only one GHD sales offer (7.7%) described green incentives exclusively for future owners. Greenery as a building element was mentioned in one GHD description (7.7%); however, no specific technology was provided. The visual content extensively focused on showing nature within GHD and in the surroundings in the context of outdoor activities in greenery (61.5% of GHD), elements of greenery (100% of GHD) and greenery as a building element (23.1% GHD). The study revealed a greater focus of graphic content on greenery than in texts. These results are in accord with recent studies indicating that graphic tools and methods used to prepare renderings can trigger specific emotions, which is relevant for advertising purposes [103,104]. For instance, the lower colour saturation of pictures results in an eternal or romantic aura [105]. Visualising extensive greenery in the background of the housing estate triggers positive emotions in buyers and creates the vision of their future lifestyles as active and close to nature while still in the central urban districts. The presentation of greenery in visual advertising content contributes to the prestigious image of GHD, due to the presence of UGI in the vicinity, while the access to landscape values in new housing estates in other locations is not always obvious.

At least one of the four GWIs defined in the study was found in the visual material of 11 GHDs (84.6%). Two GHDs, which did not reveal GWI in graphic content, did not present extensive greenery within the project. In these two GHDs, the only natural element shown in the renderings was realistic or photorealistic UGI in the vicinity. Analysis of the use of greenery in the written and visual content of GHD websites revealed the lack of understanding of the concept of NbS and identified greenwashing in all advertising materials. As studies critically point out, GHD advertising campaigns present environmental—economic visions that are difficult to validate after the investment is completed [55,58]. The present investigation supports the findings of Tateishi (2018) who revealed that the greenwashing of the real estate market, especially GHD, restricts efforts to minimise the adverse environmental impacts of urban development by reducing global ecological capacity [54].

Claiming the benefits from the existing UGI, in the majority by using two keywords, greenery and recreational areas, showed that developers in Rzeszow do not consider the provision of natural capital and associated ecological values within the housing estate as an obligation that increases the prestige of the investment. At the same time, green marketing strategies have been implemented by using greenery-related keywords and an extensive presentation of greenery in renderings, indicating that developers understand the importance of the human—nature relationship in a housing environment and the willingness to live close to greenery. These results reflect those of Maruani and Amit-Cohen (2013) who found that the symbolic presence of nature-related terms in housing estate names supports their prestigious image as spaces of leisure, wellbeing, and good life in general [97]. As stated by Gałecka-Drozda et al. (2021) and Tateishi (2018), green marketing positively influences the perception of a housing estate and generates a stronger intent to purchase the product [7,54]. Developers claim that UGI in the vicinity is an opportunity

for future owners to live near green landscapes and include outdoor activities in their daily routine. However, the location of the investment within the existing UG became a pretext for developers to reduce the greenery within the GHD limits in favour of increasing the density of buildings and the built-up share in the project area, resulting in higher financial profits. The construction of GHD is of interest to developers because of the UGI in the surroundings, which is readily available and can become a beneficial element of advertising campaigns without additional financial investment.

The limited presence of NbS on GHD websites has been identified in written and visual content. Only one GHD sales text claimed the supporting role of nature to architecture, but did not specify how such a relationship would be realised. In the visual material, NbS were shown in six GHDs (46.2%) using natural capital at the site plan level (two GHD) and with connection to architecture. The NbS related to architecture included green roofs, green facades, and plants on balconies and terraces, which belong to future owners of apartments. The study considers the presented NbS to be misleading green claims, which corroborate the findings of Gałecka-Drozda et al. (2021) who noted that maintenance of NbS within private areas is not a developer's responsibility, but depends on the acceptance of property owners and their involvement in maintenance [7]. Furthermore, the web offers analysed did not specify technologies that contribute to the environmental sustainability of GHD. The case study revealed that despite growing global environmental awareness, the housing estate market in Rzeszow is not progressive and does not contribute to urban resilience and sustainability. According to the report, "*Who pays for green? The economics of sustainable buildings*" [106], green buildings require 5% to 7.5% additional construction costs. The higher initial investment may be the current barrier for developers in medium-sized cities to choosing outdated technologies and not applying NbS Zhang, Wu, and Liu (2018) noted that the inconsistency in economic viability can slow the construction of green buildings and suggested that increased comfort and health of residents should be included in the benefit analysis [107]. For medium cities, the lack of evidence on immediate opportunities arising from sustainable housing estate planning may be the crucial factor that limits the implementation of novel solutions. The general benefit of providing new dwellings for the growing urban population outweighs the environmental damage in a short-term perspective. Recent technological advancements and tools are recommended to test methods that support the decision-making process in choosing sustainable low-cost building materials and components [108] and creating a supportive relationship between existing UGI and new developments through NbS [109,110] as a socially inclusive process [111].

Misleading marketing material is commonly used for greenwashing of projects. The researchers have identified different types of greenwashing:

- Greenlighting occurs when company communications (including information on websites and advertisements) spotlight a particularly green feature of its operations or developments, however small, in order to draw attention away from environmentally damaging activities being conducted elsewhere.
- Greenlabelling is a practice where marketers call something green or sustainable, but a closer examination reveals that their words are misleading.
- Greenhushing refers to the act of corporate management teams' under-reporting or hiding their sustainability credentials in order to evade consumer, buyer, or investor scrutiny.

6. Conclusions

In our urban future, much will depend on how we develop, plan, design, build, and manage new housing estates; socially, economically, culturally, and environmentally. Our journey to identify better pathways for a circular transition of urban settlements is still in its infancy, where cities become drivers of future change using systemic thinking of the zero-waste concept, the circular economy, and regenerative design principles. We will not

achieve the transformation toward the regenerative city of the 21st century if we keep applying outdated urbanisation models from the 20th century. Higher densities are unavoidable. However, 'quality density' is required, accommodating growth through careful densification, and developing first the vacant lots that are inside the existing city. New housing should be constructed in already built-up areas with existing infrastructure, rather than creating more GHD.

The main aim of the study was to analyse the transformation of UG into GHD from 2019 to 2023 in the medium-sized city of Rzeszow (Poland) by evaluating the validity of references to the greenery in advertising texts on the developers' websites. Furthermore, to assess the impact of the proposed greenery-related changes on UGI. The results of this investigation showed that GHD in Rzeszow took 43,852 square metres (4.3852 hectares) of land designated for UGI between 2019 and 2023. The GHD advertising websites do not represent an added ecological asset but committed greenwashing. All GHDs caused irretrievable environmental damage, including the degradation of wetlands, greenfields, and trees. The written and graphic content of the advertising websites do not define the environmental indicators of the housing estates, including how the GHDs would compensate for the destruction of natural habitats. Deceptive green claims were more often identified in visual material, which was prepared inaccurately, than in texts, which extensively used greenery-related jargon, however, vaguely. GHD marketing campaigns in Rzeszow are based on the lack of knowledge of potential buyers and their lack of understanding of the significant ecological costs of their potential place of living, which was intentionally unmentioned in the advertising material and replaced by deceptive green claims.

The research findings raise some critical points around integrity and correctness of the marketing texts. The act of making false and misleading claims about the environmental benefits of GHD to appeal to environmentally conscious buyers might be considered as greenwashing. Project developers engage in greenwashing to improve their image, boost sales, and avoid criticism from environmental organisations. Here are some key points on how they used greenwashing and made unsubstantiated claims in their promotional materials and websites:

- Misleading claims: Several developers made false or exaggerated claims about the environmental benefits of their projects, such as "carbon neutral" or "eco-friendly", without providing credible evidence to back up these claims.
- Lack of transparency: Developers used vague or ambiguous terms to describe their environmental practices, making it difficult for buyers of apartments to verify their claims.
- Hidden trade-offs: Developers promoted one environmental aspect of their project while ignoring other negative impacts, such as the loss of green space.
- Greenwashing of harmful materials and products: Some developers greenwashed products or construction materials that they have used for the building that have negative impacts on the environment, such as toxic paints and materials that impact the interior environment and indoor air quality.
- Non-compliance with regulations: Many countries, including Poland, have regulations in place to prevent greenwashing, but developers still engage in this practice by making false or misleading claims that are not prohibited by law.

The greenwashing activities can include: the use of seasonal jargon, push-to-sell by non-domain expert consultants (using sustainability buzzwords for PR with glossy brochures), fabrication of data, starting with high ambition but without tangible paths to an outcome, and self-congratulating "trust barometers".

The third objective of the study was to provide recommendations to decision-makers for the formulation of future policies relevant to protecting UGI and in order to prevent negative impacts from GHD from negatively transforming medium-sized cities. Such a list of recommendations might include:

- A clear list of possible actions that the local government and the development industry should pursue.

- Modifying building codes to make regenerative development practice for new urban neighbourhoods the norm.
- Demonstrating the benefits through exhibition and debate, highlighting the capabilities of NbS, enhancing awareness, educating the planning and design professions.
- Using the opinions of committed investors, and actively engaging owners and occupants of new housing developments to promote positive change.
- Accompanying the realisation of new types of urban neighbourhoods with performance data monitoring to provide scientific data as evidence base.
- Identifying the facilitators of and barriers to design/technology transfer with industry, university, and government partners, and produce a feasibility report for investors identifying the most commercially viable solutions for the determined market with a roadmap for implementation of regenerative planning.
- Ensuring longevity and impact of the implemented strategy for the creation of technical specification literature that lists practical and achievable solutions.
- Advancing evidence-based policy and planning practices through a user-centred approach to post-occupancy evaluation and effective understanding of feedback.
- Encouraging all levels of the government to take the lead in innovative urban development by implementing a scheme of incentives for the construction of regenerative housing developments (e.g., by allowing a higher plot ratio if the buildings follow and apply the principles identified, and if these are likely to become an important demonstrator project for other urban developments).
- Producing peer-reviewed publications to ensure market confidence including the wide dissemination of standardised information on regenerative urban development in different cities.

The study is limited to medium-sized cities and does not investigate the quality of housing estate investments, but focuses on the use of UG for advertising and raises questions on the impacts on urban sustainability. The paper focuses on these areas in Rzeszow that were allocated to UGI. The remaining UG transformed in GHD is not included in the analysis.

Future research should focus on implementing the defined recommendations for improving UGI. Indicators and evidence on the benefits of NbS in multifamily housing and brownfield regeneration for new neighbourhoods must be defined to implement research-based and regenerative design that responds to the context-specific needs of a medium-sized city. An interview study with developers is recommended to better understand their drivers and motivations for taking over UGI and greenwashing for advertising purposes. It is recommended to conduct a similar study in a different country or region to compare the results and provide more detailed recommendations that can be used as a starting point for strategies and policies aimed at reducing greenwashing in housing estate advertising campaigns.

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