www.degruyter.com/view/j/remav

REFLECTING SUSTAINABILITY IN THE ANALYSIS OF HIGHEST AND BEST USE: EVIDENCE FROM POLISH MUNICIPALITIES

Małgorzata Rymarzak
Departament of Investment and Real Estate,
University of Gdansk, Poland
e-mail: malgorzata.rymarzak@ug.edu.pl, ORCID: 0000-0001-8877-5414

Ewa Siemińska
Departament of Investment and Real Estate
Nicolaus Copernicus University in Torun, Poland
e-mail: ewahsiem@econ.umk.pl, ORCID: 0000-0002-8885-0338

Krzysztof Sakierski
NGL Advisory Sp. z o.o.
ul. Koszykowa 61B, 00-667 Warszawa, Poland
e-mail: krzysztof.sakierski@ngladvisory.com

Abstract

The combination of policy concerns over climate and demographic change, energy shortages, resource efficiency and the natural environment, has led municipalities to be expected to reflect sustainability in different actions, including the decision-making on a considerable amount of their real property assets. As more and more municipalities, use the highest and best use analysis for reviewing the configuration of real property asset portfolio to achieve public goals, this provokes an examination of the reflection of sustainability (environmental, economic and social dimensions) in this kind of elaboration. Thus, this paper aims to investigate how Polish municipalities deal with the incorporation of sustainability into the highest and best use analysis and its operationalization in four tests (legally permissible, physically possible, financially feasible, and maximally productive). The research goal was pursued based on quantitative research using surveys conducted between April and May 2022 among eleven municipalities (creating the largest metropolitan areas in Poland) and qualitative research by the content analysis of HBU analyses prepared for them in previous years.

Keywords: *sustainability, highest and best use, municipalities*.

JEL Classification: *D81, Q01, Q51, R52, R59*.

Citation: Rymarzak, M., Siemińska, E., &Sakierski, K. (2022). Reflecting sustainability in the analysis of highest and best use: evidence from Polish municipalities. *Real Estate Management and Valuation, 30*(4), 103-115.

DOI: https://doi.org/10.2478/remav-2022-0032

1. Introduction

Embedding sustainability into municipalities requires actions at various levels. This also applies to making decisions related to complex and substantial amounts of real property assets of which they are providers, owners and users (Phelps, 2012). Municipalities can facilitate transitions toward more sustainable futures (Vogel, 2016) by adopting local regulations, policies or just good practices

(Jordanet al., 2018; Fuhr et al., 2018; van den Beemt-Tjeerdsma & Veuger, 2016; Zavadskas et al., 2021; Gross & Wolny-Kucińska, 2021) promoting environmental, economic and social well-being.

Although not all municipal governments generally think of their holdings as a "portfolio" whose composition might be modified to better serve public purposes and develop local sustainability, an increasing number of them review, from time to time, whether the current use of individual properties is appropriate and matches municipal long-term needs, using the highest and best use analysis (HBU) (Kaganova & Nayyar-Stone, 2000; Hasbi Hanis et al., 2011; Mardiasmo et al., 2015; Moranoet et al., 2016; Rahmadanti et al., 2019).

In the literature on the appraisals of enterprises' assets (Lorenz & Lutzkendorf, 2008; Runde & Thoyre, 2010; Lambourne, 2021) there is already a debate on how to embed sustainability into the highest and best use analysis and how it can be operationalized (Walacik et al., 2020). In municipal real property asset management, a reflection of sustainability in the mentioned analyses has so far received only limited attention among researchers of the subject. There is also a lack of a link between the metrics of sustainability, widely described in the literature (Warren-Myers, 2012; World Economic Forum, 2016; Taylor, 2013; Goubran et al., 2019), and the four tests of HBU.

Therefore, the paper aims to fill the gap in the literature and review how selected Polish municipalities deal with the incorporation of sustainability into the highest and best use analysis and its operationalization in four tests (legally permissible, physically possible, financially feasible, and maximally productive).

In the following sections, the existing literature on the highest and best use concept in municipal real property asset management as well as sustainability dimensions and their metrics are presented. Then, research methods and the results of the empirical research relying on surveys conducted among the Polish municipalities (creating the largest metropolitan areas) and content analysis of HBU analyses prepared for them, are described. Finally, the discussion and conclusions are outlined, followed by the contribution of this work and its implications.

2. Literature review

2.1. Highest and best use analysis in municipal real property asset management

The highest and best use (in the UK called alternative use) is often presented as an appraisal concept that in the view of different possible uses of the property allows for reliable estimation of investment value (Dotzour et al., 1990) or market value (Scribner, 1997; The Dictionary of Real Estate Appraisal, 2010; The Appraisal of Real Estate, 2020).

The analyses may be applied to the land (site as though vacant), or building (of the property as improved). Although they come down to the consideration of generally two possibilities (continuation of an asset's existing use or an alternative to an existing use) (IVS, 2020), they are distinct and serve different functions.

The first one, as if vacant, is the basis for determining the likely use of the land. It seeks answers to such questions as: Should the land be left vacant or developed? If left vacant, when would future development be financially feasible? If developed, what kind of improvement should be built to be neither underimprovement nor an overimprovement (The Appraisal of Real Estate, 2020, 307)? Should the land be divided or merged with other plots (Trojanowski, 2019)?

In contrast, in the second one, as if improved, the analysis is to consider decisions on continuation or alternative use (single, mixed, interim or special) of the building. It requires the answer to such a question as: Should the existing improvements on the property be modified in the current state or should they be altered in some manner (renovated, converted or modified, repaired, upgraded, re-functionalize, extended by a superstructure), or should they be demolished and redeveloped the site for a different use (The Appraisal of Real Estate, 2020, 308, 313-314; Ribera et al., 2020)?

In municipalities' real property asset management, the highest and best use analysis is equated with a tool or technique supporting the decision-making process in determining the most appropriate use, or the reasonably probable use of real property (Munizzo& Musial, 2008, 101). It should not be based solely on economic criteria (obtaining the highest economic value), but also take into account other goals (for example cultural, social, etc.) (Kutut et al., 2021) to ensure the optimal portfolio composition.

The analysis can be applied to each of the real property assets in the municipal portfolio to find a rationale for its ownership or disposal (Kaganova & Nayyar-Stone, 2000; Rahmadanti et al., 2019). It

may be also used for real property assets representing specific sub-portfolio categories to maximize their potential (Table 1).

Table 1

Highest and best use analysis in the management of the municipal real property assets

Category (property function)	Real property asset types	Asset management goal and reasons for HBU analysis
Surplus properties (remnants from various sources)	- rent-generating assets - disposable assets (redundant)	To maximize financial returns on the assets and support the adoption of public policy regarding catering to investment To maximize financial returns on the assets and support the adoption of public policy regarding catering to investment.
Core properties (for mandatory functions)	city hall, police stations, schools, healthcare facilities, cemeteries, etc.	To maximize efficiency (i.e. access) and minimize expenses (while maintaining acceptable quality).
Additional properties (for discretional functions)	- socio-economic nature (to support social, political and other initiatives – parks, public housing, office spaces for NGOs, etc.) - spatial development nature (for future goals, e.g. widening of a motorway, etc.)	To quantify and minimize subsidy.

Source: authors' own elaboration based on: Utter 1989; Dent 1989, Kaganova & Nayyar-Stone, 2000; Dziworska & Trojanowski, 2008; Kaganova, 2012; Kask, 2014.

In the case of surplus properties named also revenue-generating (Utter, 1989), tenanted properties (Dent, 1997), or income-generating properties (Dziworska & Trojanowski, 2008), not needed for municipal primary operations, the aim of the analysis of the highest and best use is to indicate the scenario that maximizes the wealth of the owner through the most profitable use (Scribner, 1997). This may come down to renting space/building/land to bring periodical income in rent or privatizing property to generate one-off income e.g. upon their sale and then property taxes and/or perpetual usufruct; as well as reduce maintenance costs and liability on the property (Kaganova, 2012).

For core properties, also called mandatory properties (Utter, 1989), direct service property (Dent, 1997), and functional/statutory (Dziworska & Trojanowski, 2008), used to perform the basic functions of public entities, and which by nature, do not generate a profit, the analysis is to enable knowing the opportunity cost of not using properties in the most profitable way. It can contribute to making decisions on, for example, not locating public administration offices in the commercially most attractive areas. Additionally, it can support municipalities in increasing the effective use and minimizing operating expenses of the asset and/or finding the best use option (development or redevelopment potential of the property) to achieve asset management goals other than financial only (Kaganova&Nayyar-Stone, 2000).

In turn, regarding additional properties, also known in literature as discretional properties (Utter, 1989), or instrumental (Dziworska & Trojanowski, 2008), owning to spatial development or supporting socio-economic initiatives, the result of the alternative use analysis is to determine the ways of using properties enabling the reduction of ownership costs (while still accomplishing the goal) as well as decrease of the vacant space that can be leased until the land is developed for its ultimate use (Crompton, 2001; Rymarzak & Trojanowski, 2013).

2.2. Sustainability dimensions and their operationalization in highest and best use analysis

The sustainability agenda has been explored by many scholars and is presented differently (Kucharska-Stasiak & Olbińska, 2018; Kauko, 2019). In studies on the built environment, the term is sometimes used interchangeably with green buildings (Simmons, 2010; Runde & Thoyre, 2010; Lambourne, 2021) which have been designed and built to have a less negative overall impact on the natural environment (Berardi, 2013). "Sustainability" is a broader concept, not solely focused on the environment but considering the 3 Ps: planet, profit and people, which are also called the triple-

bottom-line model of environmental, economic, and social dimensions (Hansmann et al., 2012). They can be measured by various quantitative and qualitative metrics (Reinhart et al., 2006; Shen, et al., 2007; Hartmuth et al., 2008; Rogmans & Ghunaim, 2016; Azar et al., 2016; Marjaba & Chidiac, 2016; Fenton & Gustafsson, 2017; United Nations Environment Programme, 2020; Ferreira et al., 2021) to provide solid bases for decision-making (Scipioni et al., 2009; Moreno Pires & Fidélis, 2015; Caldas et al., 2022). Most of them, however, are defined from the perspective of real property/enterprises or municipalities separately, and not combined for real property assets of municipalities.

The environmental dimension of sustainability is often linked with the protection of the environment and avoiding environmental destruction. In real property, it remains largely related with the issue of energy efficiency of buildings, waste management and water quality and consumption, ozone, carbon monoxide, and sulphur dioxide emission (Scipioni et al., 2009; Rogmans & Ghunaim, 2016). In municipalities, it is associated with dealing with their own planning and development in the sense of designing the eco-city, adopting its strategies, applying its solutions, and implementing its policies to improve the health of the city (Bibri, 2020).

In turn, the economic dimension of sustainability in enterprises is related to the economization of available resources to attain maximum profits and ensure a good revenue for stakeholders. In municipalities which are not supposed to be profit-making ventures, the "profi" pillar is translated as the creation of prosperity for all (Kuhlman & Farrington, 2010; Finnegan, 2018; Lambourne, 2021; Mironiuc et al., 2021).

The social dimension refers to an extensive array of issues, e.g. safety, human health, good quality of life, inclusion (Sutherland, et al., 2016). As such, the breadth of concepts allocated to this dimension creates a significant challenge when attempting to operationalize it. It implies the social responsibility to various stakeholders (Geltner et al., 2014; Ziemba et al., 2015), in municipalities, especially to the local communities (Dempsey et al., 2011; da Cruz & Cunha Marques, 2013).

Over the last decades, mostly selected dimensions of sustainability and metrics have been considered in determining the highest and best use of real property assets which traditionally must meet four conditions (tests): legally permissible, physically possible, financially feasible, and maximally productive (Table 2).

Table 2

Sustainability dimensions in the four tests of the highest and best use analysis presented in the literature

	Legally permissible	Physically possible	Financially feasible	Maximally productive
Environmental dimension (PLANET)	EVS (2020); The Appraisal of Real Estate (2020, p. 308)	Scribner (1997); EVS (2020); RICS (2020); The Appraisal of Real Estate (2020, p. 305)	-	Walacik, Renigier-Biłozor, Chmielewska, & Janowski (2020)
Economic dimension (PROFIT)	-	-	Austin (2012)	
Social dimension (PEOPLE)	Nahkies (2002)	-	Ribera, Nestico, Cucco, Maselli (2020)	

Source: authors' own elaboration.

The test of legally permissible uses (also known as the legal constraint) has to do with current (the permitted uses under the law) and possible future legal restrictions (expected changes in the law) that eliminate the use of the asset. The need for environmental dimension incorporation and its metrics in this test are indicated, among others by EVS (2020), and The Appraisal of Real Estate (2020, p. 308, 337). They pay attention to environmental regulations (such as those concerning clean air, environment, water, and wetlands). In turn, Nahkies (2002) points out the social dimension by highlighting that in the case of heritage buildings the property development process should not be the one that takes the line of least resistance in terms of recognizing the concerns of the public.

The physical possibility test (technical constraint) addresses the physical attributes and limitations of the asset (i.e. size, shape, terrain, infrastructure, functionality) and whether there is the potential for their change (Walacik et al., 2020). As part of this test Scribner (1997), EVS (2020), and The Appraisal

of Real Estate (2020, p. 305, 310) recommend considering the environmental dimension. They outline that the alternative use should also be environmentally acceptable and include the risk of natural disasters such as floods or earthquakes affecting the uses to which land can be put.

To reflect the requirement to be financially feasible (budget constraint test), also called financially sustainable (Ribera et al., 2020), it is considered whether an alternative use of the asset will result in an adequate income or cash flow for income-producing properties (EVS 2020), or the value of economic benefit for the assumed development of the property will exceed the costs of its implementation (Trojanowski, 2019, p. 133) or demolition of the existing structure when is nearing the end of its economic life for not-income producing properties (The Appraisal of Real Estate, 2020, p. 314). In this test, Austin (2012) emphasizes the need to incorporate the economic dimension and such metrics as expenditure on sustainability attributes and lower operating costs (i.e. energy efficiency), while Ribera, Nestico, Cucco, & Maselli (2020) highlight the social dimension by referring to the social cohesion and economic wellbeing.

The maximally productive test (economically convenient) provides that, of the financially feasible uses, the use that produces the highest value of the real estate is the highest and best use (Johnson, Atwood, & Walther, 2010). Walacik et al. (2020) point out that this use should be strongly correlated with sustainability (referring to all three dimensions). Thus, maximal productivity in the highest and best use analysis contexts means directly not to assume any decreases in sustainable value (the worst option) or provide the possibility to increase the sustainable value in the future.

3. Data and Methods

To investigate how Polish municipalities deal with the incorporation of sustainability into the highest and best use analysis and its operationalization in the four tests, quantitative and qualitative research was conducted using surveys and the content analysis of HBU analyses prepared for municipalities.

The survey questionnaire was distributed via emails among departments responsible for real property asset management (variously named, e.g. Real Estate Management Department, Real Estate and Operation Department, Buildings and Premises Management Department, Department of Property Disposal) of eleven municipalities (creating the largest metropolitan areas with populations exceeding 500 thousand, including Katowice, Warszawa, Kraków, Łódź, Gdańsk-Sopot-Gdynia, Poznań, Wrocław, Bydgoszcz-Toruń, Szczecin) (Rackiewicz, 2017). These municipalities were chosen as research carried out in other countries on municipal sustainability efforts has shown that larger municipalities are significantly more likely to adopt policies to support sustainability than smaller communities (Conroy & Iqbal, 2009; Homsy& Warner, 2015). Moreover, as outlined in reports prepared for Poland, on the one hand, those municipalities house a considerable number of public use and communal buildings that have a significant environmental impact and, on the other hand, they present ambitious plans for changes (i.e. low-emission economy, or actions towards sustainable energy) (Rackiewicz, 2017). The data collection was conducted between April and May 2022. The surveys addressed to the directors of offices responsible for real property asset management consisted of four questions linked with/to sustainability dimensions.

When analyzing the results of the study, the called frequency indicator was used, which had the following formula (Karaszewski & Sudoł, 1997):

$$W = \frac{\sum_{i=1}^{k} n_i w_i}{k \cdot N} \quad (1)$$

where:

W – frequency indicator,
i – evaluation index,
n_i – the number of indications for a given factor at the i-th position,
k – maximum frequency rating on a scale of 1 to k (the order of the factors meant assigning their rating in reverse order),
N – the number of respondents that answered the question,
w_i – the rating corresponding to the location of the i factor.

Since reflecting sustainability and its operationalization in the analysis of highest and best use is relatively unexplored in Polish municipalities, the content analysis of HBU analyses prepared for municipalities by external entities was deemed appropriate (Saunders et al., 2019).

Five HBU analyses reflecting sustainability were included (publicly available or obtained directly

from municipalities on application based on the access to public information legal act). They were employed to:

1) the land:
   - surplus property: Highest and best use study of a 60-ha plot located in Gdynia (Chapman Taylor, 2020),
   - additional property: Masterplan including HBU analysis for international horticultural exhibition in Łódź (PwC Advisory & Chapman Taylor, 2019),
2) the buildings:
   - core property: Feasibility study on modernizing along with elements of refurbishment of a historical monument theatrical building in Warsaw (KPPM Doradztwo Sp. z o.o., 2013),
   - additional property: Analysis on the possibility of development of new retail centers (with sales areas above 2,000 sqm) including a forecast of development consequences for 26 locations in Warsaw (AECOM Sp. z o.o., 2013),
   - additional property: Highest and best use study of historical landmark building in Warsaw (PwC Advisory, 2018).

However, it is worth noting that, although all of the analyses were the basis for determining the likely use of the land or considering decisions on the continuation or alternative use of the buildings, they differ significantly in terms of their content (from around 100 up to 2 000 pages in multiple volumes) and titles (often linked with the feasibility studies, expertise, and analysis of the possibilities).

4. Empirical results

The results of the surveys show that six out of eleven municipalities carried out HBU analyses. Four of them prepared them for all types of real property assets, and two for selected types (one for rent-generating assets and socio-economic nature, the other for core properties and spatial development nature only). Most of the analyses, however, concerned core properties and additional ones (including socio-economic and spatial development nature) (Table 3).

Table 3

HBU analysis in real property asset management of Polish municipalities

Category (property function)	Real property asset types	Number of respondents (n = 6)	Frequency indicator*
Surplus properties	rent-generating assets	5	0,67
	disposable assets (redundant)	4	0,50
Core properties		5	0,71
Additional properties	socio-economic nature	5	0,71
	spatial development nature	5	0,71

**Frequency indicator interpretation: 1 – each of the analyses, 0 – any of the analyses*

Source: authors' own elaboration based on the results of the surveys.

Most of the HBU analyses included sustainability metrics, however, in legally permissible tests they existed more often for determining the likely use of the land than for the decisions on the continuation or alternative use of the buildings (Table 4).

Table 4

Frequency* of sustainability incorporation in selected tests of the HBU analyses for land and buildings in Polish municipalities

	Frequency indicator for land (site as through vacant) (n = 6)	Frequency indicator for building (of the property as improved) (n = 6)
Legally permissible	0,83	0,79
Physically possible	0,67	0,67
Financially feasible	0,88	0,88
Maximally productive	0,92	0,92

**Frequency indicator interpretation: 1 – each of the analyses, 0 – any of the analyses*

Source: authors' own elaboration based on the results of the surveys.

The sustainability dimensions were embedded to varying extent in individual HBU tests. While in legally permissible tests the environmental dimensions metrics were most often taken into account, in physically possible tests – the indicators of the environmental and social dimensions, in financially feasible tests – economic and social dimensions metrics. In turn, in the maximally productive test, the most frequently occurred indicators were linked with the social dimension (Table 5).

The content analysis of individual HBU analyses prepared for the municipalities by external entities shows that individual sustainability dimensions have been operationalized by various metrics (quantitative and qualitative) which can be divided into internal and external at each of the four HBU tests (Table 6).

Table 5

Frequency* of sustainability dimensions addressing in individual HBU tests in Polish municipalities

	Frequency indicator for environmental dimension (n = 6)	Frequency indicator for economic dimension (n = 6)	Frequency indicator for social dimension (n = 6)
Legally permissible	0,83	0,71	0,71
Physically possible	0,75	0,63	0,75
Financially feasible	0,71	0,92	0,92
Maximally productive	0,88	0,92	0,96

**Frequency indicator interpretation: 1 – each of the analyses, 0 – any of the analyses*

Source: authors' own elaboration based on the results of the surveys.

Table 6

Operationalization of sustainability dimensions in the HBU analysis of real property assets of Polish municipalities

	Legally permissible	Physically possible	Financially feasible	Maximally productive
Environmental dimension (PLANET) INTERNAL work environment	consistency of development/ improvement with safety regulations (KPPM Doradztwo Sp. z o.o., 2013, p. 22, 24)	– ensuring indoor quality of air, temperature (PwC Advisory & Chapman Taylor, 2019, p. 237 C*) – use of environmentally friendly/ low carbon footprint materials and development techniques (PwC Advisory, 2018, p. 16)	optimization of the building consumption of energy, heat, water efficiency (PwC Advisory & Chapman Taylor, 2019, p. 237 C*)	highest environmental value for occupants (KPPM Doradztwo Sp. z o.o., 2013, p. 22)

	EXTERNAL surrounding / natural environment	consistency of development/ improvements with: – zoning regulations (PwC Advisory, 2018, p. 19; Chapman Taylor, 2020, p. 24; PwC Advisory & Chapman Taylor, 2019, p. 37 C*) – regulations on the historical district/ heritage (PwC Advisory, 2018, pp. 20-21) – environmentalregulations(KPPM Doradztwo Sp. z o.o., 2013, p. 158; AECOM Sp. z o.o., 2013, p. 23)	– reduction of a footprint on surrounding (biodiversity and ecosystems, desertification, raw materials, water, energy, and air) (PwC Advisory & Chapman Taylor, 2019, p. 31 A*, 81 C*, 239 C*)	impact on utilization of public infrastructure: – public and private transportation (PwC Advisory, 2018, p. 28; PwC Advisory & Chapman Taylor, 2019, p. 75 A*, 17 C*) – municipal media suppliers (PwC Advisory, 2018, p. 30; Chapman Taylor, 2020, p. 17; PwC Advisory & Chapman Taylor, 2019, pp. 124-127 C*) – road system (Chapman Taylor, 2020, p. 37; AECOM Sp. z o.o., 2013, p. 16; PwC Advisory & Chapman Taylor, 2019, p. 74 C*) – public services (KPPM Doradztwo Sp. z o.o., 2013, p. 150)	highest environmental value for surroundings (PwC Advisory, 2018, pp. 60-61; Chapman Taylor, 2020, pp. 20-21; PwC Advisory & Chapman Taylor, 2019, p. 227 C*)
Economic dimension (PROFIT)	INTERNAL real property and municipality	impact of development/ improvements on real estate taxes, legal public fees (Chapman Taylor, 2020, p. 142)	– prioritization of the total or partial reuse of existing buildings, facilities, materials, etc. (KPPM Doradztwo Sp. z o.o., 2013, p. 29) – inclusion of environmentally friendly materials limiting opex costs (PwC Advisory & Chapman Taylor, 2019, p. 237 C*) – possibility of future changes in the property (PwC Advisory & Chapman Taylor, 2019, pp. 439-440 C*)	– investment costs (PwC Advisory, 2018, p. 68) – income from investment (PwC Advisory, 2018, p. 72) – operating costs (use and maintenance costs) (KPPM Doradztwo Sp. z o.o., 2013, p. 99; Chapman Taylor, 2020, 100-107; PwC Advisory & Chapman Taylor, 2019, p. 37 B*)	highest economic performance of real property (PwC Advisory, 2018, p. 74)
	EXTERNAL local economy	impact of development/ improvements on the utility of legal acts (i.e. zoning plans, tax breaks, support programs) (PwC Advisory & Chapman Taylor, 2019, p. 99 A*)	impact on: – new economic development (AECOM Sp. z o.o., 2013, p. 66; PwC Advisory & Chapman Taylor, 2019, p. 69 A*)	– local economic growth support (KPPM Doradztwo Sp. z o.o., 2013, p. 30; PwC Advisory & Chapman Taylor, 2019, p. 69 A*) – municipality performance (competitiveness enhancement) (KPPM Doradztwo Sp. z o.o., 2013, p. 29) – employment, job creation / unemployment reduction (KPPM Doradztwo Sp. z o.o., 2013, p. 34)	highest economic value for stakeholders including community (Chapman Taylor, 2020, pp. 91-139)

Social dimension (PEOPLE)	INTERNAL real property users	consistency of development /improvements with: – outcome of availability analysis (i.e. access to green and public infrastructure) (KPPM Doradztwo Sp. z o.o., 2013, p. 142; Chapman Taylor, 2020, p. 29, 77) – non-discrimination, inclusion policy (KPPM Doradztwo Sp. z o.o., 2013, p. 56; PwC Advisory & Chapman Taylor, 2019, p. 184 D*)	– prioritization of building occupants (health, comfort, well-being) (KPPM Doradztwo Sp. z o.o., 2013, p. 22, 24) – injury rate, exposure, riskiness rate, death rate (PwC Advisory & Chapman Taylor, 2019, p. 73 C*, 383 C*)	– productivity of building occupants (Chapman Taylor, 2020, p. 145) – reduction of negative social/healthcare observations for occupants, that limit public spending (Chapman Taylor, 2020, p. 81)	highest social value for real property users (KPPM Doradztwo Sp. z o.o., 2013, p. 84)
	EXTERNAL local communities / society	consistency of development /improvement with city development strategic document (KPPM Doradztwo Sp. z o.o., 2013, p. 29; Chapman Taylor, 2020, p. 45; (PwC Advisory & Chapman Taylor, 2019, p. 98 A*)	ensuring a sense of community, belonging (PwC Advisory & Chapman Taylor, 2019, p. 9 D*)	– local household income (Chapman Taylor, 2020, p. 61) – population growth rate (Chapman Taylor, 2020, p. 63; PwC Advisory & Chapman Taylor, 2019, p. 72 C*) – population density (Chapman Taylor, 2020, p. 63) – migration rate (Chapman Taylor, 2020, p. 63)	highest social value for society (PwC Advisory & Chapman Taylor, 2019, p. 82 B*)

**A – Location analysis, B – Budget analysis, C – Architectural analysis, D – Program analysis.*

Source: authors' own elaboration based on the results of the HBU analyses.

The environmental metrics of sustainability in the context of real property assets referred to the indoor work environment and natural environment. They were, in particular, relevant for core and additional properties. The HBU analyses searched for the use that would bring the highest environmental value to occupants or/and the surroundings and focused on identifying constraints and limiting potential negative impact at the same proposing new blue and green infrastructure and framework development concepts (i.e. 15 minutes city) to be implemented.

The economic metrics of sustainability related to the real property assets and municipality as well as the local economy. Their importance was noticeable in the analyses concerning especially surplus and additional properties. HBU analyses were to find the use that would contribute to achieving the highest economic performance of real property or/and value for stakeholders including the community measured both through financial (PIT, CIT, VAT, property tax returns) and non-financial metrics (improvement of municipalities competitive position accessibility and creation of economic opportunity).

In turn, the social metrics were associated with the influence of the real property assets on the individuals (building occupants) as well as the local communities, society (and future generations). They were reflected in analyses relating to core properties and additional properties. HBU analyses were focused to find the use that guarantees the highest social value for real property users or/and for society (and future generations), including legacy programmes on how the property could be reused in the future.

5. Discussion and conclusions

Highest and best use analysis and sustainability dimensions (environmental, economic and social) have been extensively and independently discussed both by researchers and practitioners for many years. So far, little has been known about how municipalities dealt with the sustainability incorporation in HBU analysis of municipal real property assets. By drawing on the survey conducted among Polish municipalities, this paper shows that sustainability was reflected in most of the HBU analyses, however, its dimensions were embedded to varying extent in individual HBU tests.

Moreover, the content analysis of HBU analyses prepared for real property assets of municipalities enables the presentation of meaningful metrics (quantitative and qualitative), which extend beyond those presented in the literature on HBU analysis so far, and their link with four HBU tests (legally

permissible, physically possible, financially feasible, and maximally productive).

It exposes that the environmental dimension is operationalized by indication of the legal restrictions (heritage and environmental regulations) and the footprint of real property assets on surroundings as well as on work environment safety.

As for the economic dimension, it is illustrated by metrics referring also to the impact of development or improvements on the performance of the municipality (economic value) and the local economy, in addition to the economic performance of the real property.

In turn, the social dimension is linked with metrics related not only to the impact of real property assets use on the local communities and future generations but also on its users.

Although the paper gives an overview of HBU analyses prepared for municipalities from only one country, its implication extends beyond Poland since more and more municipalities around the world are under pressure to facilitate transitions toward more sustainable futures. They look for the tools supporting the decision-making process leading to securing the long-term functioning of the municipality and its citizens as well as real property assets. In turn, academic researchers at large can benefit from this study through the new knowledge it provides to the existing literature, which can be the ground for more in-depth investigation. Future work can consider municipalities from other countries to get a wider perspective and more metrics to improve the asset management of municipalities in the context of long-term environmental, economic and social objectives. Additionally, in the countries where HBU analyses are widely used, it can focus on identification of specific sustainability metrics when making decisions on various real property assets (surplus, core, and additional properties).

6. References

AECOM Sp. z o.o. (2013). *Analiza możliwości budowy na terenie Warszawy nowych obiektów handlu wielkopowierzchniowego [The possibility analysis of building new large-scale retail shops in Warsaw].* Warszawa: AECOM Sp. z o.o.

Austin, G. W. (2012). Sustainability and Income - Producing Property Valuation: North American Status and Recommended Procedures. *Journal of Sustainable Real Estate, 4*(1), 78–122. https://doi.org/10.1080/10835547.2012.12091832

Azar, E., Nikolopoulou, C., & Papadopoulos, S. (2016). Integrating and optimizing metrics of sustainable building performance using human-focused agent-based modeling. *Applied Energy, 183*(1), 926–937. https://doi.org/10.1016/j.apenergy.2016.09.022

Berardi, U. (2013). Clarifying the new interpretations of the concept of sustainable building. *Sustainable Cities and Society, 8*(8), 72–78. https://doi.org/10.1016/j.scs.2013.01.008

Bibri, S. E. (2020). The eco-city and its core environmental dimension of sustainability: Green energy technologies and their integration with data-driven smart solutions. *Energy Informatics, 3*(1), 4. Advance online publication. https://doi.org/10.1186/s42162-020-00107-7

Caldas, P., Dollery, B., & Marques, R. C. (2022). Measuring whatmatters in local government: A Municipality Sustainability Index. *Policy Studies, 43*(4), 738–758. https://doi.org/10.1080/01442872.2020.1726311

Conroy, M. M., & Iqbal, A.-A. (2009). Adoption of sustainability initiatives in Indiana, Kentucky, and Ohio. *Local Environment, 14*(2), 109–125. https://doi.org/10.1080/13549830802521428

Crompton, J. L. (2001). Parks and Open Space: The Highest and Best Use of Public Land? *Journal of Park and Recreation Administration, 19*(3), 133–154.

da Cruz, N. F., & Marques, R.C. (2013). New Development: The Challenges of Designing Municipal Governance Indicators. *Public Money & Management, 33*(3), 209–212. https://doi.org/10.1080/09540962.2013.785706

Ferreira, J.F.d.C., Corrêa, J.M. & de Alcantara Junior, J.E. (2021). Sustainability assessment in the Brazilian Amazon: The municipalities of the state of Amapá. *Environment, Development and Sustainability, 23*(11), 15725–15738. https://doi.org/10.1007/s10668-021-01359-3

Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development (Bradford), 19*(5), 289–300. https://doi.org/10.1002/sd.417

Dent, P. (1997). Managing public sector property assets: The valuation issue. *Property Management, 15*(4), 226–233. https://doi.org/10.1108/02637479710187062

Dotzour, M. G., Grissom, T. V., Liu, C. H., & Pearson, T. (1990). Highest and Best Use: The Evolving Paradigm. *Journal of Real Estate Research, 5*(1), 17–32. https://doi.org/10.1080/10835547.1990.12090599

Dziworska, K., & Trojanowski, D. (2008). Podstawy strategii zarządzania nieruchomościami komunalnymi. [Fundamentals of municipal real estate management strategies] In W. Golnau (Ed.), *Inwestycje i nieruchomości - wybrane problemy [Investment and real estate - selected problems]*. Fundacja Rozwoju Uniwersytetu Gdańskiego.

EVS. (2020). *European Valuation Standards.* TEGOVA, The European Group of Valuers' Association.

Fenton, P., & Gustafsson, S. (2017). Moving from high-level words to local action -Governance for urban sustainability in municipalities. *Current Opinion in Environmental Sustainability, 26-27*, 129–133. https://doi.org/10.1016/j.cosust.2017.07.009

Finnegan, S. (2018). *New Financial Strategies for Sustainable Buildings*. Routledge.

Fuhr, H., Hickmann, T., & Kern, K. (2018). The role of cities in multi-level climate governance: Local climate policies and the 1.5 °C target. *Current Opinion in Environmental Sustainability, 30*, 1–6. https://doi.org/10.1016/j.cosust.2017.10.006

Geltner, D. M., Miller, N. G., Clayton, J., & Eichholtz, P. (2014). *Commercial real estate: Analysis and Investments.* Mason: OnCourse Learning.

Goubran, S., Masson, T., & Caycedo, M. (2019). Evolutions in Sustainability and Sustainable Real Estate. In T. Walker, C. Krosinsky, L. N. Hasan, & S. D. Kibsey, *Sustainable Real Estate* (pp. 11-31). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-94565-1_3

Gross, M., & Wolny-Kucińska, A. (2021). Public real estate resource – A burden or a source of income? A study of municipal land management in Poland. *Land Use Policy, 106*, 105447. https://doi.org/10.1016/j.landusepol.2021.105447

Hasbi Hanis, M. H., Trigunarsyah, B., & Susilawati, C. (2011). The application of public asset management in Indonesian local government: A case study in South Sulawesi province. *Journal of Corporate Real Estate, 13*(1), 36–47. https://doi.org/10.1108/14630011111120332

Hansmann, R., Mieg, H. A., & Frischknecht, P. (2012). Principal sustainability components: Empirical analysis of synergies between the three pillars of sustainability. *International Journal of Sustainable Development and World Ecology, 19*(5), 451–459. https://doi.org/10.1080/13504509.2012.696220

Hartmuth, G., Huber, K., & Rink, D. (2008). Operationalization and contextualization of sustainability at the local level. *Sustainable Development (Bradford), 16*(4), 261–270. https://doi.org/10.1002/sd.377

Homsy, G. C., & Warner, M. E. (2015). Cities and Sustainability: Polycentric Action and Multilevel Governance. *Urban Affairs Review, 51*(1), 46–73. https://doi.org/10.1177/1078087414530545

IVS. (2020). *International Valuation Standards*. IVSC International Valuation Standards Council.

Johnson, I. R., Atwood, K. E., & Walther, L. (2010). Incorporating Highest and Best Use into Accounting Standards Expands Opportunities for Appraisers. *The Appraisal Journal, 78*(2), 150–158.

Jordan, A., Huitema, D., Schoenefeld, J., Van Asselt, H., & Forster, J. (2018). Governing Climate Change Polycentrically: Setting the Scene. In *A*. Jordan, D. Huitema, J. Schoenefeld, H. Van Asselt, & J. Forster, *Governing Climate Change: Polycentricity in Action*? (pp. 3–26). Cambridge University Press. https://doi.org/10.1017/9781108284646.002

Kaganova, O. (2012). *Guidebook on real property asset management for local governments.* Urban Institute Center on International Development and Governance, IDG Asset Management Toolkit.

Kaganova, O., & Nayyar-Stone, R. (2000). Municipal Real Property Asset Management: An Overview of World Experience, Trends and Financial Implications. *Journal of Real Estate Portfolio Management, 6*(4), 307–326. https://doi.org/10.1080/10835547.2000.12089624

Karaszewski, W., & Sudoł, S. (1997). *Empirical research on the process of transformation of Polish Companies in the perion of 1990-1995*. Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Kask, K. (2014). *Public sector real estate asset management models and their valuation*. University of Tartu Press.

Kauko, T. (2019). Innovation in urban real estate: The role of sustainability. *Property Management, 37*(2), 197–214. https://doi.org/10.1108/PM-10-2017-0056

KPPM Doradztwo Sp. z o.o. (2013). *Modernizacja z elementami przebudowy zabytkowego budynku Teatru Polskiego im. Arnolda Szyfmana w Warszawie [Modernization with elements of reconstruction of the historic building of the Polish Theater Arnold Szyfman in Warsaw]*. Warszawa: KPPM Doradztwo Sp. z o.o.

Kucharska-Stasiak, E., & Olbińska, K. (2018). Reflecting sustainability in property valuation - defining the problem. *Real Estate Management and Valuation, 26*(2), 60–70. https://doi.org/10.2478/remav-2018-0016

Kuhlman, T., & Farrington, J. (2010). What is Sustainability? *Sustainability (Basel), 2*(11), 3436–3448. https://doi.org/10.3390/su2113436

Kutut, V., Lepkova, N., & Źróbek, S. (2021). Immovable Cultural Heritge Usage Modes: Theoretical Approach. *European Research Studies, XXIV*(Special Issue 1), 1136–1151. https://doi.org/10.35808/ersj/2092

Lambourne, T. (2021). Valuing sustainability in real estate: A case study of the United Arab Emirates. *Journal of Property Investment & Finance*. Advance online publication. https://doi.org/10.1108/JPIF-04-2020-0040

Lorenz, D., & Lutzkendorf, T. (2008). Sustainability in propertyvaluation: Theory and practice. *Journal of Property Investment & Finance, 26*(6), 482–521. https://doi.org/10.1108/14635780810908361

Mardiasmo, D., Sampford, C., & Barnes, P. (2015). Stagnancy in Indonesia's Reformed State Asset Management Policies and Practices: A Wicked Problem? In W. B. Lee, B.-K. Choi, & L. Ma, *Proceedings of the 7th World Congress on Engineering Asset Management (WCEAM 2012)* (pp. 443-457). Switzerland: Springer International Publishing. https://doi.org/10.1007/978-3-319-06966-1_40

Marjaba, G., & Chidiac, S. (2016). Sustainability and resiliency metrics for buildings – Critical review. *Building and Environment, 101*, 116–125. https://doi.org/10.1016/j.buildenv.2016.03.002

Mironiuc, M., Ionascu, E., Huian, M. C., & Taran, A. (2021). Reflecting the sustainability dimensions on the residential real estate prices. *Sustainability (Basel), 13*(5), 2963. Advance online publication. https://doi.org/10.3390/su13052963

Morano, P., Locurcio, M., & Tajani, F. (2016). Cultural heritage valorization: An application of AHP for the choice of the highest and best use. *Procedia: Social and Behavioral Sciences, 223*, 952–959. https://doi.org/10.1016/j.sbspro.2016.05.328

Moreno Pires, S. M., & Fidélis, T. (2015). Local Sustainability Indicators in Portugal: Assessing Implementation and Use in Governance Contexts. *Journal of Cleaner Production, 86*, 289–300. https://doi.org/10.1016/j.jclepro.2014.08.002

Munizzo, M. A., & Musial, L. V. (2008). *General Market Analysis and Highest and Best Use.* DEarborn Real Estate Education.

Nahkies, B. (2002). Heritage Protection - Redefining Highest and Best Use? *Pacific Rim Real Estate Society (PRRES) 8th Annual Conference Christchurch*, 1-13.

Phelps, A. (2012). Municipal property asset management – a comparative study of UK and Russia. *International Journal of Strategic Property Management, 15*(4), 416–437. https://doi.org/10.3846/1648715X.2011.642537

PwC Advisory. (2018). *Studium wykonalności dla koncepcji zagospodarowania nieruchomości przy ul. Targowej 14 w Warszawie [Feasibility study for the concept of real estate development at ul. Targowa 14 in Warsaw*]. PwC Advisory.

PwC Advisory, & Chapman Taylor. (2019). *Masterplan dla Expo Horticultural 2024 [Masterplan for Expo Horticultural 2024].* Łódź.

Rackiewicz, I. (2017). *Raport o stanie polskich miast: Niskoemisyjność i efektywność energetyczna [Report on the state of Polish cities: Low-emission and energy efficiency*]. Instytut Rozwoju Miast.

Rahmadanti, D. A., Azis, Y., & Komara, R. (2019). Asset optimization of baranangsiang terminal commercial area using highest and best use analysis: a case study of Bogor city government's asset. *Journal of Business, Management and Social Research, 5*(2), 324–337. https://doi.org/10.18801/ijbmsr.050219.35

Reinhart, C. F., Mardaljevic, J., & Rogers, Z. (2006). Dynamic Daylight Performance Metrics for Sustainable Building Design. *Leukos. The Journal of the Illuminating Engineering Society, 3*(1), 7–31. https://doi.org/10.1582/LEUKOS.2006.03.01.001

Ribera, F., Nestico, A., Cucco, P., & Maselli, G. (2020). A multicriteria apporach to identify the Highest and Best Use for historical buildings. *Journal of Cultural Heritage, 41*, 166–177. https://doi.org/10.1016/j.culher.2019.06.004

RICS. (2020). *RICS Valuation - Global Standards: Incorporating the IVSC International Valuation Standards.* RICS.

Rogmans, T., & Ghunaim, M. (2016). A framework for evaluating sustinability indicators in the real estate industry. *Ecological Indicators, 66*, 603–611. https://doi.org/10.1016/j.ecolind.2016.01.058

Runde, T., & Thoyre, S. (2010). Integrating Sustainability and Green Building into the Appraisal Process. *Journal of Sustainable Real Estate, 2*(1), 221–248. https://doi.org/10.1080/10835547.2010.12091795

Rymarzak, M., & Trojanowski, D. (2013). Asset Management of the Public Sector in Poland. *Real Estate Management and Valuation, 21*(1), 5–13. https://doi.org/10.2478/remav-2013-0001

Saunders, M. N., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students*. Prentice Hall.

Scipioni, A., Mazzi, A., Mason, M., & Manzardo, A. (2009). The Dashboard of Sustainability to measure the local urban sustainable development: The case study of Padua Municipality. *Ecological Indicators, 9*(2), 364–380. https://doi.org/10.1016/j.ecolind.2008.05.002

Scribner, D. (1997). A new standard for conducting highest and best use studies of income-producing properties in the USA and the UK. *Journal of Property Valuation and Investment, 15*(5), 466–478. https://doi.org/10.1108/14635789710189245

Shen, L.-Y., Hao, J. L., Tam, W.-Y., & Yao, H. (2007). A checklist for assessing sustainability performance of construction projects. *Journal of Civil Engineering and Management, 13*(4), 273–281. https://doi.org/10.3846/13923730.2007.9636447

Simmons, A. F. (2010). An Introduction to Green Homes. Appraisal Institute.

Sutherland, J. W., Richter, J. S., Hutchins, M. J., Dornfeld, D., Dzombak, R., Mangold, J., Robinson, S., Hauschild, M. Z., Bonou, A., Schönsleben, P., & Friemann, F. (2016). The role of manufacturing in affecting the social dimension of sustainability. *CIRP Annals, 65*(2), 689–712. https://doi.org/10.1016/j.cirp.2016.05.003

Taylor, B. M. (2013). Sustainability and Performance Measurement: Corporate Real Estate Perspectives. *Performance Improvement, 52*(6), 36–45. https://doi.org/10.1002/pfi.21356

Taylor C. (2020). *Ekspertyza dotycząca optymalnego kierunku zagospodarowania terenów gminnych w dzielnicy Chwarzno-Wiczlino w Gdyni [Expertise on the optimal development of communal areas in the Chwarzno-Wiczlino district in Gdynia*]. Chapman Taylor.

The Appraisal of Real Estate. (2020). Appraisal Institute.

The Dictionary of Real Estate Appraisal. (2010). Appraisal Institute.

Trojanowski, D. (2019). *Dylematy wyceny nieruchomości komercyjnych w Polsce [The valuation dilemmas of commercial real estate in Poland].* Uniwersytet Gdański.

United Nations Environment Programme. (2020). *2020 Global Status Report for Buildings and Construction: Towards a zero-emissions, efficient and resilient buildings and construction sector.* United Nations Environment Programme.

Utter, M. (1989). Public Asset Management. *Economic Development Commentary*, 4-11.

van den Beemt-Tjeerdsma, A., & Veuger, J. (2016). Towards a more professionalised municipal real estate management. *Journal of Corporate Real Estate, 18*(2), 132–144. https://doi.org/10.1108/JCRE-11-2015-0041

Vogel, N. (2016). Municipalities' ambitions and practices: At risk of hypocritical sustainability transitions? *Journal of Environmental Policy and Planning, 18*(3), 361–378. https://doi.org/10.1080/1523908X.2015.1099425

Walacik, M., Renigier-Biłozor, M., Chmielewska, A., & Janowski, A. (2020). Property sustainable value versus higest and best use analyzes. *Sustainable Development (Bradford), 28*(6), 1755–1772. https://doi.org/10.1002/sd.2122

Warren-Myers, G. (2012). The value of sustainability in real estate: A review from a valuation perspective. *Journal of Property Investment & Finance, 30*(2), 115–144. https://doi.org/10.1108/14635781211206887

World Economic Forum. (2021). *Green Building Principles: The Action Plan for NEt-Zero Carbon Buildings.* Geneva: World Economic Forum.

Zavadskas, E. K., Turskis, Z., Šliogerienė, J., & Vilutienė, T. (2021). An integrated assessment of the municipal buildings' use including sustainability criteria. *Sustainable Cities and Society, 67*, 102708. https://doi.org/10.1016/j.scs.2021.102708

Ziemba, E., Śmietana, K., Ramian, T., & Kania, K. (2015). The concept of a sustainable approach to corporate real estate management. *Real Estate Management and Valuation, 23*(4), 85–94. https://doi.org/10.1515/remav-2015-0039