

# TRANSFORMING MEGACITIES: VALUE AND IMPACTS OF MIXED-USE DEVELOPMENTS WITH MULTI-CRITERIA DECISION-MAKING

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ARTICLE INFO	ABSTRACT
<p><b>Keywords:</b> real estate valuation, mixed-use developments, Multiple-Criteria Decision-Making (MCDM), Key Performance Indicators, ESG considerations</p> <p><b>JEL Classification:</b> C39, R39</p>	<p>This research article explores the valuation of mixed-use developments and their impact on urban planning and city regeneration. The study introduces a Multi-Criteria Decision Making (MCDM) methodology to analyze complex buildings developed in Shanghai from 2009 to 2019. Two MCDM appraisals are offered in different developments using three groups of key indicators that served as benchmarks for other Chinese clusters and global megacities. The article addresses two primary research questions: how mixed-use assets can be assessed using MCDM, and what the key performance indicators and factors contributing to the success of mixed-use developments are. The findings highlight the importance of connectivity, previous real estate experience, ESG strategies, international branding, architectural design, financial metrics, and adaptability of the real estate industry in evaluating mixed-use assets. The study provides insight to stakeholders involved in real estate development, including urban planners, developers, and investors, enabling them to make informed decisions and improve sustainable practices. The research also highlights the importance of considering ESG principles, community benefits, and long-term strategies when assessing mixed-use developments to drive social change and contribute to urban regeneration.</p>
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## 1. Introduction

The appraisal of real estate has been studied by scholars (Chen et al., 2017), employing various approaches such as international benchmarks (Gabrielli & French, 2021), Building Information Modeling (BIM) (Couto et al., 2021), and machine learning (Adomavičius, 2022), among others. However, limited research exists on the valuation of mixed-use developments as well as their subsequent impact on urban planning (Robin, 2022). Despite the crucial role of the real estate industry in the global economy, there is a lack of research on how mixed-use buildings influence urban development and city regeneration (Gregory, 2017). This study aims to address this gap in real estate appraisals and promote interdisciplinary awareness for key real estate stakeholders.

The study introduces a Multi-Criteria Decision Making (MCDM) methodology (Afshari et al., 2016) to analyze complex buildings developed in Shanghai between 2009 and 2019. While separate valuations of different buildings could be implemented, the methodology of MCDM for mixed-use assets offers a robust and widely recognized approach for value assessment in real estate (Wallenius et al., 2008). By considering multiple criteria and weighing their importance, MCDM allows for a comprehensive and systematic evaluation of complex real estate developments.

Therefore, this research leverages previous valuations on urban and real estate performance done by Chu and Calubad (2012), Bhole (2018), Guarini (2018), Huang (2020), Mantoganis (2020), Dobrovelskiene (2021), and Shaikh (2021).

Two appraisals are offered in different buildings that served as benchmarks for other Chinese clusters (Shen & Kee, 2017) and global megacities (Engel et al., 2018).

From the analysis and previous research examined, the study aims to address two primary research questions:

- How can mixed-use assets be assessed using multi-criteria methodologies? and
- What are the key performance indicators and factors that contribute to the success of mixed-use developments?

Two appraisals are conducted: In the first MCDM analysis, the buildings are categorized by three groups of key fundamental indicators: External factors, specifics of the real estate industry, and user-related considerations. In the second study, the MCDM covers corporate and financial information, strategy indicators, and specifics of the mixed-used developments.

## 2. Literature review

The field of real estate valuation has been extensively researched, covering various approaches and methods (Vandell, 2007). Traditional valuation analyses, such as linear programming and property purchase studies, have been widely reviewed by Addae-Dapaah (2005), Lin (2020), and Kowalski (2020). Additionally, researchers have explored alternative valuation systems, including hedonic pricing for mixed-use properties (Wei et al., 2022), as well as the application of artificial intelligence and data analytics for more accurate and sophisticated valuation models (Yakub et al., 2021). Real option valuation, which captures the value of embedded options within a mixed-use development, has also received attention (Zhong & Hui, 2021). Despite these advancements, there are still gaps in the literature concerning the valuation of specific asset types and the incorporation of comprehensive valuation frameworks.

### 2.1. Urban landscape

Urbanization in Asia (Prasetyanto et al., 2023), particularly in China (Cheng & Ng, 2023) and Shanghai (Wu, 2011), has led to impressive development (Chiu, 2008) and a remarkable urban landscape (Evans, 2014). Mixed-use assets have become a key feature to seamlessly integrate commercial, residential, and hotel space (Gao & Lim, 2023). These assets are aligned with major commercial hubs and streets (Wu et al., 2021), thereby connecting buildings and urban networks (Fang, et al., 2021),

structuring a city's urban regeneration (Berta et al., 2018), and promoting sustainability initiatives (Abubakar & Dano, 2020).

Urban policy and zoning regulations are crucial for promoting and regulating mixed-use developments (Raman & Roy, 2019). However, there is a lack of evidence on how these policies ensure different land uses within mixed-use buildings (Rabianski et al., 2009). While Shanghai has experienced remarkable growth and development (Luo, 2021), there are gaps in academic research on real estate and urban dynamics (Zhang, et al., 2021). Therefore, this study aims to address the participation of these mixed-use assets in city masterplans (Shen & Kee, 2017), their impact on open areas (Zhu & Wang, 2022), and urban factors (Li et al., 2022).

Primary literature focuses on urban mobility, metro systems (Lin, et al., 2020), and underground expansion (Xiao-rong & Hai-Xiao, 2017), with limited analysis of the contribution of mixed-use assets to city-wide infrastructure (Wang, 2017) or transportation systems (Ge, 2017).

### 2.2. User perspectives

Other studies have examined consumer perspectives in the hospitality industry (Zhao et al., 2022), retailers (Liang & Wilhelmsson, 2011), and multinational companies (Woohyoung et al., 2020). Luxury brands are also found in many mixed-use projects (Singh, Shukla, & Schlegelmilch, 2022), serving as indicators of opportunity for occupiers (Pantano et al., 2021) and global brands (Welté et al., 2022).

However, there is limited analysis of the performance of mixed-use buildings towards their occupiers (Maliene, 2011) or their own property operations (Azian et al., 2023). In addition, there is a lack of relationship between building use (Liu et al., 2020), global retailer presence (Wu, 2011), or participation from global design firms (Madsen & Petermans, 2020).

### 2.3. Environmental, Social, and Governance (ESG)

Incorporating environmental, social, and governance (ESG) principles (Brown & Barber, 2012) into mixed-use buildings has transformed urban living in China's megacities (Chiu, 2012).

The inclusion of ESG factors (Chatterji, 2016) and MCDM analysis (Dobrovolskienė, et al., 2019) aimed to improve the sustainability and social impact of these developments (DeLisle & Grissom, 2013). However, there is limited research on the compliance of mixed-use assets with green certifications (Jang et al., 2018),

ESG reporting (Laposa & Villupuram, 2010), and global standards in large cities (Hassan & Lee, 2015).

Therefore, understanding the impact of ESG factors is relevant for sustainable development (Mercereau et al., 2022), informed decision-making by asset managers (de Jong & Rocco, 2022), and increasing consumers' awareness in multi-use buildings (Cheung et al., 2019).

#### 2.4. Financial analysis

Financial literature has explored real estate performance (Jing, 2017), financial competitiveness (Lin & Shao, 2013), and the capital structure of large firms with a presence in Asia (Tian, 2023). Other studies have examined corporations that own their real estate (Ng et al., 2022) and how managerial ownership (Ruan et al., 2009) affects their capital structure.

Corporate studies have explored the performance (Yuan, 2019) and competition (Fan et al., 2022) of firms. Chinese scholars studied the relationship between debt (Chu et al., 2023) and a range of factors, like equity in business operations and technical efficiency (Wang et al., 2015).

The influence of foreign investment (Ayamba et al., 2020) and financing in the development of mixed-use projects in Shanghai (Fu et al., 2015) has also been examined. Furthermore, the relationship between direct and indirect real estate investments (Lim et al., 2015) and the asset valuation of local developers has been reviewed through core competitive indicators (Zhang et al., 2010).

In the real estate industry, there is literature discussing the financial framework (Liang et al., 2014), investment strategy (Wei, 2019), stocks, and corporate governance (Xu et al., 2016) of key players. Additionally, Real Estate Investment Trusts (REITs) and publicly listed real estate developers have gained a significant role in the development of these projects (Vorontsov et al., 2016), which has served developers to make different investment decisions (Pandya & Patel, 2020).

While previous studies have analyzed diversified portfolios (Dhar & Goetzmann, 2006), specific typologies (Fu & Jennen, 2008), and different time horizons (Delfim & Hoesli, 2019), limited research has focused on listed companies involved in mixed-use developments. Thus, there is a need to explore the relationship between direct and indirect real estate investments in China, which Newell et al. (2005) found to be relevant for large urban areas like Shanghai.

### 3. Data and methods

#### 3.1. Real Estate Indicators

The first MCDM analysis reviews large real estate firms with mixed-use projects completed in Shanghai between 2009 and 2019 (Deng et al., 2018); (Ersoy, 2017).

Table 1 illustrates the classification of three group dimensions (E, I, and U) based on the level of detail in defining real estate assets and the importance assigned to different ratings (1 to 5). The stakeholder selection criteria follows mixed-use uniqueness (McBride, 2014) specific to this asset type and definitions from the Project Management Institute (Smith, 2000).

Indicators with higher scores, such as proximity to public transportation (Tian et al., 2017), ESG corporate strategy (Avramov et al., 2022), catchment area (Dolega et al., 2016), previous development experience, and presence of international brands (Léo & Philippe, 2002), are considered more significant due to their direct impact on the buildings. On the other hand, indicators with lower scores are not strategic or relevant for these assets.

The scoring in this MCDM appraisal can be customized for different building types. Portfolio stakeholders can evaluate all buildings using these ratings, and an external advisor or valuation consultant can assign scores ranging from 0 to 10 for each indicator based on the suitability of each building to the criteria set out by the consultant.

These indicators can be adapted for distinct types of buildings, assets, and locations, making them universally applicable to real estate. Key Performance Indicators (KPIs) are summarized in the Appendix.

#### 3.2. Finance and Corporate Indicators

The second MCDM appraisal focuses on major stock exchange-listed firms in Asia (Anglin, 2014), with a focus on those with geographic expansion after completing mixed-use projects in Shanghai. Suggested KPIs are identified after studying research data from top real estate investors and publicly listed information (Hui & Chan, 2014).

As per the literature reviewed, KPIs are divided into three groups: F, I, and U, and are rated from 1 to 5, with 5 being the most important (Table 2). Similarly, these indicators can be adapted based on the asset portfolio.

**Table 1**

Three groups of indicators (E, I, and U) with criteria of relative performance

Group	Mixed-use appraisal		Rating	
	(E, I, U)	Indicator	1-5	
External Indicators	1	E1	Country stability	3
	2	E2	Population growth	5
	3	E3	Catchment area	4
	4	E4	Access to metro	5
	5	E5	E-commerce	2
	6	E6	Regen-Experience	5
	7	E7	Competitors	3
Industry Indicators	8	I1	Scalable branding	3
	9	I2	Listed developer	3
	10	I3	Similar experience	4
	11	I4	Global designers	5
	12	I5	Intl Awards	3
	13	I6	Retail GLA / tenants	4
	14	I7	Total sqm / Plot size	5
	15	I8	Project duration	5
	16	I9	Above / Below ground	3
	17	I10	Parking	4
	18	I11	Dedicated CRE teams	3
	19	I12	Sustainability	4
User Indicators	20	U1	Mix rent-roll	5
	21	U2	Supermarket / Cinema	4
	22	U3	Luxury Anchors	3
	23	U4	Flex Office	2
	24	U5	Living (Hotel / Resi)	3
	25	U6	Disposable income	5
	26	U7	Population profile	2

Source: own study.

**Table 2**

Three groups of indicators (F, I, and U) with criteria of relative performance

Group	Mixed-use appraisal		Rating	
	(F, I, U)	Indicators (2009-2019)	1-5	
Corporate & Finance	1	F1	Revenue	4
	2	F2	EPS	5
	3	F3	Net Debt / Total Assets	4
	4	F4	Price per share	4
	5	F5	Productivity	3
	6	F6	Corporate reporting	2
Industry	7	I1	Scalable branding	4
	8	I2	International presence	2
	9	I3	JV - Partnership	3
	10	I4	Sustainability	5
Mixed-Use	11	U1	Office	4
	12	U2	Co-working	2
	13	U3	Living (Hotel / Resi)	3
	14	U4	Retail	5

Source: own study.

**Table 3**

T"EIU " assigned values																						
E							I							U								
E4	E5	E6	E7	E8	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	U1	U2	U3	U4	U5
E-commerce growth	Catchment area	Access to metro	Competitors	Scalable branding	Listed developer	Similar experience	Intl-Local Mix	Global designers	Intl Awards	Own CRE team	Occupancy retail	Occupancy office	Occupancy living	Flex Operator	Hotel	Occupancy/Rents	Parking Ratio	Mix rent-roll	Supermarket/Cinema	Anchors	Disposable income	Population profile
2	4	5	2	3	3	4	3	5	3	3	5	5	5	2	3	5	4	5	4	3	5	2

Source: own study.

**Table 4**

C <sub>j</sub> values (0-10) for TAPEIU calculation. Source: own study																									
E1	E2	E3	E4	E5	E6	E7	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	U1	U2	U3	U4	U5	U6	U7
10	8	6	10	5	10	8	10	10	10	10	10	8	5	5	8	8	10	9	7	5	9	10	10	9	9

Source: own study.

### 3.3. Research calculation

The first MCDM analysis covers 26 mixed-use projects.

We select  $n_E$  indicators of type  $E$ ,  $n_I$  of type  $I$ , and  $n_U$  of type  $U$ , such that:

$$m = n_E + n_I + n_U \quad (1)$$

where "m" is the total number of KPIs (26 indicators in our case). Each KPI has a given score, denoted by:

$$E_j = 0 \leq j \leq n_E, I_j = 0 \leq j \leq n_I \text{ and } U_j = 0 \leq j \leq n_U \quad (2)$$

That, for the mixed-use projects, take values from a given internal criteria<sup>1</sup> from 1 to 5, that is:

$$0 \leq E_j \leq 5, \text{ with } 0 \leq j \leq n_E$$

$$0 \leq I_j \leq 5, \text{ with } 0 \leq j \leq n_I$$

$$0 \leq U_j \leq 5, \text{ with } 0 \leq j \leq n_U$$

The total scoring "T<sub>EIU</sub>" for the "m" indicators considered is,

$$T_{EIU} = \sum_{j=1}^{n_E} E_j + \sum_{j=1}^{n_I} I_j + \sum_{j=1}^{n_U} U_j \quad (3)$$

In our case, with m=26, we assign the  $C_j$  values (Table 3).

#### Criteria

An external advisor will be able to rank each of the mixed-use projects studied, for instance, assigning  $C_j$  (from 0 to 10), to each indicator -  $E$ ,  $I$ , and  $U$ .

<sup>1</sup> An external advisor could assign a correlative value to each  $E$ ,  $I$ , and  $U$  indicator. In our case, 1 to 5.

Therefore, the criteria for appraisal will be  $0 \leq C_j \leq 10$ .

#### Condition

To ensure there is a minimum weight and value given by each group ( $E$ ,  $I$ , and  $U$ ), a minimum value of x% is assigned for each of the three KPIs:

$$\sum_{j=1}^{n_E} E_j \geq \% \sum_{j=1}^{n_E} C_j, \sum_{j=1}^{n_I} I_j \geq \% \sum_{j=1}^{n_I} C_j, \text{ and } \sum_{j=1}^{n_U} U_j \geq \% \sum_{j=1}^{n_U} C_j \quad (4)$$

In our case, we assume all groups should have at least 15%  $\sum_{j=1}^{n_E} C_j$  value.

#### Appraisal

As per the MCDM analysis, the Total Asset Performance (TAP) for 26 indicators, grouped in three categories,  $E$ ,  $I$ , and  $U$ , weighted by  $C_j$  criteria, results in:

$$TAP_{EIU} = \frac{\sum_{j=1}^{n_E} E_j \times C_j + \sum_{j=1}^{n_I} I_j \times C_j + \sum_{j=1}^{n_U} U_j \times C_j}{T_{EIU}} \quad (5)$$

As an example, the analysis done for one of the recently opened projects in Shanghai (HKRI Taikoo Hui) is shown below. An external advisor could assign the  $C_j$  criteria for each of the  $E$ ,  $I$ , and  $U$  KPIs (Table 4).

$T_{EIU}$  scoring, from 1 to 5, is assigned to the 26 KPIs. An external advisor can then assess the mixed-use projects against these indicators, ranking them from 0 to 10.

A similar research calculation is done for the second MCDM appraisal. Details of the calculation are shown in the Appendix.

## Empirical Results

For the first MCDM analysis, all 26 mixed-use projects are assessed against the given  $T_{EIU}$ , evaluated with an external score from 0 to 10.

The scoring for HKRI Taikoo Hui, as of December 31, 2019, with retail occupied at 98%, offices at 99%, and residential at 91% is seen in Table 5.

We then analyze all 25 remaining mixed-use projects against the given criteria  $T_{EIU}$ , assessing them with an external score of 0 to 10.

A chart with a summary of the results is presented

in Fig. 2. The same method is studied in the second MCDM appraisal and group of indicators through those listed firms responsible for some of the projects reviewed. The details of the methodology are presented in Table 6.

For this project and  $m = 26$  KPIs, the  $\max C_j$ ,  $\sum_{j=1}^m C_j$  (6) will be 219, with 15% equal to 33, being  $\sum_{j=1}^{n_E} E_j$ ,  $\sum_{j=1}^{n_I} I_j$  and  $\sum_{j=1}^{n_U} U_j \geq 33$ . HKRI Taikoo Hui  $TAP_{EIU}$  is 8.32 (Fig. 1).

**Table 5**

Taikoo Hui  $C_j$  and TEIU parameters for TAPEIU calculation. Source: own study.

	Country stability	Population growth	Catchment area	Access to metro	E-commerce	Regen-Experience	Competitors	Scalable branding	Listed developer	Similar experience	Global designers	Intl Awards	Retail GLA / tenants	Total sqm / Plot size	Project duration	Above / Below ground	Parking	Dedicated CRE teams	Sustainability	Mix rent-roll	Supermarket / Cinema	Luxury Anchors	Flex Office	Living (Hotel / Resi)	Disposable income	Population profile	Total score
$TAP_{EIU}$	3	5	4	5	2	5	3	3	3	4	5	3	4	5	5	3	4	3	4	5	4	3	2	3	5	2	97
$C_j$	E1	E2	E3	E4	E5	E6	E7	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	U1	U2	U3	U4	U5	U6	U7	
	8.32	10	8	6	10	5	10	8	10	10	10	10	8	5	5	8	8	10	9	7	5	9	10	10	9	9	219

Source: own study.



**Fig. 1.** HKRI Taikoo Hui<sup>2</sup> project opened in Jing'An District in 2017.  
 Source: Hkri.com

## 4. Discussion, Valuation Considerations, and Limitations

The integration of various functions within mixed-use buildings has the potential to drive social transformation, enhance social cohesion, and improve access to amenities and services in urban areas (Paradise, 2016). These developments have played a

pivotal role in CBD regeneration (Lopez-Mugica et al., 2022) and serve as hubs for future city expansion (Meng et al., 2023). Several key observations can be made based on the results of the MCDM valuations:

- The most attractive mixed-use developments include proximity to a metro station (100% of the developments analyzed had access to a metro entrance within a 500-meter radius).
- Developers with higher scores exhibit prior real estate experience and specific teams involved in distinct phases of development. This practice is observed in most listed firms (Meijer & Buitelaar, 2023) that have well-established corporate ESG strategies.
- Employing an omnichannel strategy and maintaining consistent ESG branding is essential (Rahman et al., 2022) to ensure a balanced commercial mix between local and international occupiers (Pangarkar et al., 2022).
- These hybrid assets offer the advantage of spreading risk across different uses (Yue et al., 2014), spreading investment out between retail, hotels, offices, and residential. Property owners can lease offices with additional service offerings when there is a shopping center at the

<sup>2</sup> Image available at <https://www.hkri.com/>, Accessed, Nov '23

podium level (Wu & Lo, 2018). And hotel use and apartments (Ndaguba et al., 2023) have the convenience of enjoying the services provided by retail (Ye et al., 2021) or as tourist destinations (Mustelier-Puig et al., 2018).

- The most attractive mixed-use assets exhibit strong financial indicators (Wu et al., 2015), sustainability strategies, relevant certifications, and priority ESG governance (Chiang et al., 2019).

A chart with a summary of the results is shown in Fig. 3.

The methodology and appraisal of the three groups of indicators can be adapted to different

agents across the real estate ecosystem (Gielens & Roggeveen, 2023). Therefore, they are intended to be applicable to all industry advisors, including corporate real estate leaders (Wang et al., 2019), investors, developers, and local administrations (Robinson & McIntosh, 2022). In fact, in June 2021, the Mayor of Shanghai announced the creation of "China's largest fund for Urban Renewal" with over 80 billion RMB to attract additional investment to support the redevelopment of old neighborhoods and urban renewal (Razzak, 2023), emphasizing the significance of public involvement and partnership with the business community (Azzam & Alhababsah, 2022).

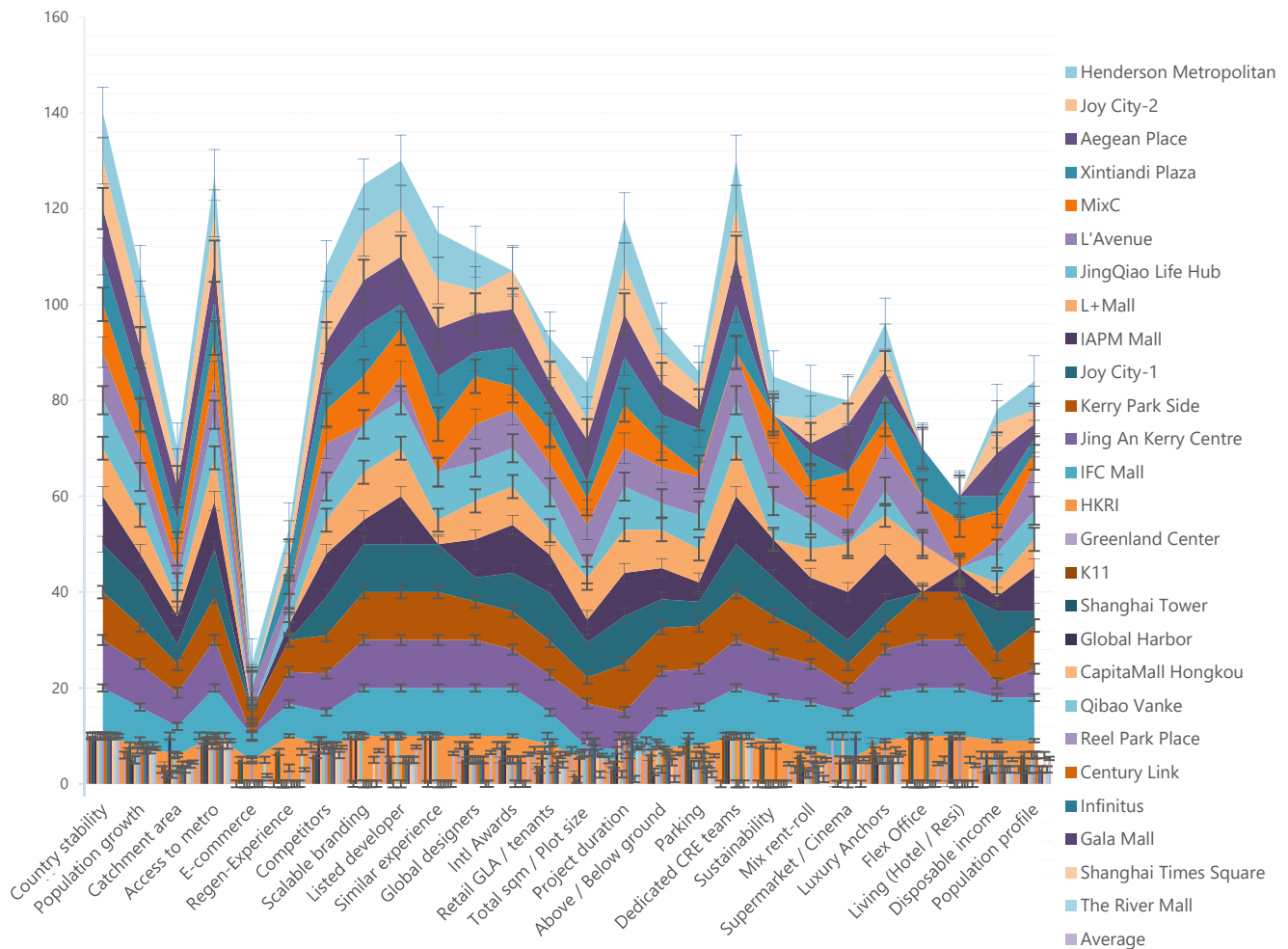


Fig. 2. T<sub>EIU</sub> Summary of the twenty-six analyzed projects. Source: own study.

Table 6

Table with Mixed-Use developers and selected projects.

Developer	Stock Code	Mixed-Use Development	Opening
Sun Hung Kai Properties	0016.HK	IFC Mall	2010
CapitaLand Integrated Commercial Trust	C38U.SI	CapitaMall Hongkou	2011
Henderson Land Development	0012.HK	Henderson Metropolitan	2011
Kerry Properties	0683.HK	Jing An Kerry Centre	2013

Hong Kong New World	0017.HK	K11	2013
Vanke	000002.SZ	Qibao Vanke Plaza	2016
CITIC	0267.HK	Gala Mall	2017
HKR International & Swire	1972.HK & 0480.HK	HKRI Taikoo Hui	2017
China Resources Land (& Shentong)	1109 HK & 600834.SS	MixC	2017
Shui On Group	0272.HK	Xintiandi Plaza	2019

Source: own study.

The triple evaluation of indicators for mixed-use projects is proposed for large cities under development as well as for other international urban locations (Lee, 2011). International practitioners can gain insights from this study for future expansion, development, and operations (Batsakis et al., 2023).

This article examines major real estate developers from Hong Kong, China, and Singapore (Zheng, 2013), focusing on their mixed-use assets in Shanghai, through two MCDM appraisals with three groups of

indicators. It aims to fill the research gap in the valuation of mixed-use developments and their impact on urban planning and city regeneration. It provides an overview of MCDM methodologies and their applicability to complex real estate assets and adds academic background to the field. The MCDM methodology offers a comprehensive and systematic evaluation of complex real estate assets and can be customized for different building types, assets, and other development geographies.

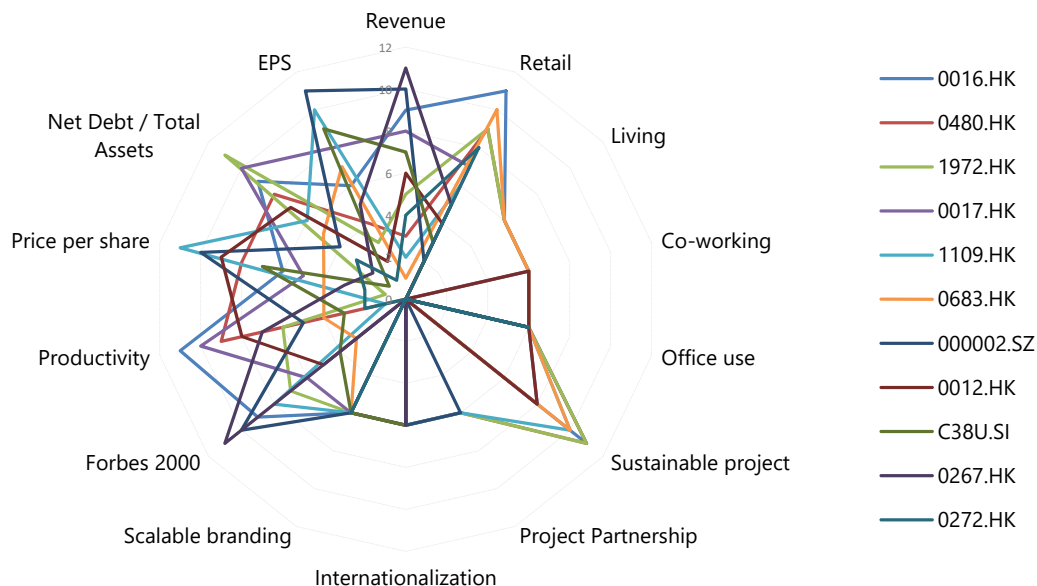


Fig. 3. MCDM appraisal of 11 listed firms. Source: own study.

The study places particular emphasis on the integration of Environmental, Social, and Governance (ESG) factors within the valuation process of real estate. By including financial analysis and performance evaluation of listed real estate developers, the research expands upon conventional appraisal methods. It underscores the significance of considering financial indicators, sustainability strategies, and relevant certifications. This paper highlights the critical role of ESG integration in achieving efficient pricing and promoting sustainable development. It goes beyond traditional valuation approaches, suggesting a comprehensive analysis of

financial aspects and a performance evaluation of listed real estate developers. The study underlines the importance of financial indicators, environmental sustainability strategies, and recognized global certifications.

Listed firms aim to create value and maximize shareholders' wealth (Zhao, 2023). They also have a significant influence on the cities they operate in (Musil, 2011), particularly when they adopt a long-term strategy (Niu et al., 2019), corporate branding (Khanna et al., 2013), and ESG commitment (Park, Lee, & Kim, 2013). Firms with strong ESG compliance and certification (Białkowski et al., 2023) protect

stakeholders' interests (Elg & Welinder, 2022). Therefore, including ESG practices in investments (Kaiser, 2020), corporate governance (Cai et al., 2017), and strategic partnerships with authorities (Lichtenberg & Ding, 2009) is highly recommended (Ionaşcu, 2020).

The study utilizes two MCDM evaluations with three groups of KPIs, supported by interviews with international real estate professionals (Chen et al., 2023). The first MCDM analysis utilized qualitative data, articles, and corporate ESG reports of listed companies (Hui et al., 2013). It was conducted with a diverse group of stakeholders, including developers, architects, and representatives from the real estate sector in Shanghai and other Chinese cities (Matsushita et al., 2005). The second MCDM appraisal focuses on examining assets and developers from 2009 to 2019, a decade between crises, which provides a focused timeframe within the methodology (Ng et al., 2022).

However, due to the limited number of assets and certain data being confidential, further development is needed to provide more data on the proposed indicators and performance model. Nevertheless, the limited sample size does not restrict the generalizability of the findings. It is crucial to consider the competitive landscape of the city and identify districts open to future investments (Elmedni et al., 2018). These factors significantly impact stakeholders' criteria (Mittal & Kashyap, 2015), sustainability management, construction planning (Kim et al., 2019) and urban policy opportunities (Lai et al., 2020).

## 5. Conclusions

The article provides insights into the valuation and appraisal of large mixed-use projects in megalopolis areas, with a focus on land optimization and its impact on economic growth and social transformation (Ye & Shi, 2017).

The first MCDM study emphasizes the importance of considering three groups of indicators, i.e.: External-Social, Real Estate Industry, and Users or Occupiers. The findings support the development of inclusive neighborhoods by incorporating social infrastructure and enhancing the regeneration of megacities (Lee, 2017). These insights can be used to create regulations and policies that foster transparency, accountability, and sustainable growth in the real estate sector internationally (Kong et al., 2023).

The second MCDM study highlights the importance of considering KPIs in evaluating the

financial performance of listed developers in the context of mixed-use developments (Andrew & Glenn, 2003). This research addresses the lack of substantial research linking social, real estate, and financial implications, emphasizing the need for a holistic perspective (Sana Hsieh, 2014). Furthermore, the study introduces a flexible framework for appraising mixed-use assets, providing requirements for funds and asset management firms (Ng et al., 2022).

The study also evaluates the decision criteria (Erdogan & Naumčik, 2019) and internationalization valuations employed by developers. However, further investigation is needed on relationships between developers and authorities (Hietanen et al., 2016), the ownership decision structure of firms (Tang & Mori, 2017), and external macro-economic factors (Feng & Baijie, 2018). The study also highlights that the integration of ESG factors in location selection reflects the importance of sustainable development and urban planning (Aroul et al., 2022). This information can assist stakeholders (Ranfagni & Guercini, 2014) in decision-making and resource allocation (Kumar, 2017).

The presented findings can be applied to other cities facing similar challenges related to execution, regeneration and urban expansion, including international city-to-city collaborations (de Villiers, 2009). Policymakers, real estate developers, investors, and international partnerships can benefit from adopting the proposed framework (Gupta & Ramachandran, 2021).

Overall, this methodology provides guidance for optimizing strategies and improving financial performance, demonstrating its adaptability and relevance across different geographies. It offers insights into the value and impacts of mixed-use developments in transforming megacities.

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