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SUSTAINABILITY OF AFFORDABLE HOUSING: A REVIEW OF ASSESSMENT TOOLS

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ABSTRACT

This paper aims to examine the current sustainability assessments of affordable housing in Malaysia by reviewing existing tools used in project development. In line with global concerns on sustainable development and advancement in the development of tools accessing sustainability, Malaysia has also implemented similar green assessment systems such as Green Building Initiative (GBI), Green Real Estate (GreenRE), the Environmental Impact Assessment (EIA), Low Carbon Building Assessment, etc. The scope and focus of each are somewhat different, with each of these targeting specific types of building or development sectors; but none has been developed to suit the requirements of high-rise low-income or affordable housing. Indeed, this is a special sector considering its circumstances of low budget and thus limiting itself in resource utilization and construction implementation. This paper argues that there are inadequacies in the existing sustainable assessment systems with regard to the special requirements of the high-rise affordable housing sector. In this paper, we will discuss these issues and highlight some of the inadequacies. Data derived mainly from a content analysis of policy documents and news reports. Examples and data focusing on Penang state are featured. The findings are part of a study in developing a framework of sustainability assessment for high-rise affordable housing in Malaysia.

Disciplinary: Architectural Science (Sustainable Housing and Policy).

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1. INTRODUCTION

Rapid development and concentration of population in cities pose high demands for housing with the construction sector accounted as a key sector contributing to sustainable challenges. As such, sustainability in providing adequate housing is a subject that demands critical attention. Sustainable housing takes into account economic, environmental, and social issues and must equally satisfy the

long-term sustainable outcomes (Brandon & Lombardi, 2011). However, integrating sustainability into affordable housing are challenging due to time and financial constraints (Gan et al., 2017). Affordability would disappear if households spend more than 30% of their income on housing as this leaves little for other non-housing necessities such as food, clothing, medical, education, and utility bills (Feldman, 2002). Besides the life-cycles of buildings, sitting and location of the buildings are some other contentious issues. Providing affordable housing in locations away from the city means longer commuting distance and higher energy consumptions, with the lower-income group, tend to be less likely to move than those from higher levels (Wahi et al., 2018). It can pose substantial threats to natural resources, in the instances of opening up land in hill slopes and coastal seafront causing degradation of environmental features. Presently, there are already in place various screening and evaluation processes before a project development can be implemented. But none has specifically focused on the high-rise affordable housing sector. This paper aims to provide a review on the implementation of project evaluation tools related to sustainable assessment and highlight to what extent they are adequate for integrating sustainability features in the assessment of high-rise affordable housing. The focus will be on Penang state with its highly urbanized setting and the manifestation of issues challenging the notions of sustainable affordable housing (Abujrad, 2018).

2. METHODOLOGY

This paper is mainly based on secondary resources using the content analysis method in reviewing policy documents and news reports. A large amount of text of existing documents is reviewed and transformed into organized and summarized information. Cases of news reports involving impacts of housing developments and the related commentaries are organized and the issues analyzed. These are supplemented with existing literature and past studies related to the topic.

3. LITERATURE REVIEW

3.1 AFFORDABLE HOUSING POLICIES

In Malaysia, affordable housing is offered by three-tiers of governments, i.e. federal, states, as well as local authorities with each playing different roles and responsibilities. The federal government formulates policies and guidelines for development and planning on affordable housing; state governments provide appropriate locations while the local governments are responsible for the approval of plans and development applications (Ebekoziem et al., 2017). Over the years various housing policies have been implemented. Policies such as National Housing Policy, National Five-Year Plan, New Economic Policy; and proposal of One Million Affordable Homes (RMN) 2018-2020, show the efforts of governments towards achieving affordable housing targets. Tables 1 and 2 present the list of current affordable housing schemes and the associated financial assistance.

Apart from the federal government, state governments such as those from Penang and Selangor, have taken pro-active steps contributing to affordable homes. In 1982, the Penang state government implemented a 30% quota requirement for low-cost housing that was imposed in private sectors to stimulate them in supplying low-cost housing. In 2014, it was revised to 20% low-cost and 20% low-medium-cost housing (FMT, 2018b). In January 2019, the Penang State government decided to allow some of the affordable housing units to be sold in the open market instead of restricted to only

first-time home-buyers; it has also raised household income cap to encourage more take-up rates and counter the high cases on bank loan rejections (Malay Mail, 2019).

Table 1: Affordable Housing Schemes in Malaysia.

(Source: Authors' compilation from various sources)

Affordable Housing Schemes	Objectives	Targeted Income
1 Malaysia People's Housing (PR1MA)	To build affordable housing in urban areas for middle-income Malaysians	RM2,500-15,000
Private Ownership Housing Scheme (MyHome)	To encourage more affordable homes development by private sectors	RM3,000-6,000
Perumahan Penjawat Awam Malaysia (PPAM)	To provide an affordable and quality house for government servants	Entitled for all grades of government servants
Program Perumahan Rakyat (PPR)	To improve the standard and living cost of the low-income group	< RM2,500
Rumah Idaman Rakyat (RIR)	To provide affordable houses for the middle-income group	Household: ≤ RM10,000 Individual: ≤ RM7,500
Wilayah Residen (RUMAWIP) <i>Formerly known as Rumah Mampu Milik Wilayah Persekutuan</i>	To provide affordable homes form middle-income Malaysian who stays and works in Wilayah Persekutuan	Household: ≤ RM15,000 Individual: ≤ RM10,000
Rumah Selangorku	To provide affordable houses to a middle low-income group within the vicinity of the Selangor region	≤ RM10,000
Rumah Mampu Milik	To provide affordable housing to low and middle-income group	Varied among states

Table 2: Financial Affordable Housing Schemes of homeownership in Malaysia.

Source: Authors' compilation from various sources

Financial Assistant Schemes	Description
FundMyHome Scheme	A crowdfunding initiative in which buyers pay for 20% of property prices and investors pay for the balance.
Rent-to-Own Schemes	Buyers need not pay for the 10% down payment
Reside-and-Purchase Program	Buyers need to pay for 5% down payment and have to pay the balance within 36 months with no interests
My Deposit Scheme	10% of the sale price or a maximum of RM30,000 (whichever is lower) is provided by the government for first-time home-buyers and need not return

3.2 SUSTAINABILITY ISSUES IN CURRENT DEVELOPMENT OF AFFORDABLE HOUSING IN PENANG

Indeed, quality housing promotes high design standards in construction, accessibility, takes care of the environment, and provides adequate amenities, infrastructure, and facilities to the communities. However, at times, this may not entirely be the case. In a highly urbanized situation such as Penang Island, the limited resources need to be distributed fairly across geography and in different sectors. The competing land use in cities made it expensive to build cheap houses as the land price is one key factor that contributes to high costs in housing (Kamal et al., 2016). Hence, finding new land or creating more land for development could mean jostling between the social, human, and natural capital, in fulfilling the three pillars of sustainability. In other words, it is about finding the right balance by looking at the opportunity cost, between providing housing and sacrificing environmental resources.

In Penang, the development of high-rise high-density affordable housing has frequently caught controversies with its ‘boldness’ in the implementation, such issues include raising the housing density to an unprecedented level, allow encroachment into environmentally sensitive areas, lack of concerns to other side effects such as safety and congestions, etc. On the housing density issues, in 2016 it was increased to 128 units per acre from 87 units per acre previously. The reason given was that the smaller the unit size, the lower the price for affordable housing (The Sun, 2016). The reason for doing so was said to due to limited land resources on the island. This amendment of guideline seems to be valid given that some researchers support for high-density developments. Winston and Eastaway (2008) suggested that higher density development is more sustainable than low-density development where lesser land is required; and that higher density development tends to reduce energy consumption (Towers, 2010). However, Ng (2013) argued that higher density development can only sustainable if it is well-planned and well-designed. The Consumers’ Association of Penang (CAP) argued that with such high-density development it would bring adverse effects to the environment, quality of life of the occupants, and residents in the surrounding areas (FMT, 2016).

On the issue of building on environmentally sensitive areas, there have been several housing projects built on hill slopes which were criticized as violating the guidelines. Referring to the Penang Structure Plan 2020 which was gazette in 2007, “development projects above a gradient of 25 degrees *and/or* 250 feet above sea level” shall be prohibited. However, in the latest Penang Structure Plan 2030 tabled in 2018, it has changed to “development projects above a gradient of 25 degrees *and* 250 feet above sea level” shall be prohibited. The amended guideline has raised concerns and worries of citizens that the development projects will only get disapproval if both criteria are fulfilled.

In less than three years, a spate of unfortunate disasters involving the construction of high-density housing development has occurred. In 2017, a site accident happened in a high-rise affordable housing project in Tanjung Tokong resulting in the loss of eleven lives after heavy rain and landslide (Malaysiakini, 2017). Another similar housing project, Pine Sanctuary, which is a high-density apartment consisting of three blocks of forty-seven stories luxury apartments and a forty-one story affordable housing received criticisms as it is constructed on a steep hill slope (Asia One, 2017). Also in 2018, a mixed development project was approved to construct on a Class Four Hill. (As according to Safety Guidelines for Hill Slope Development 2012, Class Four Hill has slope gradient of more than 35 degrees and classified as Environmental Sensitive Areas with Disaster Risk.) It includes five blocks of twenty-nine stories of tower blocks, two blocks of thirty-four stories serviced apartment and one block of affordable apartments (FMT, 2018a).

Apart from the environmental issues, economic issues such as the realities of demand and supply are factors to be considered in the sustainability equation. The current seemingly over-supply of the affordable housing situation in the State of Penang has prompted the state government to do a major overhaul to the policies. Previously, affordable housing was strictly controlled only to be sold to Penang residents. In January 2019, the terms and conditions of purchasing affordable housing were revised and relaxed, with 40% of the listed affordable housing units to be sold in the normal open market following market rate, of which 20% are opened to residents from other states (The Star, 2019).

3.3 CURRENT ASSESSMENT OF SUSTAINABILITY IN AFFORDABLE HOUSING

Clearly, from the issues above, the sustainability of the current development of affordable

housing is questionable. A review of related assessment systems has found that sustainable development schemes in Malaysia employ several approaches. Generally, sustainable performance of housing can be evaluated by rating tools, policies, indicators and frameworks. Most of these approaches apply to all types of buildings – residential and non-residential.

Aside from the indicators, which are considered as non-legal binding and voluntary-based, an assessment used to control project development is carried out through development planning systems. All development projects on land, including housing, shall apply for planning permission from local authorities. The local authorities will carry out the procedure to inspect and assess the proposed development project by reviewing items, criteria and restrictions as formulated. Below are the current approach used, that are related to the evaluation of the sustainable performance of housing:-

3.3.1 TOWN AND COUNTRY PLANNING SYSTEM

Town and Country Planning Act (TCPA) is a legal tool for control and regulation of town and country development. It was enacted in 1976 and has since undergone four amendments from 1993 to 2017. A development plan must be submitted before the commencement of any development projects. According to subsection 19 (1), Town and Country Planning Act 1976 (Act 172), proposed development projects shall obtain permission and approval from the Local Planning Authority before carrying out on site. Under Act 172, there are four types of development plans, which are – National Physical Plan (RFN), State Structure Plan (RSN), District Tour Plan (RTD), and Special Area Plan (RKK).

Table 3: Development Plans under the Town and Country Planning Act 1976 (Act 172).
(Source: Pulau Pinang Town and Country Planning Development)

Development Plan	Functions
National Physical Plan	Used as a physical planning guide and implemented at Federal and state levels throughout Peninsular Malaysia.
State Structure Plan	Consists of State’s policies and strategic regard to the development and land use which to streamline existing development plan policies
District Tour Plan	Defines general policies in State Structure Plan to a more detailed and more physical form
Special Area Plan	A specific action plan for an area identified by the authorities which is a more detailed proposal plan than District Tour Plan

Apart from this, the Development Proposal Report (LCP) shall also be submitted to the authorities for planning permission (Section 21A(1)) along with Layout Plan (Section 21B, Act 172). LCP is a technical report to explain and justify the development’s concept. It consists of the location map, key plan, site plan, contour plan; description of land including physical environment, topography, landscape, geology, drainage and natural feature; land use analysis; and survey of existing trees, vegetation and building affected by the development.

3.3.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Environmental Impact Assessment (EIA) is one of the mandatory requirements for developments that exceed a certain scale and pose threats to the environment. It identifies the positive and negative effects of the environment caused by a proposed development (Hamid and Long, 2017). The EIA provides an understanding of existing environmental issues and potential environmental impacts. It is

considered as a technique to improve environmental performance and ultimately achieving sustainable development.

Under the EIA, public participation is an essential element to be incorporated. However, the effectiveness of public participation in EIA is questionable. Feedbacks and perceptions of the public often seem meaningless and disregarded although they concern very much of environmental issues (Rahman, 2011). According to Makmor and Ismail (2015), EIA should address the cumulative impacts of the proposed development. It is because a single development project might only bring a little impact to the environment, but a significant effect may result when integrating other activities.

3.3.3 SOCIAL IMPACT ASSESSMENT (SIA)

Before Town and Country Planning (Amendment), Act 2017 (Act A152) came into effect, Social Impact Assessment was only a report or a part of the EIA report. However, since 2017, developers have to carry out SIA as a mandatory process for developments. SIA is a tool to assess human needs and social impacts affected by the proposed developments. Besides, the SIA acts as a framework for dialogue on development priorities among social groups, civil society, grassroots organizations, different levels of government, and other stakeholders (Hassan, 2018).

Similar to EIA, SIA requires public participation during the scoping stage. Malaysia is a multi-cultural nation whereby to carry out SIA is to ensure concerns and benefits of all ethnicities are taken into account in development. Presently, SIA is still not as widely accepted and essential as compared to EIA in project developments. The concern of implementation of SIA was raised in a recent seminar in Penang (KPB, 2019). As a stand-alone report, the developers must, therefore, evaluate and assess positive and negative social impacts brought by the proposed developments. Taking Penang South Reclamation (PSR) project as an example, the SIA was viewed to be important to ensure the welfares of the local citizens are uplifted and secured.

3.3.4 GREEN RATING TOOLS

Other tools related to sustainability assessment are referring to green building assessment systems implemented in Malaysia since the 1990s. There are several types of rating tools available in Malaysia to evaluate the sustainable performance of buildings. The green rating tools were designed according to the country's weather, social and cultural needs, political and development contexts.

The first green rating tool was the Green Building Index (GBI), developed by Pertubuhan Arkitek Malaysia (PAM) in 2009. It evaluates buildings' performance in six criteria: energy efficiency (EE), indoor environment quality (EQ), sustainable site planning and management (SM), materials and resources (MR), water efficiency (WE), and innovation (IN). Until January 2019, a total number of forty-four buildings were certified by GBI in Penang. Among these, The Light Collection 2 was one of the more well-known green certified residential buildings.

Another similar green building rating tool is Green Real Estate (GreenRE) initiated by Real Estate and Housing Development's Association (REHDA) in 2013. It assesses a building's performance in terms of water and energy efficiency, indoor air quality, and environmental protection and carbon emissions of the development. Building performance is evaluated by qualified GreenRE managers: comprised mostly of architects, engineers and developers (GreenRE, 2018). Until January 2019, there was a total of thirty-seven certified (fully and provisional) residential buildings with GreenRE.

Another green rating tool used is Green Mark from Singapore. It covers several types of buildings, including residential buildings, non-residential buildings and infrastructures (Building and Construction Authority, 2018). Its rating criteria include energy efficiency, water efficiency, environmental protection, indoor environmental quality and other green features and innovation. Priced at more than half a million, the River Tropics was a first green high-rise residential project to receive Green Mark certification in Penang.

4. ISSUES IN CURRENT SUSTAINABILITY ASSESSMENT

At present, there are various incentives and recognitions provided by agencies and governments on the sustainable performance of buildings, to encourage the construction of green buildings. However, it is observed that residential buildings certified with current green rating tools all fall within the category of middle to high costs categories. Table 4 displays the market price of certified green residential buildings in Penang. As indicated, all of the green-certified buildings cost above half a million ringgit, which are way beyond the affordable levels of the general public.

Table 4: Residential buildings certified with current green rating tools in Penang and the market values of each property (retrieved data on 15 January 2019
Source: Authors' compilation from various sources)

Project Name	Certification	Classification	Property Value (propertyguru.com.my).
The Light Collection 2	GBI	Certified	RM580,000 onwards
Olive Tree Residences	GBI	Certified	RM720,000 onwards
The Tamarind	GreenRE	Bronze	RM800,000 onwards
Preston Oaks	GreenRE	Gold	RM6,250,000
River Tropics	Green Mark	Gold	RM500,000 onwards

Indeed, affordable housing is a critical category of housing that needs higher, if not an equal emphasis in green ratings. This mass housing sector is essentially satisfying the sustainability agenda with its efficient use of resources in providing essential shelter, forming the core elements of sustainable habitat to provide human 'needs', rather than 'wants'. Why then, is there a lack of initiative in getting affordable housing to be certified and rated as a green building? Does it mean in the process to provide housing with the cheapest means, environmental concerns such as using green and energy-saving materials, pollution and traffic congestions are secondary?

One of the critiques on existing green building assessment such as the GBI was that it has become a commercial trick by some property developers (Abidin, 2010). Sustainability is thus perceived as a method to enhance an organization's public image and promote a positive impression in endorsing Corporate Social Responsibility (CSR), as can be seen from the experiences of AECOM and ARUP. Research has also shown that green certifications help to increase property value (Abdullah et al., 2016). In Malaysia, there tends to be an emphasis by developers on "visible aspects" of sustainable design, such as green facades and externally placed renewal energy technologies.

According to Charoenkit & Kumar (2014), the sustainability framework and tools are developed by governmental agencies or professionals and experts and focuses only on their narrow sectorial concerns. Another deficiency in existing sustainability assessment tools is that it does not address

potential vulnerability and resilience to disasters. Studies have shown that income level as one of the factors when confronting disasters (Baker, 2011; King, 2001; Pajoo, 2014). For the low-income group, they are often deemed as vulnerable groups to climate threats (Laukkonen et al., 2009).

Another fact is that the current sustainability framework seems to place a higher emphasis on physical environment aspects, i.e. site selection, design features, building materials compared to social sustainability aspects. According to Rapaport (2015), “culture” cannot be seen or observed; it can only be expressed in terms of its effects and products. Research also pointed out that cultural elements in housing do affect occupants’ satisfaction level. With a higher satisfaction level, occupants tend to appreciate, and thus the quality of life would be enhanced (Sultan Sidi, 2011). Other factors that are left out in the existing assessment tools are levels of acceptance of affordable housing schemes by surrounding communities, local governance and improper social relations (Winston & Eastaway, 2008). Indeed socio-cultural integration of different occupants within the affordable housing schemes involves issues that are seldom addressed. In addition, community participation and empowerment (Ross et al., 2010); security of tenure and effective management of properties in creating a sense of belonging and community stability (Azevedo & Silva, 2010) are other elements to be considered in a holistic sustainable assessment of affordable housing.

5. CONCLUSION

The construction industry brings significant impacts on the economy, environment and society (Kucukvar and Tatari, 2013). Thus, sustainability in the construction sector plays an important role across the whole life cycle, from planning to disposal (Kibert, 2008). Sustainability in the building is not about the day it is completed but only revealed through long-term performance. Housing represents multiple attributes, including shelter, personal status, self-satisfaction and financial asset. It is permanently fixed in space, cannot be moved from places to places and have a very long life cycle. Therefore, a sustainability framework is essential to evaluate the performance of affordable housing. As discussed, there may be several assessments and evaluation tools in place in Malaysia. However, it is lacking a proper sustainability framework for the affordable housing sector, especially for the high-rise high-density affordable or low-income housing. To integrate sustainability into affordable housing, economic, social context and natural resources must be taken into consideration. It is also essential to include concerns and input all stakeholders in developing an appropriate sustainability framework for affordable housing.

6. DATA AND MATERIAL AVAILABILITY

Data can be made available by contacting the corresponding author.

7. REFERENCES

- Abidin, N. Z. (2010). Investigating the awareness and application of sustainable construction concept by Malaysian developers. *Habitat International*, 34, 421–426. doi: 10.1016/j.habitatint.2009.11.011
- Abujrad, A. A. M., Hassan, A. S. (2018). Home ownership in low-cost houses in Penang, Malaysia. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*. 9(2), 85-96. <http://tuengr.com/V09/085.pdf>

- Asia One (2017) Penang landslide: Residents living under shadow of fear, Malaysia News. *Asia One*. <http://www.asiaone.com/malaysia/penang-landslide-residents-living-under-shadow-fear> (Accessed: February 2019).
- Ebekozien, A., Abdul-Aziz, A.R.B., Jaafar, M.B. (2017). Comparative Analysis of Low-Cost Housing Policies in Malaysia and Nigeria. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*. 8(3), 139-152. <http://tuengr.com/V08/139.pdf>
- Feldman, R. (2002). The Affordable Housing Shortage: Considering the Problem, Causes and Solutions. *Banking and Policy Working Paper 02-2(2)*, 1–43.
- FMT. (2016). CAP alarmed by ‘decision’ to raise housing density. *Free Malaysia Today*. <http://www.freemalaysiatoday.com/category/nation/2016/03/03/cap-alarmed-by-decision-to-raise-housing-density> (Accessed: February 2019).
- FMT (2018a). Engineer: Lives at risk in Penang hill project. *Free Malaysia Today*. <http://www.FreeMalaysiaToday.com/category/nation/2018/04/29/engineer-lives-at-risk-in-penang-hill-project> (Accessed: February 2019).
- FMT (2018b) Penang moots new affordable housing scheme. *Free Malaysia Today*. Available at: <http://www.freemalaysiatoday.com/category/nation/2018/11/15/penang-moots-new-affordable-housing-scheme> (Accessed: January 2019).
- Gan, X. *et al.* (2017). How affordable housing becomes more sustainable? A stakeholder study. *Journal of Cleaner Production*. 162(2017), 427–437. doi: 10.1016/j.jclepro.2017.06.048.
- Hamid, M. A. and Long, K. Q. (2017). An Assessment of Environmental Impacts Assessment (EIA) in Malaysia’, in *SHS Web of Conference*. EDP Sciences. Available at: http://www.shs-conferences.org/articles/shsconf/pdf/2017/04/shsconf_icga2017_00018.pdf (Accessed: January 2019).
- Hassan, M. M. (2018) ‘Social Impact Assessment (SIA): A Review of SIA Procedure in Malaysia’, *The International Journal of Social Sciences and Humanities Invention*, 5(4), pp. 4550–4557. doi: 10.18535/ijsshi/v5i4.02.
- KPB. (2019). Seminar Penang 2030 – Manual of Social Impact Assessment (SIA). A seminar held on 19 February 2019, organised by Kelab Jabatan Perancang Bandar & Desa Negeri Pulau Pinang and PLANMalaysia, Pulau Pinang.
- Kucukvar, M. and Tatari, O. (2013) ‘Towards a triple bottom-line sustainability assessment of the U.S. construction industry’, *The International Journal of Life Cycle Assessment*, 18(5), 958–972. doi: 10.1007/s11367-013-0545-9.
- Makmor, M. and Ismail, Z. (2015) ‘Improving Environmental Impact Assessment (EIA) Process in Malaysia’, *Jurnal Teknologi*. Penerbit UTM Press, 78(1). Available at: <http://jurnalteknologi.utm.my/index.php/jurnalteknologi/article/view/4489/4631> (Accessed: January 2019).
- Malaysiakini (2017) *All 11 victims in Tg Bungah landslide accounted for*, *Malaysiakini*. Available at: <http://www.malaysiakini.com/news/399170> (Accessed: February 2019).
- Penang introduces steps to spur housing industry | Malaysia | Malay Mail* (2019) *Malay Mail*. Available at: <http://www.malaymail.com/news/malaysia/2019/01/28/penang-introduces-steps-to-spur-housing-industry/1717208> (Accessed: January 2019).
- Rahman, H. A. (2011) ‘Public Involvement on Environmental Issues in Malaysia with Reference to Alor Star, Kedah’, in *2011 International Conference on Environmental, Biomedical and*

Biotechnology, 90-93. Available at: http://www.thegef.org/gef/public_involvement (Accessed: February 2019).

The Star (2019) Penang's overhang addressed – Nation. *The Star Online*. <http://www.thestar.com.my/news/nation/2019/01/29/penangs-overhang-addressed/> (Accessed: February 2019).

The Sun (2016) *Development density guidelines in Penang to take effect next year, the Sun*. Available at: <http://www.thesundaily.my/archive/2054913-YTARCH407125> (Accessed: February 2019).

Wahi, N. *et al.* (2018) 'Problems and Issues of High Rise Low Cost Housing in Malaysia', *IOP Conference Series: Materials Science and Engineering*. 341(1). doi: 10.1088/1757-899X/341/1/012027.

Winston, N. and Pareja Eastaway, M. (2008). Sustainable Housing in the Urban Context: International Sustainable Development Indicator Sets and Housing. *Social Indicators Research*. 87(2), 211-221. doi: 10.1007/s11205-007-9165-8.



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