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CRITICAL STRATEGIES FOR CONSTRUCTION PLAYERS IN THE ADOPTION OF BIOPHILIC CITY CONCEPT IN MALAYSIA

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Abstract

Around 2.5 billion individuals will be living in urban areas by 2050. Two out of three individuals are going to live in urban communities or other urban focuses, featuring sustainable urban planning and public services. A biophilic city concept which is a sister term of the green city innately affiliates human being to other living organisms. Apart from adhering to human needs, the concept is the economical among other green city concepts. However, biophilic city concept is still an alien term to construction players and the public. The paper aims to propose and evaluate the critical strategies for construction players in the adoption of the biophilic city concept in Malaysia. 173 respondents consisting of government agencies, developers, consultants and contractors were involved in a questionnaire survey. 81 out of 107 strategies were accepted as the critical strategies in adopting the biophilic city concept. Among the strongest strategies are (1) effective water conservation in biophilic city project; (2) acknowledging biophilic city concept adoption publicly; and (3) adequate material resource availability for the biophilic city project. These strategies fall under three different items, namely; (1) sustainability in the biophilic city project; (2) awards and recognition for biophilic city concept adoption; and (3) organisation in the biophilic city project, respectively. Commitment of all construction players are crucial towards inclusive, sustainable urban planning and public services.

Keyword: Biophilic City Concept, Construction Players, Critical Strategies, Malaysia.

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INTRODUCTION

The expected total population for 2030 is 8.5 billion. The population might skyrocket to 9.7 billion in 2050 and 11.2 billion by 2100 (United Nations, 2015). Currently, Malaysia is one of the most urbanised countries in East Asia (Rasli *et al.*, 2019). The developments of townships and new cities are urgently needed to fulfil the basic need of human beings, such as shelter and protection. Unfortunately, townships developments are always associated with harming living organisms (Love *et al.*, 2016). The 11th Sustainable Goal 11, established by the United Nations (UN) focuses on sustainable cities and communities (Waage *et al.*, 2015). A significant number of researchers and government entities from federal and state government, developers and consultants have proposed the new adoption of eco-friendly construction projects. In Malaysia, these projects are in line with the 11th Malaysian Plan (11MP) and Malaysia Baru Strategic Thrust of pursuing green growth for sustainability and resilience by embracing rakyat's environmental-friendly habits and behaviour (EPU, 2015).

This paper proposes the adoption of a biophilic concept into construction projects (i) to respond to the rapid increase in urban population and (ii) to reduce the negative effects of construction projects to other living organisms. The term biophilic was originally taken from the word biophilia that is defined as the inherent of human inclination to natural systems and processes (Xue *et al.*, 2019) by urging the humans to innately affiliate with other living organisms (Wilson, 1986). There exist many contributing factors faced by government entities, developers, consultants, contractors as well as end-users to the failure in biophilic concept adoption (Arof *et al.*, 2020). These factors need to be prevented, monitored and managed. Therefore, this paper aims to propose and evaluate the critical strategies for uptake by construction players in the adoption of a biophilic city concept in Malaysia.

LITERATURE REVIEW

Biophilia is the absolute human tendency to seek connection with nature or other form of life. Even in the advanced world, biophilia continues to be fundamental to the physical and psychological well-being (Wilson 1986; Kellert & Wilson 1993; Kellert 2012; Kellert & Calabrese, 2015). Biophilia acknowledges that human species has advanced with more than 99% of its history in adaptive response to the natural world and not due to artificial forces. The term biophilic which was originally rooted from the word biophilia emerged and later popularised by Harvard myrmecologist and sociobiologist, Edward O. Wilson (Beatley and Newman, 2013). Wilson (1986) defines biophilic as the innate emotional affiliation of human beings to other living organisms as a part of natural cycle. The adoption of biophilic into city development means humans as city inhabitants can interact spontaneously with other living organisms.

This study has conducted a systematic literature review on (i) the general strategies of adopting green construction, and (ii) the strategies in adopting biophilic city concept in construction project.

Based on the systematic review, 107 strategies were identified for uptake by construction players in the adoption of green construction projects. The general strategies for a successful adoption of green construction project are categorized under ten (10) items, namely: (1) government regulation and standards; (2) incentives and research and development (R&D) support; (3) awareness and publicity programmes; (4) education and information dissemination; (5) awards and recognition; (6) project; (7) project team; (8) organisation; (9) external environment; and (10) sustainability (Shi *et al.*, 2013; Darko *et al.*, 2017; Mavi and Standing, 2018; Darko and Chan, 2018; Zhang *et al.*, 2019; Oke *et al.*, 2019; Zhang *et al.*, 2019; Li *et al.*, 2019; Darko *et al.*, 2019; Yas and Jaafer, 2020).

In reference to the 107 identified strategies, the most frequently appeared item in previous studies is the ‘government regulation and standards’, which consists of nine strategies: (1) mandatory policies of green construction project; (2) mandatory regulations for green construction project; (3) availability of competent promotion teams for green construction project; (4) good enforcement of green construction project policies; (5) good enforcement of green construction project policies; (6) green construction project labelling programs; (7) availability of competent local authorities in green construction project; (8) availability of proactive promotion teams for green construction project; and (9) availability of proactive local authorities in green construction project. The second most frequently appeared item is ‘incentives and R&D support’ which include eight strategies: (1) financial incentives for green construction project adoption; (2) further market-based incentives for green construction project adoption; (3) low-cost loans from the government for green construction project; (4) low-cost subsidies from the government for green construction project; (5) low-cost loans from financial institutions for green construction project; (6) low-cost subsidies from financial institutions for green construction project; (7) strengthened green construction project R&D; and (8) tax reduction for green construction project.

Additionally, the third most frequently appeared item is ‘awareness and publicity programmes’ consisting of three strategies: (1) support from executive management in green construction project; (2) public environmental awareness creation through workshops, seminars and conferences for green construction project; and (3) more publicity through media (namely print media, radio, television, and internet) for green construction project). The fourth most frequently appeared item is ‘education and information dissemination’ that consists of five strategies: (1) green construction project-related educational and training programmes for developers, contractors and policymakers; (2)

availability of institutional framework for effective green construction project adoption; (3) innovation technology in green construction project; (4) availability of better information on the cost of green construction project; and (5) availability of better information on the benefits of green construction project. “Awards and recognition” is the fifth most frequently appeared item, covering four strategies: (1) more green construction project adoption advocacy by the federal government agencies; (2) more green construction project adoption advocacy by the state government agencies; (3) acknowledging green construction project adopters publicly; and (4) rewarding green construction project adopters publicly.

The item “project” is the sixth most frequently appeared item that include 13 strategies, which also appears as the third item with most strategies: (1) cost-effectiveness in green construction project; (2) proper knowledge management (KM) practices in green construction project; (3) green construction project met planned quality standard; (4) long commissioning and turning period of green construction project; (5) agile processes for green construction project; (6) minimal scope change in green construction project; (7) green construction project’s alignment with corporate strategy; (8) clear goals and objectives of green construction project; (9) reasonable size of green construction project; (10) reasonable complexity level of green construction project; (11) low environmental impact on green construction project; (12) urgency of green construction project; and (13) good project delivery system for green construction).

The second most item with strategies appeared in previous studies is “project team”, which is also placed at the seventh rank of the most frequently appeared item. Project team consists of 17 strategies: (1) competent project manager in green construction project; (2) motivated team in green construction project; (3) a global commitment in green construction project; (4) effective consultation with key stakeholders of green construction project; (5) effective consultation with key beneficiaries of green construction project; (6) competent designers in green construction project; (7) high owner’s commitment to the green construction project; (8) proper green construction project life-cycle management processes; (9) proper risk management in green construction project; (10) well-integrated team in green construction project; (11) competent team procurement in green construction project; (12) good project manager’s performance in green construction project; (13) high owner’s involvement in green construction project; (14) proper liability management in green construction project; (15) effective green construction project planning methods; (16) effective green construction project scheduling methods; and (17) effective green construction project control).

‘Organisation’ is item with the most strategies and ranked as the eighth most frequently appeared item by the previous studies. Organisation covers :(1)

experienced workers in green construction project; (2) skilled level of workers in green construction project; (3) board community support for green construction project; (4) full top management support for green construction project; (5) good cooperation between stakeholders in green construction project; (6) active stakeholders involvement in green construction project; (7) adequate finance resource availability for green construction project; (8) adequate material resource availability for green construction project; (9) skilled facilities management team in green construction project; (10) good relationship with stakeholders in green construction project; (11) trust among stakeholders in green construction project; (12) good communication with stakeholders in green construction project; (13) full sponsor support for green construction project; (14) maintenance of skills over time for staff retention in green construction project; (15) high awareness workers in green construction project; (16) proper green construction project's site/workplace environment; (17) accurate time control system in green construction project; (18) accurate time feedback system in green construction project; (19) adequate labor resource availability for green construction project; (20) continuous performance measurement for green construction project; (21) thorough technical understanding of green construction project; (22) thorough technical capability of green construction project; (23) lessons learned from previous project and applied to green construction future projects; (24) proper organisational structure in green construction project; (25) dedicated department for sustainability in green construction project; and (26) organisational maturity level in green construction project.

The ninth most frequently appeared item by the previous studies is 'external environment' which include nine strategies: (1) parties awareness in environmental issues; (2) parties awareness in environmental-related legislation; (3) stakeholder expectations in green construction project; (4) end-user imposed restrictions in green construction project; (5) sufficient market availability for green construction project; (6) adequate number subcontractors for green construction project; (7) adequate financial conditions of subcontractors for green construction project; (8) promote in achieving national profile green construction project; and (9) political stability in green construction project).

Finally, the tenth most frequently appeared item and the least cited item in the previous study is 'sustainability'. Sustainability encompasses 12 strategies: (1) effective energy consumption for green construction project; (2) effective water conservation for green construction project; (3) proper recycling management for green construction project; (4) proper waste management for green construction project; (5) usage of recycled material in green construction project; (6) low noise pollution during the green construction project; (7) optimising cost of construction in green construction project; (8) offering fair public comfort in green construction project; (9) offering fair public health and safety in green construction project; (10) usage of reusable material in green

construction project; (11) offering basic public utility in green construction project; and (12) offering fair users' security in green construction project.

The identified strategies were adopted and used to propose the critical strategies for uptake by construction players in the adoption of biophilic city concepts in Malaysia via a questionnaire survey.

METHODOLOGY

The methods used in this study were systematic literature review and questionnaire survey. A systematic literature review was the secondary data collection method that identifies, selects and critically appraises previous research (Dewey and Drahota, 2016). The method was conducted over multiple databases and grey literature on strategies for uptake by construction players in the successful adoption of (i) green construction project in general and (ii) biophilic city concept. The data from previous research were arranged based on its importance. The importance was gauged in relation to the number of mentions in the previous research.

The questionnaire survey was used to collect primary data. The survey was designed based on the systematic literature review. The minimum Cronbach's alpha value of 0.7 (specifically 0.99 with 17 subject matter experts view) as recommended by Nunnally (1967) was applied in pilot study to select questionnaire items for the actual survey. The questionnaire survey was distributed to 173 construction players involved in the design and planning of Malaysia cities. The respondents consist of government agencies (40 respondents at 23%), developers (3 respondents at 2%), consultants (78 respondents at 45%) and contractors (52 respondents at 30%). 62% of the respondents had working experiences of more than 5 years. 30% of the respondents had been involved in four (4) to ten (10) green construction projects in Malaysia. Data analysis was undertaken using the method of relative importance index (RII). Based on RII, the critical strategies were arranged based on their importance, following the study by Arof *et al.* (2018). In addition, the strategies were considered important when the RII value equal to or exceed more than 80.00 based on Rooshdi *et al.* (2018). On the contrary, the strategies were considered unimportant and irrelevant if the RII value was less than 70 (Hair *et al.*, 1998).

RESULT AND DISCUSSION

The analysis examined 107 strategies, where 81 were accepted, 26 were eliminated and 3 strategies were considered critical. The eliminated strategies were: (1) optimising cost of construction in biophilic city projects; and (2) usage of recycled material in biophilic city projects under sustainability in biophilic city projects. One strategy under each of 'awards and recognition for biophilic city concept adoption' and 'biophilic city project' were eliminated, namely more

biophilic city concept adoption advocacy by federal government agencies and urgency of biophilic city project adoption, respectively.

Furthermore, under ‘incentives and R&D support for biophilic city concept adoption’, four strategies were identified as irrelevant and were eliminated, namely: (1) financial incentives for biophilic city concept adoption; (2) low-cost loans from the government for biophilic city concept adoption; (3) low-cost subsidies from financial institutions for biophilic city concept adoption; and (4) tax reduction for biophilic city concept adoption. Three strategies were also eliminated and considered irrelevant under government regulation and standards for biophilic city concept. The three eliminated strategies were: (1) availability of proactive local authorities in biophilic city concept adoption; (2) good enforcement practice in biophilic city concept adoption; and (3) availability of competent local authorities in biophilic city concept adoption.

In addition, eight strategies were eliminated under ‘organisation in biophilic city project’, which made it the item with the most eliminated strategies. The eliminated strategies were: (1) adequate finance resource availability for biophilic city project; (2) experienced workers in biophilic city project; (3) accurate time control system in biophilic city project; (4) thorough technical understanding of biophilic city project; (5) good relationship with stakeholders in biophilic city project; (6) full sponsor support in biophilic city project; (7) skilled facilities management team in biophilic city project; and (8) maintenance of skills over time for staff retention in biophilic city project. Finally, seven strategies under ‘project team in biophilic city project’ were eliminated. The eliminated strategies were: (1) effective biophilic city project planning methods; (2) good project manager’s performance in biophilic city project; (3) global commitment in biophilic city project; (4) high owner’s involvement in biophilic city project; (5) motivated team in biophilic city project; (6) proper liability management in biophilic city project; and (7) effective biophilic city project control.

Table 1 illustrates the findings of the study on critical strategies for uptake by construction players in the adoption of a biophilic city concept in Malaysia. As shown in Table 1, the most critical item was the ‘external environment influence in biophilic city project adoption’. Malaysian construction players believed that the adoption of biophilic city concept can be done by (i) promoting the achievement of national profile for biophilic city projects, (ii) having an adequate number of subcontracts for biophilic city project and (iii) enhancing awareness in environmental-related legislation. Only three strategies were considered as critical with RII value exceeding 80.00, namely: (1) effective water conservation in biophilic city project; (2) acknowledging biophilic city concept adoption publicly; and (3) adequate material resource availability for biophilic city project. These strategies were under three different items namely: (1) ‘sustainability in the biophilic city project’, (2) ‘awards and recognition for

biophilic city concept adoption’, and (3) ‘organisation in the biophilic city project’, respectively.

Table 1 Critical strategies for construction players in the adoption of biophilic city concept in Malaysia

External environment influence in biophilic city project adoption	RII	Rank	Ave RII	Ave Rank
Promote achievement of national profile for biophilic city project	79.77	1		
Adequate number of subcontracts for biophilic city project	78.73	2		
Parties awareness in environmental-related legislation	78.27	3		
Political stability in biophilic city project	76.07	4		
Sufficient market availability for biophilic city project	75.61	5	76.10	1
Parties awareness in environmental issues	74.91	6		
Adequate financial conditions of subcontracts for biophilic city project	74.68	7		
Stakeholder expectations in biophilic city project	73.99	8		
End-user imposed restrictions in biophilic city project	72.83	9		
Awareness and publicity programmes for biophilic city concept adoption	RII	Rank	Ave RII	Ave Rank
More publicity through media (e.g. print media, radio, television, and internet) for biophilic city concept	76.07	1		
Support from executive management in biophilic city concept adoption	74.91	2	74.57	2
Public awareness creation through workshops, seminars and conferences for biophilic city concept	72.72	3		
Sustainability in biophilic city project	RII	Rank	Ave RII	Ave Rank
Effective water conservation in biophilic city project	83.70	1		
Effective energy consumption in biophilic city project	77.57	2		
Proper waste management in biophilic city project	75.84	3		
Offering basic public utility in biophilic city project	74.91	4		
Low noise pollution during the construction of biophilic city project	75.61	4	74.06	3
Proper recycling management in biophilic city project	74.91	5		
Usage of reusable material in biophilic city project	73.64	6		
Offering fair users' security in biophilic city project	72.25	7		
Offering fair public comfort in biophilic city project	71.91	8		
Offering fair public health and safety in biophilic city project	70.17	9		
Awards and recognition for biophilic city concept adoption	RII	Rank	Ave RII	Ave Rank
Acknowledging biophilic city concept adoption publicly	81.04	1		
Rewarding biophilic city concept adoption publicly	73.29	2		
More biophilic city concept adoption advocacy by state government agencies	71.79	3	73.90	4
Low-cost subsidies from the government for biophilic city concept adoption	73.06	2		
Low-cost loans from financial institutions for biophilic city concept adoption	71.79	3		
Strengthened biophilic city concept R&D	70.52	4		

***RII = relative importance index; Ave RII = average relative importance index; Ave Rank = average rank

Table 1 Critical strategies for construction players in the adoption of biophilic city concept in Malaysia (cont'd)

Biophilic city project	RII	Rank	Ave RII	Ave Rank
Low environmental impact on biophilic city project	76.65	1		
Long commissioning and turning period for biophilic city project	76.42	2		
Agile project processes for biophilic city concept adoption	75.95	3		
Clear goals and objectives of biophilic city project	75.95	3		
Proper knowledge management (KM) practices in biophilic city project	75.49	4		
Reasonable complexity level of biophilic city project	73.87	5	73.61	5
Biophilic city concept's alignment with corporate strategy	73.41	6		
Reasonable size of biophilic city project	73.18	7		
Good project delivery system for biophilic city project	72.72	8		
Cost-effectiveness in biophilic city project	71.68	9		
Minimal scope change in biophilic city project	71.33	10		
Biophilic city project met planned quality standard	71.21	11		
Education and information dissemination of biophilic city concept adoption	RII	Rank	Ave RII	Ave Rank
Innervational technology in biophilic city concept implementation	76.42	1		
Biophilic city concept-related educational and training programs for developers, contractors and policymakers	73.99	2		
Availability of institutional framework for effective biophilic city concept adoption	73.99	2	73.32	6
Availability of better information on the cost of biophilic city concept adoption	72.14	3		
Availability of better information on the benefits of biophilic city concept adoption	70.06	4		
Government regulation and standards for biophilic city concept	RII	Rank	Ave RII	Ave Rank
Biophilic city rating programmes	79.42	1		
Biophilic city labelling programmes	77.69	2		
Availability of competent promotion teams for biophilic city concept adoption	76.18	3	72.42	7
Mandatory policies of biophilic city concept adoption	74.10	4		
Availability of proactive promotion teams for biophilic city concept adoption	73.64	5		
Mandatory regulations of biophilic city concept adoption	73.53	6		
Organisation in biophilic city project	RII	Rank	Ave RII	Ave Rank
Adequate material resource availability for the biophilic city project	81.27	1		
Thorough technical capacity of biophilic city project	78.73	2		
Adequate labour resource availability for biophilic city project	75.26	3		
Proper site/workplace environment in biophilic city project	75.14	4		
Trust among stakeholders in biophilic city project	74.80	5		
High awareness workers in biophilic city project	74.45	6		
Lessons learned from other construction project and applied to future projects	74.34	7		
Accurate time feedback system in biophilic city project	73.29	8		
Good communication with stakeholders in biophilic city project	72.95	9		
Organisational maturity level in biophilic city project	72.83	10	71.82	8
Proper organisational structure in biophilic city project	72.72	11		
Good cooperation between stakeholders in biophilic city project	72.49	12		
A dedicated department for sustainability in biophilic city project	72.02	13		
Full top management support in biophilic city project	72.02	13		
Active stakeholders' involvement in biophilic city project	71.91	14		
Continuous performance measurement for biophilic city project	71.10	15		
Board community support for biophilic city project	70.87	16		
Skilled level of workers in biophilic city project	70.52	17		
Thorough technical capability of biophilic city project	70.40	18		

***RII = relative importance index; Ave RII = average relative importance index; Ave Rank = average rank

Table 1 Critical strategies for construction players in the adoption of biophilic city concept in Malaysia (cont'd)

Project team in biophilic city project	RII	Rank	Ave RII	Ave Rank
Effective consultation with key beneficiaries in biophilic city project	78.15	1		
High owner's commitment to biophilic city project	75.26	2		
Proper biophilic city project life-cycle management processes	74.80	3		
Effective biophilic city project scheduling methods	74.57	4		
Proper risk management in biophilic city project	74.57	4	71.70	9
Effective consultation with key stakeholders in biophilic city project	74.22	5		
Competent designers in biophilic city project	73.29	6		
Competent team procurement in biophilic city project	73.29	6		
Competent project manager in biophilic city project	73.17	7		
Well-integrated team in biophilic city project	71.90	8		
Incentives and R&D support for biophilic city concept adoption	RII	Rank	Ave RII	Ave Rank
Further market-based incentives for biophilic city concept adoption	74.68	1		
Low-cost subsidies from the government for biophilic city concept adoption	73.06	2	69.67	10
Low-cost loans from financial institutions for biophilic city concept adoption	71.79	3		
Strengthened biophilic city concept R&D	70.52	4		

***RII = relative importance index; Ave RII = average relative importance index; Ave Rank = average rank

CONCLUSION AND RECOMMENDATION

A total of 173 responses were collected via questionnaire survey, involving respondents of various professional backgrounds (government agencies, developers, consultants and contractors) in green construction projects in Malaysia. Out of 107 proposed strategies, 81 strategies were considered important and relevant while 26 strategies were eliminated.

Three main strategies recommended for uptake by construction players in the adoption of biophilic city concept in Malaysia were: (1) effective water conservation in biophilic city project; (2) acknowledging biophilic city concept adoption publicly; and (3) adequate material resource availability for biophilic city project. These strategies fell under three different items, namely: (1) 'sustainability in the biophilic city project', (2) 'awards and recognition for biophilic city concept adoption', and (3) 'organisation in the biophilic city project' respectively.

The findings emphasized that mutual engagement of all construction players is significantly important to ensure the successful adoption of biophilic city concept in Malaysia. Alongside the full commitment of all construction players, the government's aspiration to pursue green growth for sustainability and resilience by embracing *rakyat's* environmental-friendly habits and behaviours can be successfully achieved.

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