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Review Article

CRITICAL CAUSAL FACTORS OF FAILURE (CCFF) IN ADOPTING A BIOPHILIC CITY CONCEPT IN MALAYSIA

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Abstract

Biophilic city is a sister term of the green city that eventually improvised the concept of the latter. The concept of biophilic city holistically brings humans closer to nature rather than bringing nature to humans. Regrettably, in introducing this concept, numerous causal factors of failure need to be faced by the government, local authorities, developers, consultants, and even contractors. Within this context, this paper aims to investigate the causal factors of the failure of adopting a biophilic city concept in Malaysia. This paper provides a review of existing literature related to causal factors of failure of cities in general towards the adoption of a biophilic city concept. A set of questionnaires was designed based on the literature review that may well facilitate in responding to the causal factors of failure in adopting a biophilic city in Malaysia. The questionnaire underwent a pilot study consists of 15 respondents with a Cronbach's alpha value of 0.96. After the pilot test, the questionnaire survey was distributed among 143 construction players involved in the design and planning of city development, namely local authorities, developers and consultants. The most top three critical causal factors of failure in (CCFF) adopting biophilic city concepts in Malaysia are the lack of government awareness, followed by biophilic city scale and space value conflict as well as limited existing green spaces.

Keywords: Biophilic city, cities development, critical causal factors of failure (CCFF), Malaysia.

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INTRODUCTION

The population growth has increased from 756 million in 1950 to nearly four billion in 2014, where the percent of the world's population living in cities is expected to reach 70 percent by 2050 (United Nations, 2014). This shows that city development is required to fulfill the basic need of living, which is shelter. Nevertheless, what is the best city concept that best suits for human beings and less harm to the natural habitat? This paper hence proposes the adaption of the biophilia concept by Wilson (1984) in cities design, which is also popularly known as a biophilic city.

A biophilic city concept is a new approach to the cities development with apparently limited research available on the subject. Hence, more relevant studies need to be conducted to enhance the awareness of the importance of biophilic city adoption to the members of the public. This paper, therefore, aims at investigating the critical causal factors of failure (CCFF) in biophilic city adoption in Malaysia. The output of this paper is highly benefiting the government and the taskforces, which consist of the local authorities, project developers and consultants specifically at the decision-making stage during the project planning. Understanding the causal factors of failure in biophilic city concept adoption at the early stage is essential to ensure that this new city concept can create an affiliation between nature and human function that are practically meeting the citizen's needs without endangering the natural environment.

Conceptually, the biophilic city is a term adopted from the word "biophilia" that can be defined as inanition of the emotional affiliation of human beings to other living organisms (Ebrahimpour *et al.,* 2017). Ryan *et al.* (2014) and Elsadek et al. (2019) claimed that the relationship of human being with natural world enhances productivity and performance, gives a positive impact on attention restoration and stress reduction, increases positive emotions, reduces negative emotions, leads to relaxation of the brain, ocular muscles, and lenses as well as lower diastolic blood pressure and stress hormone (namely cortisol) levels in the bloodstream. The benefit of biophilic city concept adoption is not just on human beings but also to the green nature and natural habitat.

LITERATURE REVIEW

This section discusses the previous study related to various city's causal factors of failure in general with particular reference to the biophilic city although very minimal reference is available. This paper elaborates on the cities' critical causal factors of failure, in general, to understand the physical behavior of the cities before going through the development of city enhancement.

Cities Causal Factors of Failure

Before going further to the critical causal factors of failure (CCFF) of biophilic city concept adoption, this paper initially defines causal factors followed by highlighting the causal factors of failure in cities in general. The causal factor is defined by Paradies and Unger (2000) as an issue or element associated with the incident that, if corrected, could have prevented the incident from occurring or would have significantly mitigated its consequences. It could also be a barrier or safeguard that was either not in place or was in place but was ineffective at preventing the incident. From the perspective of this paper, cities' causal factors of failure are the contributor to the

undesirable condition of rapid city development, that if eliminated would have either prevented the occurrence of the incident or reduced its severity or frequency (Angel, 2019).

The study on cities' causal factors of failure is significant since it is generally accepted that developing and merging cities are generally constrained by various factors fragmenting urbanite discourse. Some of the cities key causal factors of failure involve rapid urbanization with mass migrations between urban and rural areas; increasing wealth that permits gap between rich and poor (Glaeser *et al.,* 2008) as well as less manual work that affects the quality of job growth (Wilson, 2011), which eventually leads to long-term unemployment.

Modern infrastructure has also augmented to a major city's health challenges that include exposure to air pollution and congestion from the effect of fast-growing cities, traffic noise pollution due to increasing private vehicle and physical inactivity due to modern urban lifestyle. The skills profiles of cities are progressively associated to their demographics, with younger cities nurture to be characterized by not only more skilled labor markets and higher graduate inflows, but also by more outward-looking and international populations. In the most advanced economies at least, the differing cultures of cities and regions are likely to become increasingly important for the cities locational determinants.

Holistically, the future of the cities and populations depends on the efforts of all parties in accepting changes in urban renewal. Urban renewal can only contribute to sustainability when it is perceived as an integral system of systems. Collaboration across various disciplines is very important in dealing with complex problems in urban renewal. For a better understanding of the interrelated environmental, social and economic issues in the cities, continuous study, and research efforts are therefore urgently needed.

Table 1 shows the cities' causal factors of failure in general discussed by Amira (2016). There are 27 causal factors of failure listed in total, which are divided into five main categories, namely transport, job, population growth, housing, and finance. Based on Amira (2016), cities causal factors of failure in transportation are: (1) increase private vehicle; (2) incomplete public transport network; (3) congestion; (4) to develop integrated transport system; (5) to develop seamless accessibility; and (6) distorted urban mobility. The challenges under jobs consist of four namely: (1) to creating jobs; (2) long term unemployment; (3) job retention; and (4) low job growth rate. Population growth has five causal factors of failure which are: (1) demand for rapid growth; (2) accommodating and increasing population; (3) rapid urbanisation; and demographic challenges; and (4) challenges of fast-growing cities.

Under housing categories, four causal factors of failure are listed namely: (1) provide affordable housing; (2) in numerous vagabond; (3) increase number social housing; (4) expanding the territory of social lodging; (5) indirectly increase number slump; and (6) to build housing with the good environmental standard; and to building housing that meets the needs of all income levels. Lastly, under finance category namely: (1) financial budget limitation; (2) maintaining the revenue and tax base; (3) financial constraints due to high debt loading; (4) revenue shortfalls; and (5) financing infrastructure. These cities causal factors of failure is important in city development. Stakeholders in the construction industry should consider these factors in adopting any concept to city development
.

Table 1. Cities causal factors of failure

Cities Causal Factors of Failure	
Transportation 1. Increase private vehicle 2. An incomplete public transport network 3. Congestion 4. To develop integrated transport system 5. To develop seamless accessibility 6. Distorted urban mobility **Jobs** 7. To creating jobs 8. Long term unemployment 9. Job retention 10. Low job growth rate **Population growth** 11. The demand for rapid growth 12. Accommodating and increasing population 13. Rapid urbanisation 14. Demographic challenges 15. Challenges of fast-growing cities	**Housing** 16. To provide affordable housing 17. In numerous vagabond 18. Increase number social housing 19. Expanding the territory of social lodging 20. Indectly increase number slump 21. To build housing with the good environmental standard 22. To building housing that meets the needs of all income levels **Finance** 23. Financial budget limitation 24. Maintaining the revenue and tax base 25. Financial constraints due to high debt loading 26. Revenue shortfalls 27. Financing infrastructure

Source: Adopted and modified from Amira (2016)

Causal factors of failure in biophilic city development

Littke (2016), Almusaed and Almssad (2014) and Beatley and Newman (2013) list the causal factors of failure in biophilic city development as shown in Table 2. From their study, sixteen causal factors of failure were found and short-listed.

Table 2: Cities causal factors of failure in biophilic city development

Cities Causal Factors of Failure in Biophilic City Development	
1. Lack of resources will to fully understand the importance of greenspace	9. The architecture will face challenges in materials, technologies, constructions, management, etc.
2. Lack of management leads to deterioration of green spaces	10. Architecture has all the disadvantages of a tree: diseases and pests, fire risk, root damage, and falling objects, etc.
3. The conflict between preservation and new development	11. Social and cultural obstacles
4. Concept confusion in local planning and decision making	12. Economic and legal obstacles

5. The inertia of changing existing business and existing policy/regulations	13. Cultural and aesthetic bias on natural urban environments
6. How to establish and maintain an environment that supports human health and at the same time ecologically sustainable	14. Fear of nearby nature that must be overcome (spiders, bats, coyotes)
7. Biophilic habitats are often seen as an unadulterated esthetical element in architecture	15. Urbanites underestimate the benefits of and enjoyment received from nature
8. Biophilic scale and space value conflict	16. Obstacles presenting by prevailing short-term centered political and economic decision-making mechanism

Source: Adopted and modified from Littke (2016), Almusaed and Almssad (2014) and Beatley and Newman (2013)

METHODOLOGY

This paper involves a systematic literature review and a questionnaire survey of 143 respondents. A systematic literature review is the secondary data that identifies, selects and critically appraises previous research (Dewey and Drahota, 2016) over multiple databases and grey literature that can be replicated and reproduced by other researchers on city development in general as well as biophilic cities in particular. On the other hand, a questionnaire survey has been used as the primary data, where the data collected from the systematic literature review were used in designing the questions that passed through a pilot study with minimum Cronbach's alpha value 0.7 (specifically 0.96) as recommended by Nunnally (1967). The questionnaire survey is then distributed to 143 construction players involved in the design and planning of cities in Malaysia, including local authorities, developers and consultants. Data analysis was subsequently undertaken via the relative importance index (RII), where the causal factors of failure in adopting a biophilic city concept in Malaysia are eventually arranged based on its importance as done by Arof *et al*. (2018).

RESULTS AND DISCUSSION

Table 3 illustrates the causal factors of failure in adopting a biophilic city concept in Malaysia. From the table, it is clearly seen that from the sixteen causal factors of failure suggested by Littke (2016), Almusaed and Almssad (2014) and Beatley and Newman (2013), some amendments have been made by the respondents involved as to suit the current scenario of cities development in Malaysia.

Lack of awareness by the government, which is not suggested before in the systematic literature review is placed at the top ranking with 78.63 percent Relative Importance Index (RII). It is vital to cultivate government understanding as they play a significant role in regulating the biophilic city development towards ensuring the benefits of its implementation to the well-being of its citizens and natural environment. If government regulations and planning requirements did not support urban greening initiatives to follow suit the biophilic cities concept, this may definitely lead to the unsuccessful implementation of Biophilic Cities.

Biophilic scale and space value conflict are at the second rank with 78.38 percent RII. Primarily, the biophilic scale involves quantitative change, sequence change and form change that might affect human psychology (Guan et al., 2018), hence biophilic scale and space value are seen as important towards ensuring the successful adoption of biophilic city concept in Malaysia. Wilson (1984) also linked this biophilic scale and space value conflict with the basic theory of biophilia, which includes "biophobia" or negative emotional responses to certain habitats, activities and objects that are possibly harmful hence provide conflicts, for example, barren landscape or predators or any other dangerous animals. Since human needs food, water, shelter and exhibit positive emotions towards domestic and wild animals, biophilic scale and space value conflict might reflect predilection towards being near to those animals as a food source. The human also tends to be protected from those wild animals and climate changes, which also leads to biophilic scale and space value conflict. Similarly to those wild animals. Therefore, it is quite challenging to meet human needs without endangering nature and to balance between both.

As for the space value conflict, there will be a conflict between the land space value and green space value. If its closer to the city center the higher the land space value, whilst at the same time, the green space value will come constantly. This comparison of these two values will raise the space value conflict (Guan et al., 2018). The third rank is limited to existing green spaces with 78.00 percent RII. This finding is expected as Malaysia is currently facing rapid urbanization at 76.04 percent (Plecher, 2020), where existing green spaces are dominated by mass of concrete, creating unnatural environment (Gokyer *et al.,* 2012) that is contradicting from providing healthy environment for humans, good planning and management, vegetation and wildlife population (Godefroid, 2001). It is important to understand the relationship between urban population and quality as well as the amount of green space in terms of sustainability, health, and resilience of urban areas (Russo and Cirella, 2018). The WHO (2012) indicated that the recommended green space availability per individual is at a minimum of 9 m^2 with an ideal Urban Green Space (UGS) value of 50 m^2 per capita. With limited green spaces, it is quite challenging to establish and maintain biophilic environments as the biophilic cities' vital concept is to support human health and at the same time are ecologically sustainable.

The least critical causal factor of failure (CCFF) is cultural and aesthetic bias in natural urban environments with 72.13 percent RII. Biophilic cities invoke recognition and enhancement of the existing nature in cities as well as the design and amalgamation of the new forms of nature (Reeve et al, 2015). Participation and engagement with nature is the main feature of biophilic cities and can be in many forms that include participation in various nature association and organization. Despite captivating every opportunity to embrace the nature with built structures, the biophilic city still protecting and restoring flora, fauna, and even fungi. This is towards achieving biophilic city vision of blending nature remnant of natural species and habitats to mix with more human-designed forms of nature such as living walls, green rooftops, and sky parks (Beatley, 2017). As biophilic city intention is to reconnect humans with the natural surroundings, this has applied special geometry of nature to improve the mental and physical nourishment of the citizens by lowering the stresses on the human body, helping humans to built-in defenses to fight illness and promote healing. A healing environment arises when human beings draw from the complexity of nature and conceive of themselves as in touch with their inner feelings and emotions. People are increasingly demanding environments that lower stress: living and working spaces that act to keep us healthy (Salingaros, 2015).

Economic and legal obstacles have been the second least CCFF with 72.25 percent RII. To attain positive competitive economic advantages on the economic development of biophilic cities, it is essential to have a leader and leadership teams that support improvements in biophilic conditions. However, since biophilic cities have to compete with other similar cities it remains an open question whether biophilic cities will be able to maintain its businesses and their citizens in the face of economic stresses and downturns (Beatley and Newman, 2013). Currently, to adopt the biophilic city concept, it does not involve any re-enactment or re-

inventing of the existing legislation. Biophilic cities will be using the existing legal mechanisms however with a new focus to increase the presence of nature in urban spaces and residents' access (Brown, 2016).

The third least CCFF is biophilic habitats often seen as an unadulterated esthetical element in architecture with 72.50 percent RII. Architects have adopted the biophilic design and it has been well articulated. However, less attention has been given to understand the consequences of biophilia in the design and planning of the urban neighborhoods, cities, and metropolitan regions, else known as biophilic cities (Beatley and Newman,2013). To assimilate design into the ecology of the place and residing energy in the community, planning, and architecture necessarily have to work together to be sustainable. It is important to outline the characteristic of biophilic architecture and put them into a clear, workable, organized format as to promote the important connection of the natural environment in biophilic building design to developers, designers, planners, and architects so that they can learn (Almusaed and Almssad, 2006). Salingaros (2015) emphasized that biophilic design reorient architecture toward a world governed coherent information and correspondingly leads people to think at various levels of complexity the same way as nature works.

Table 3. Causal factors of failure in adopting a biophilic city concept in Malaysia

Critical Causal Factors of Failure in Adopting Biophilic City Concept in Malaysia	RII	Rank
1. Lack of government awareness	78.63	1
2. Biophilic scale and space value conflict	78.38	2
3. Limited existing green spaces	78.00	3
4. The conflict between preservation and new development	76.38	4
5. Fear of public to nature and natural habitat	75.38	5
6. Public underestimate the benefits of nature and natural habitat	75.25	6
7. Challenges in providing suitable materials, technologies, constructions, and management	75.00	7
8. Differences in planning and decision making	74.25	8
9. The effect of nature and natural habitat to architectural	74.50	9
10. Power of willing to change existing business and existing policy/regulations	74.13	10
11. Establish and maintain the infrastructure	73.63	11
12. Obstacles presenting by prevailing short-term centered political and economic decision-making mechanism	73.25	12
13. Social and cultural obstacles	72.88	13
14. Biophilic habitats are often seen as an unadulterated esthetical element in architecture	72.50	14
15. Economic and legal obstacles	72.25	15
16. Cultural and aesthetic bias on natural urban environments	72.13	16

CONCLUSION AND RECOMMENDATION

To sum up, all sixteen cities' causal factors of failure in adopting a biophilic city concept in Malaysia are found to be important. Since nine out of these sixteen cities causal factors of failure namely: (1) lack of government awareness; (2) limited existing green spaces; (3) conflict between preservation and new development; (4) challenges in providing suitable materials, technologies, constructions, and management; (5) differences in planning and decision making; (6) power of willing to change existing business and existing policy/regulations; (7) establish and maintain the infrastructure; (8) obstacles presenting by prevailing short-term centered political and economic decision-making mechanism; and (9) economic and legal obstacles are sourced mainly from the government, represented dominantly by the local authorities in the perspective of biophilic cities development in Malaysia, there is an urgency to create more awareness on the importance of adopting biophilic city concept to the governmental agencies. It is recommended that the technical expert explore the functional requirements of biophilic cities system and its technologies, for example, the sustainability, resilience, and energy conversion system as well as to learn on how to strategize a program for maintaining, restoring, preserving and expanding the nature whilst implementing the biophilic city concept. This research paper is expected to have important implications for other researchers to gain information on the causal factors of failure in adopting a biophilic city concept. Nevertheless, more research specifically on this research area is needed to provide evidence and support the causal factors of failure in adopting a biophilic city concept so that the CCFF can be minimized and mitigate at the early stage of the biophilic city implementation in Malaysia.

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