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AWARENESS TO UNDERSTANDING OF GREEN INFRASTRUCTURE IN ISKANDAR MALAYSIA

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Abstract

Strategic development of green infrastructure, including blue and green networks in developing and urbanizing neighbourhoods, is becoming more prevalent. The goal of these initiatives is to establish an ecological network to promote social, economic, and environmental well-being in Malaysia. For this purpose, seven public and private sector professionals were polled using questionnaires in a recent research study. Eight green infrastructures, which include parks, bodies of water, and bioswales, were determined to exist in Iskandar Malaysia initially according to the study. On the other hand, visible vegetation loss along city corridors signifies the urgent necessity for replanting and reforestation programs. Besides, the study identified ten key green infrastructure elements such as electric vehicle charging stations, rainwater harvesting systems, and street furniture that are relevant to the development of Iskandar Malaysia. Despite this, the development process in most developing countries unconsciously neglects the advantages and significance of green infrastructure. The main objective of the study was to investigate the various applications and benefits of green infrastructure in Iskandar Malaysia, dividing the benefits into the environmental, economic, and social categories. It also aimed to assess the level of awareness and knowledge of green infrastructure concepts in the area. The development of green infrastructure is hindered by various factors, including cultural barriers, technical difficulties, contextual limitations, structural problems, and regulatory constraints. Key challenges also include budget limitations, maintenance expenses, debates on agency responsibility, and excessive start-up expenses. Recommendations therefore encompass stimulating group efforts, implementing reforestation policies, and strengthening public-private sector partnerships. Both community and expert engagement are essential to advancing sustainable urban planning and enabling green infrastructure.

Keywords: Green, Infrastructures, Types, Values, Barriers, Sustainability, Reforestation and Biodiversity

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INTRODUCTION

To commence, intentional green and blue space construction, or "green infrastructure" (GI), gains greater prominence internationally due to proposals like the European Commission "green infrastructure strategy." In response to stresses owing to urbanization, GI initially emerged in the United States during the 1990s, proliferated there, and diffused further across other countries, including Australia, as well as the United Kingdom. Global ecosystem (GI), crucial to maintaining biodiversity, well-being of ecosystems, as well as functioning ecosystems, includes patches of seminatural patches, as well as patches of natural patches.

Green infrastructure (GI) necessitates intentional efforts, including tracing out green patches, modernizing them to modern standards, as well as creating green patches where necessary. Green infrastructure (GI) is crucial, this holistic approach, to maintaining biodiversity, human living, as well as addressing pressing concerns, including pollution, land erosions. By facilitating the incorporation of nature in the city, green infrastructure (GI) maintains green infrastructure (GI)-sustainable urbanization, balancing advancing social equity across neighbourhoods, advancing economic progress, while also maintaining the environment.

The biodiversity of GI maintains several functions of ecosystems, including climate change mitigation, water purification, and carbon sequestration. Not only does it provide social cohesion, but also quality of living, leisure, and cultural opportunities also get promoted. Well-designed green spaces attract massive crowds, boost cultural values, and boost both physical and emotional well-being. Besides, it drives economic development by advancing property values, funding, and green infrastructure projects. By reducing noises, creating spots of calm, as seen in spots like the National Park of Athens, it proves worth enhancing living quality areas while stimulating living standards. Sustainable development demands, for urban development, support by way of green infrastructure strategies. Environmental preservation demands green spaces' restoration, especially as land gets turned into land cover by way of urbanization, further causing climate change symptoms, flooding, and the heat island effect. Green infrastructure (GI) provides an inclusive way out of issues facing the environment, economy, and society. Waste generation, biodiversity decline, water use, and emissions result from the construction industry. Green building, one form, must be practiced, especially due to these issues. Green infrastructure (GI) provides an opportunity, irrespective of economic losses, especially in developing economies, like that of Malaysia. Green infrastructure, including mangroves, plays an essential role in Iskandar, Malaysia, enhancing biodiversity, climate change management, and carbon sequestration. Deforestation, land use changes, and threats facing these ecosystems necessitate

efforts aimed toward conservation. In Iskandar Malaysia, this demands efforts aimed toward preservation.

LITERATURE REVIEW

Theoretical Contexts of Green Infrastructure

Urbanization has significantly impacted biodiversity, natural habitats, as well as functions of ecosystems across Asia, Latin America, as well as Sub-Saharan Africa (McDonald, 2013). It has produced uneven distribution of green cover as well as lost land both outside as well as within the city. Besides, unless green as well as blue spaces are included in city development as advocated by Green Infrastructure (GI), future issues are bound to aggravate (UN, 2019). Besides, particular green areas categories, including city parks, gardens, as well as woodlands, have gained extensive study as well as utilization across the globe, still, especially across Asia.

Lack of full acquaintance by the planners toward the conception of the GI serves as an obstacle toward successful utilization (Cilliers, 2019). Larger, well-developed metropolises, including Kuala Lumpur, Johannesburg, Durban, as well as Bogota, have proved utilizing strategic means toward developing green as well as blue spaces across the city due to efficient management plans. Smaller metropolises, however, lack data as well as plans toward green city development, further elevating the need toward greater plans there.

Categories of Green Infrastructure

In Latin America, there has also been a focus, specifically, on Green Infrastructure (GI) study, practical application, green areas, parks, and forest, city. While there are studies specifically focusing on GI, there are those focusing on cognate concepts not utilizing the term. Specific emphasis has also been placed, specifically, on green infrastructure elements that are publicly accessible, parks, plazas, and streetside trees. Bogota's vast tree surveying has established the significance of green areas (Escobedo et al., 2015). Santiago, Chile, has only has only 43% of the trees planted on publicly accessible land, leaving it facing problems that show the significance of managing the forestry of the city differently (Reyes and Figueroa, 2010).

Other than publicly accessible green areas, the semi-natural, and natural areas found outside the periphery of the city are also essential components of Green Infrastructure (GI) network elements that perform fundamental ecological functions. In Latin American cities, by way of an example, wetlands, alongside patches of forest, are fundamental components of Green Infrastructure (GI) (Doobs et al., 2019). Not only are these areas responsible for biodiversity preservation, but also provide fundamental ecosystem functions, including regulation of floods, purification of water, as well as habitats for various species. Green Infrastructure (GI) greatly enhances the quality of the environment, by

various kinds, well established, specifically, in developed economies, including the United Kingdom, as well as Germany. These, by Feng et al. (2019), are green rooftops, green parks, green streets, SUDs, et al. Through minimization of the effect of the urban heat island, air, as well as water quality, purification, as well as biodiversity, these elements of Green Infrastructure (GI) enhance the beauty of the city, while also advancing the environment toward greater sustained.

Benefits, Significances and Purposes of Green Infrastructure

Food production, hazard minimization, and biodiversity preservation are highest prioritized by Los Angeles's Urban Green Infrastructure (UGI) study projects. Garcia et al. (2014) highlight how UGI serves as an environment and lessens flooding hazard threats, as well as coast line erosions. Besides, Vásquez et al. (2019) tackle climate change adaptation in Latin American cities wherein master plans, as well as people's policies, involve UGI approaches, although it has been noted by Reynolds et al. (2017) that there are concerns, including air quality, as well as environmental injustice, not prioritized. Just 38% of Sub-Saharan Africa (SSA) nations have conducted studies on UGI, whereby it has been noted that it is leadership by South Africa, by Du Toit et al. (2018). In the case of UGI, whereby it mostly seeks to address issues in the urban environment, including climate change, as well as flooding, temperature management plays a crucial role (Ngulani and Shackleton, 2019). Urban farms located in UGI provide food security, while urban agriculture serves as an insurance cover against poverty decline (Abo-El-Wafa et al., 2018). In 2018, Shackleton et al. Urban agriculture, as well as gathering, both play an essential role in food provisioning in SSA (Titz and Chiotha, 2019).

Among the functions of managing UGI includes creating opportunities for leisure, as well as people's spaces' enhancement (du Toit et al., 2018). However, an overconcentration on beauty could result in camouflage of the myriads of ecosystem services (ES) that UGI has to provide, silencing local innovations (Schäffler and Swilling, 2013). It is crucial, therefore, to comprehend the greater benefits of UGI, especially biodiversity preservation, so as to boost people's resilience, as well as well-being, especially those living below poverty.

Shackleton and Blair (2013) also lay emphasis on generating work opportunities in poor neighbourhoods, while King and Shackleton (2020) anticipate generation of 17,000 work opportunities by the UGI with reasonable scales of pay per annum in the minor towns of South Africa. Schäffler and Swilling (2013) discover there exists an extension observed by the green industry of Johannesburg. The majority of studies focusing on the decision-making by the UGI, particularly those by China, account for the master objective of city sustainability (Wei et al., 2018). China and India ventured significantly toward the three general gains by environmentalism, consisting of biodiversity

strengthening, reducing pollution, temperature management (Kotharker et al., 2019).

Foremost Hindrances and Enabling Factors of Green Infrastructure

Green infrastructure (GI) studies in Latin America focus primarily on quantitative estimations of spatial planning, provision of ecosystem services, and integration into urban design, with less attention given to planning and management operations (Vásquez et al., 2019). Lack of consensus among stakeholders and indicators of performance is hindering progress in this direction. Insufficient use of the word "GI" in management and planning literature constrains its possible benefits and makes it impossible to incorporate into urban development (Vásquez et al., 2019). Moreover, construction of multifunctional solutions is impeded by the inclination of public-sector GI plans to be insufficient when taking into consideration the various ecosystem services (Doobs et al., 2019).

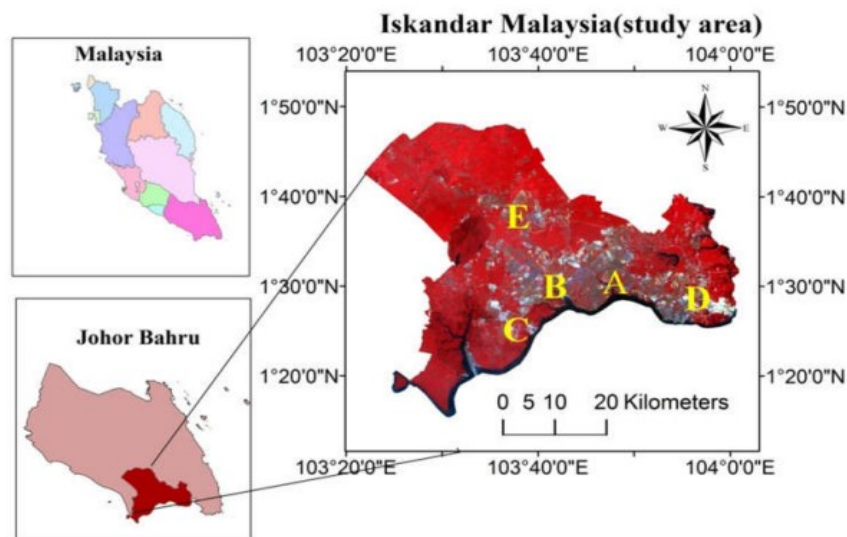


Figure 1: Iskandar Malaysia and the Right Panel Five Flagship Zones are Denoted as A-E. *Source:* Lo and Yeung, 1996; Ho et al., 2013

In spite of these challenges, NGOs and social organizations are emerging social actors involved in the development and sustenance of GI (Vásquez et al., 2017). However, scientific research pays no attention to these efforts, and there is a need for more profound scientific understanding of their goals. Neoliberal policies in Latin America restrict the application of urban planning mechanisms, which discourage the evolution of GI (Andrade et al., 2013, 2014). Vulnerable communities may be displaced by the deployment of the

UGI, and informal settlements most so because of issues like the UGI having a limited ability to enforce planning controls (Anguelovski et al., 2016).

Green Infrastructure Course of Action in Iskandar Malaysia

As part of its effort to fight climate change and global warming, Iskandar Malaysia has implemented policies aimed at green infrastructure with the intention of reducing carbon footprints and enhancing a green economy (Ho & Fong, 2007). This strategic approach aligns with the principles of sustainable growth whose core intention is to emphasize how important environmental conservation is. The conservation of Iskandar Malaysia's blue and green infrastructure has also been more of a focus in an attempt to enhance the overall well-being of the region (Azian & Mubaraq, 2012). Such policies help reduce energy usage and greenhouse gas emissions while also encouraging environmental conservation through the utilization of the advantages of green infrastructure, such as temperature regulation and carbon storage (Daniel et al., 2011). Moreover, Hamdann (2012) emphasizes the importance of incorporating blue and green infrastructure for Iskandar Malaysia as well as the overall Malaysian urban environment.

RESEARCH METHODOLOGY

Study Area

Since its initiation in 2006, Iskandar Malaysia has remained to remain to be one of the country's biggest and ambitious developments significantly transforming land use pattern throughout the country. Measuring at vast tract of land of 2216.3 km² in size, Iskandar Malaysia sits between latitudes of 1.4833° to 1.6667° north to between longitudes of 103.4500° to 103.9094° east as presented in (Figure 1). To put that in context, Iskandar Malaysia is twice that of that of that of Hong Kong Island or more than three times that of that of that of Singapore, thus presenting its vast potential for developments as well as presenting its strategic importance in region (Yunos and Johar, 2015).

In future outlooks, Iskandar Malaysia or simply known as "IM" is going to take on front-runner of contender of notable East Asia cities in ranks of notable cities like that of that of Singapore and that of that of that of Hong Kong. As that, it is going to make it leading region in influencing economic dynamics of greater region. As part of measures to induce planned investments in all infrastructure aspects in all aspects of economy, Iskandar Regional Development Authority (IRDA) was at centre of Iskandar Malaysia in its initiation in 2006. Iskandar Malaysia has general objective of causing inclusive and lasting regional developments in region. Iskandar Malaysia has model of governing through concerted actions of five regional governmental agencies in working towards implementation of strategy and policies set in (Table 1), which divide five flagship economic developments corridors or zones.

To attract planned investments in various infrastructure and economic sectors, the Iskandar Regional Development Authority (IRDA) launched Iskandar Malaysia in 2006 through strategic planning. The ultimate objective of this program is to create balanced and sustainable regional development. The synergy of five local government agencies renders the governance of Iskandar Malaysia distinctive. In addition to that, they collaborate to implement the policies and strategies enumerated in (Table. 1), which identifies five development plan flagship zones. In the long run, these zones serve a crucial function in consolidating already established economic clusters.

Table 1: Five Flagship Zones in Iskandar Malaysia

Flagship Zones	Area Covered	Development
A	City Centre of Johor Bahru	Includes the Malaysia-Singapore Causeway, a newly developed financial hub, the Central Business District, Danga Bay's waterfront city, and diverse projects in Tebrau Plentong.
B	Nusajaya	Features Medini Iskandar Malaysia, a healthcare hub, an educational city, an international tourist destination, an industrial logistics cluster, and a planned residential community.
C	Western Gate Construction	Comprises the Ramsar World Heritage Park, Tanjung Piai, a designated free trade zone, and the Port of Tanjung Pelepas (PTP), serving as an additional Malaysia-Singapore transport link.
D	Eastern Gate Construction	Includes Tanjung Langsat Port, Pasir Gudang Port and its industrial area, Tanjung Langsat Technology Park, and the Kim Regional Distribution Centre.
E	Senai-Skudai	Hosts a multimodal hub, the MSC Cyberport city, Senai International Airport, and centres for information technology and freight operations.

Methodology

This section presented a description of the methodology of research and procedures followed for conducting the study. This chapter also discussed how the data collection, handling, and analysis processes are carried out. This chapter also explains the demography of the research participants who took part in completing the questionnaire survey and how data was used to attain the study purpose. This chapter provides a descriptive explanation of the location, population, areas, and boundaries of the case study area. This research includes an overview, literature review, data collection and analysis, findings and results, conclusion, and recommendations. The settlements' green infrastructure history is established in the first phase of understanding the research. Then the problem statement was formulated, and its applicability to the study was established. Lastly, the purpose, scope, and aim of the research were established for effective

data collection and analysis. The literature review, which encompasses all the information and data collected from a variety of textual sources, is the second component of this study.

The objective of carrying out the review of literature was to determine the body of work in context to research topics at stake, alongside discovering how other researchers have tackled similar topics. Review captures the concept of green infrastructure, its manifestations, people living in these areas' benefits to them, challenges that it poses to them, alongside why it must be embraced. Gathering of data was step three in research where approach used was quantitative from primary data. Expert opinions have served as method of getting the primary data. At step four in getting the data and drawing inferences from the questionnaire, inferences from these have been interpreted through utilizing the program of Excel. To make easy to go through, results and inferences have been put in tables through utilizing the Likert Scale score of mean. Last part of research gives concluding remarks alongside suggestions on how green infrastructure in Iskandar Malaysia may improve from research results. There is clear presentation of research objectives, data sources, alongside methodology in Table 2.

The first step of research entails having clear understanding whereupon research title is set forth and analysed to establish relevance. Initial understanding is employed to set statement of the problem by providing context to research. Through utilization of accumulated wisdom, green infrastructure context of settlement is set to verify by providing context to research statement of research statement. Aside from that, to establish relevance as well as applicability of future research, initial data is employed to set research scope in scope. Aside from that, in step of research work in this step, research objectives as well as research purposes are set forth. The second step entails literature review whereupon insight of research work on green infrastructure in all green infrastructure aspects of green infrastructure in all green infrastructure from Latin America to developed countries like United Kingdom and Germany to countries of Asia like Bangladesh, Malaysia, China, India, Sub-Saharan Africa countries is synthesized.

Table 2: Links Between Research Objectives and The Method Employed

Research Objectives	Nature of Information Needed and Source	Research Methods Used
Investigate the existing green infrastructure types in Iskandar Malaysia.	Primary data collected through expert interviews.	Expert interviews, Descriptive analysis.
Assess the significance and advantages of green infrastructure in Iskandar Malaysia.	Primary data obtained from discussions with experts.	Expert interviews, Descriptive analysis.
Determine the key challenges and supporting factors	Primary data gathered from expert consultations.	Expert interviews, Descriptive analysis.

Research Objectives	Nature of Information Needed and Source	Research Methods Used
influencing green infrastructure in Iskandar Malaysia.		

Above paragraphs provide context to general objectives, precepts, as well as missions of green infrastructure in developed countries as well as countries of Asia as well as Africa. Aside from that, review provides context to ecosystem benefits of benefits in these situations. Overall challenges as well as driving factors of green infrastructure in countries like Asia, Latin America, developed countries like United Kingdom and Germany to Sub-Saharan Africa countries are analysed. Study of article diversity has helped to set green infrastructure context in the settlement in scope of its kind, benefits, benefits, as well as limitations therewith associated to it. Aside from that, research centres on green infrastructure enabling factors as well as hindrances from research work. Quantitative research approach to research is employed to obtain data in third step of research work.

The primary method of generation of data is through perceptions of experts where interviews through questionnaire have used as chief method of extracting of data. Experts have requested to provide their perceptions of green infrastructure categories, their potentialities, benefits, and contribution in Iskandar Malaysia, their obstacles and facilitators that they believe in. Questionnaire designing has done by research objectives while structure of it has decided by literature review. Value, availability, and facilitation have measured on Likert scale. Azila (2015) elucidate that Likert scale is psychometric instrument used in questionnaire to identify how much of agree or disagree on statement by respondents would agree or not agree on that statement. Through that ordinal measurement instrument that measures feelings of people on given statement by how much agree or disagree on that statement (Azila, 2015).

The most commonly employed is the five-point Likert scale, shown in (Table. 3). The scale points include strongly disagree, agree, neutral, and disagree. The 7- and 9-point Likert scale and 3-point scale are employed by a few researchers in order to verify the validity and reliability of the study. The study's objective is pertinent to the variable Likert scale. However, Azila (2015) suggests that the 5-point Likert scale is a commonly used rating scale, therefore was used in this study. Likert Scale and questionnaire were used in this study.

Primary data were employed while making the data of the study. Questionnaire survey was employed for gathering primary data for the research. Since a questionnaire is a versatile instrument from which a large number of types of answers could be extracted out of the respondents, it constitutes a significant portion of the process of collecting data. It is a well-crafted series of questions aimed at unscrambling the intricate web of public opinion, attitude, and response associated with a given subject. Bird (2009) states that the questionnaire is an

example of a systematic exercise that goes beyond questioning for a deep understanding of what drives human behaviours, beliefs, and tastes to function. The start of any questionnaire is determined by how well it is defined and closely coupled with the entire research purpose. For this study, the development of the questionnaire represents a milestone indicating the transition from theoretical basis to empirical research. The information gained by conducting a vast literature review forms the basis, assisting researchers to set up the field, form questions, and refine the survey instrument to mirror the study's nature more appropriately.

Table 3: Likert Scale

Likert Scale Description	Likert Scale	Likert Scale Range	
Strongly Disagree	1	1- 1.80	Very Low
Disagree	2	1.90-2.60	Low
Neutral	3	2.70-3.40	Moderately High
Agree	4	3.50-4.20	High
Strongly Agree	5	4.30-5	Very High

There are four distinct areas in which the research questionnaire is utilized, and each is distinct in purpose and implication. Part A sets the context in which the demographic surroundings and condition of the respondents are examined prior to transitioning into more focused analyses, similar to how an introductory prelude serves to transition into the primary composition. Section B explores expert opinions through which their opinions and assessments of the different forms of green infrastructure along Iskandar Malaysia are exposed. Section C explores perception and how these skilled witnesses balance the value and perceived value added by green infrastructure. Section D explores the functional dimensions with an eye to exposing the intricate interactions between green infrastructure and the Iskandar Malaysia ecosystem. Finally, Part E discusses the challenges, detailing the impediments that cloud the progress achieved in enhancing the green infrastructure of the region. This kind of form provides a comprehensive description of the questionnaire used in this empirical adventure, acting as a descriptive visual support to accompany the written account.

Further, research introduces a new phase marked by systematic scrutiny and rigorous scrutiny after data have been gathered. Analysis of data is the process of converting raw data into meaningful implications which involves a sophisticated balancing act between interpretive subtlety and methodological elaboration. In essence, by mapping the intricate tapestry of numbers and figures, quantitative data analysis is the navigator that guides researchers to the illusive shores of knowledge and understanding. As Azila (2015) theorizes, this analysis journey is undertaken through a myriad of statistical techniques, all of which seek

to reveal the hidden patterns, trends, and relationships that lie beneath the surface of empirical reality.

RESULTS AND FINDINGS

The scholarly study presents the findings and conclusions drawn from a rigorous process of data collection and analysis. It incorporates questionnaires using the Likert Scale with insights obtained through a literature review from global methods utilized.

Participants' Background

The intricate mosaic of traits that make up a participant's demographic background presents key information on the composition of survey respondents. It contains numerous factors such as the years of work experience, job title, age, gender, marital status, and education level. Both genders are equally represented in the sample of respondents of this research, which comprises seven experts and a gender distribution of 57 percent female and 43 percent male.

The age distribution of the respondents reveals that they constitute different generations if analysed in finer detail. Six age ranges were utilized to place the participants in groups: 18–24, 25–34, 35–44, 45–54, 55–64, and over 65. Strikingly, 57% of the participants fall in the age range 35–44, which translates to considerable middle-aged representation within the sample. In addition, 43 percent of the sample is in the 45-54 age group, which means that a significant portion of the population is at the end of their working life. The sample's occupations add another dimension to the demographic profile. There was a move to introduce diversity from a work sector perspective, with 57% being from the public sector and 43% from the private sector. It is a conscious intention on the part of public sector as well as private sector professionals to make contributions towards the dataset in order to arrive at an informed understanding of insights emanating from disparate organizational settings.

Table 4: Experts' Profiles

Experts' Profiles			
Gender	Male (%)		Female (%)
	43%		57%
Age	35-44(%)		45-54(%)
	57%		43%
Agency	Public (%)		Private (%)
	57%		43%
Year of Experience	Less than 10 years (%)	10-20 years (%)	20-30%
	14%	43%	43%

The need to document the diversity of professional experience among participants is also highlighted by the research. The respondents in (Table. 4) to

have a heterogeneity of positions and levels of experience, therefore marking the heterogeneity of the respondent samples. The research participants include novice and experienced practitioners up to veteran to provide diversity in the perspectives and opinion on the issue. The population characteristics of the study participants mark a keen consideration to accommodate representation in terms of diversity across diverse contexts. By including diversity in age, gender, occupation, and experience, the research seeks to provide strong findings commensurate with the intricate nature of the research question. Through this participative approach, topic development of the investigation is eased while making the study credible and reliable.

Green Infrastructure

The following describes chief results and inferences from results of the survey employed to obtain the data from specialists. Specialists in public organizations' green infrastructure and in organizations' green infrastructure offer their own perceptions through these results. There are four divisions in this chapter. To start with, demographical profile of survey respondents is presented. The next part consists of detailed discussion of results on green infrastructure specialists in Iskandar Malaysia. There is further explanation of these results through three sub-segments that align to specific research objectives. The section finally captures general discussion of research that captures all of its aspects.

Existing Typologies of Green Infrastructure

Opinions from specialists identify Iskandar Malaysia to have eight specific green infrastructure that have their ranks in decreasing order from their mean scores as considered vital for their community by their mean scores from expert opinions. They include sports field, parks, pocket space, water bodies, community space, residential garden, rooftop garden, courtyard, bioswales, permeable paver, hill forest, and flexible space that have their ranks in decreasing order from their mean scores. Sports field and parks ended up ranking as greatest of all these of interest that topped with their average score of 4.29 (see Table 5).

Table 5: Available Types of Green Infrastructure in Iskandar Malaysia

Available Type of GI	Number of Experts							Mean Score
	1	2	3	4	5	6	7	
Parks and Playing Fields	4	4	4	4	5	4	5	4.29
Bodies of Water	4	4	4	3	5	4	4	4.00
Hill Forests	4	3	3	2	5	4	3	3.43
Pocket Spaces	4	4	4	4	5	4	4	4.14
Courtyards	4	4	3	4	3	4	4	3.71
Loose-Fit Places	4	4	3	3	3	3	4	3.43
Neighbourhood Open Spaces, Home Gardens, and Roof Top Gardens	4	4	4	4	4	3	4	3.86
Bioswales and Permeable Pavement	4	4	4	3	3	3	4	3.57

Parks and Playgrounds: They are the most ubiquitous types of green infrastructure (GI) in Iskandar. They are recreational facilities, providing space for exercising, recreation, and socializing with others. Playgrounds and parks have a median value of 4.14, thus making them worth so much that they help boost residents' living conditions. And lastly, stash spaces hold a massive portion of all the GI. Those small patches of green amidst the concrete city give moments of respite and an injection of nature. Unjustly enough, they mostly have a numeric score of 4.00. Besides, Iskandar Malaysia has its water system of bodies that fit in with surrounding green cover. With a mean callous rating of 4.00, these water bodies provided biological benefits as well as adding beauty. They maintain biodiversity, manage microclimates, and improve general environmental health.

Another benefit is that open areas in the neighbourhood, home gardens, and rooftops gardens are easily accessible. Experts verified their proximity in Iskandar Malaysia, determining a mean standard score of 3.86. They are supportive of well-being, enable urban farming, and promote a sense of community. In addition, backyards conventionally positioned in open structures or house complexes obtain a mean score of 3.71. These comparatively hidden areas are serene and add to indoor living areas. Their development has significant effects on overall urban participation. Last but not least, pervious asphalt and bioswales receive an average score of 3.57 for their contribution to more affordable stormwater management. They capture moderate floods, filter out contaminants, and reroute groundwater.

Hillside open land and woodland have high scores of 3.43, but there are complications attached. One scientist does not know what to expect, although most experts do not either. We need to exert out-of-the-ordinary effort in preserving and defending nature in the face of uncertainty. Iskandar, Malaysia's mangrove forest is losing trees in accordance with other trends in the same direction throughout the region. Peninsular Malaysia lost approximately 19% of its mangrove cover between 1990 and 2010, and Johor lost approximately 20%

of its mangrove cover (Hamdan, 2012). In general, Iskandar Malaysia's green and blue infrastructure is caught in the middle of all this. Therefore, towards a sustainable future, however, something has to be done in order to plant more trees, sequester carbon, and reduce greenhouse gas emissions.

Table 6: Values and Benefits of Green Infrastructure in Iskandar Malaysia

Category	Value and Benefit of GI	Number of Experts							Mean Score
		1	2	3	4	5	6	7	
Social Value	Provide Goods and Products	4	4	4	2	4	4	4	3.71
	Improvements to People's Physical Health	5	4	5	4	5	4	4	4.43
	Improvements to People's Mental Health	4	4	5	1	5	4	4	3.86
	Encouraging Active Travel	4	4	5	4	4	4	3	4
	Improving Social Cohesion	4	4	5	4	3	4	4	4
	Increasing Connectivity for People and Nature	4	4	5	4	4	4	4	4.14
Environmental Value	Reducing Overheating in Urban Areas	5	4	5	2	5	5	4	4.29
	Increasing Biodiversity	4	4	5	4	4	4	4	4.14
	Improving Local Air Quality	5	4	5	4	5	4	5	4.57
	Protecting The Environment	5	4	5	4	4	3	4	4.14
	Flood Mitigation and Storm Water Management	4	4	5	5	4	5	4	4.43
Economic Value	Attracting Investment into The Area	4	4	5	5	4	5	4	4.43
	Private And Public Cost Savings	5	4	4	4	4	4	3	4
	Attracting Skilled Workers to The Area	4	4	3	3	3	4	3	3.43
	Increasing or Sustaining Tourism	4	4	5	4	4	3	4	4

The Importance and Benefits of Green Infrastructure in Iskandar Malaysia

The fifteen of these have been established by seven experts on basis of their scores' averages of mean that reflect upon how much significance or advantage green infrastructure (GI) has in Iskandar Malaysia from Table 6. Attraction of skilled workers to Iskandar was found to have lowest significance or advantage in regard to GI with average score of 3.43. At other extreme was improvement of locality air quality that was found to have greatest significance or advantage of GI with average score of 4.57. Through analysis of scores' averages of mean, improvement of locality air quality, good condition of body of people, mitigation of flooding, regulation of stormwater, attraction of investment, mitigation of overheating, and protection of environment have greater significance or advantage to GI in Iskandar Malaysia than other of these with scores of 4.57, 4.43, 4.43, 4.29, and 4.29 on average, respectively.

These findings demonstrate that all these specialists agree on aspects that contribute immensely to Iskandar Malaysia in GI benefits as well as GI

values. As in accordance to Iskandar Malaysia policy that states that qualities of lake, large trees, as well as waterways contribute immensely to cooling off of high temperature as well as greenhouses by acting as carbon sinks by absorbing CO₂ in abundance while maintaining terrestrial as well as aquatic biodiversity, these aspects have importance to their plan by Hamdan (2012), where he concluded that mangrove tree population in Johor dropped by 20% from 1990 to 2010 in order to further take account of how much it is needed to preserve as well as further GI in Iskandar Malaysia. Aside from that, with score of 4.14 on average, all these specialists concluded that Iskandar Malaysia is benefited from green infrastructure in biodiversity, connectedness to nature, as well as environmental protection.

This aligns with Iskandar Malaysia's policy to preserve mangrove forests as natural buffers to guard against intense gusts of wind, waves, and tsunamis, as well as to mitigate erosion of land and flooding. Because of these outcomes, these results have influenced Iskandar Malaysia's policy formation. Aside from that, these professionals have cited GI in Iskandar Malaysia in promoting tourism so that for transport to actively take place, community bonding is established, as well as cost savings by publics and privately—these all having mean scores of 4.00. All these results concur with Iskandar Malaysia's GI strategic plan to synchronize environmental, societal, and economic facets to create smart cities. There are six smart city elements to smart cities that include (1) smart people; (2) smart living; (3) smart mobility; (4) smart environment; (5) smart economy; and (6) smart governance. Because of these results, GI not only makes Iskandar Malaysia inviting to investors but is used to mitigate flooding in that region on a recurring basis.

Challenges Hindering the Enhancement of Green Infrastructure

As indicated in Table 7, professionals differed in their perceptions of greatest hindrance to green infrastructure promoting in Iskandar Malaysia. Regulation hindrance was initially quoted as greatest hindrance with maximum score of 3.29. Technical hindrance was followed by scores of 3.14 while that of context hindrance was 3.00 in that order. Surprisingly enough, differentiation was not achieved in structural hindrance and that of cultural/behavioural hindrance where these achieved on average score of 2.86. Thus, it would thus seem that professionals in general agree that greatest challenges in demarcating and practicing GI in Iskandar Malaysia include context, technical, and regulation hindrance.

Table 7: Barriers to Green Infrastructure in Iskandar Malaysia

Barriers	Number of Experts							Mean Score
	1	2	3	4	5	6	7	
Structural Barriers	4	2	3	4	3	3	1	2.86
Regulatory Barriers	4	2	4	5	4	3	1	3.29

Barriers	Number of Experts							Mean Score
	1	2	3	4	5	6	7	
Cultural/Behavioural Barriers	4	2	4	4	2	3	1	2.86
Contextual Barriers	3	2	3	4	3	3	3	3
Technical Barriers	4	2	2	4	4	3	3	3.14

Additionally, the findings indicate that GI in IM will be significantly impeded by regulations related to policies that are ill-defined. Thus, this finding is consistent with Iskandar Malaysia's goal of instituting laws and regulations for green space in IM. Additionally, it was found that professionals strongly acknowledge technical implementation problems and contextual factors as obstacles to developing green infrastructure. Last but not least, behavioural, cultural, and structural barriers were classified as average barriers to GI in Iskandar Malaysia. Needless to say, in cities such as Iskandar, Malaysia, culture plays a part in sustaining GI. The various types of barriers are summarized below:

Structural Barriers: Barriers that come as a result of the specific arrangements and work processes of organizations and institutions. Therefore, by altering how these organizations work and set and attain their goals, these practices can have an impact on new programs.

- Regulatory Barriers: Challenges arising from the manner in which the activities of the citizens are monitored and regulated by a government or an organization and the laws to which they are subject.
- Cultural and behavioral barriers: The impact of the attitudes, traditions, beliefs, and mentality of individuals holding pivotal positions in an organization.
- Contextual Barriers: Problems and priorities brought about by external sources which call for an institution's or state's attention.
- Technical Barriers: Functional or structural obstacles which deter or postpone the development of green infrastructure.

Insights from Specialists Regarding Additional Barriers and Supporting Factors

The expert analysis identified a range of other barriers to the growth of green infrastructure in Iskandar Malaysia. The funding cap is an issue because insufficient funding limits the capacity to implement sustainable actions and slows development. The major barrier is the cost of maintenance, which stretches available resources and is a source of concern for stakeholders. The complicated administrative structure, with its creation of conflict regarding the departments or the lead agencies charged with maintenance and enforcement, is an added source of complexity. This lack of clarity makes efficient stewardship cumbersome and

makes it difficult to maintain accountability in the infrastructure development process.

In addition, the resource allocation issue further exacerbates existing challenges by pitting organizations against each other for limited resources while they strive towards competing goals. Since it often leads to prohibitive expenses for developers who want to adopt green solutions, this shortage also hinders progress. A holistic approach through stakeholder cooperation, streamlined governance structures, and strategic fiscal planning is needed to overcome these challenges. By promoting collaboration and innovation, achieving the potential of its green infrastructure initiatives, and spearheading green growth and sustainable development in the area, Iskandar Malaysia can excel in these challenges. Additionally, the experts presented an all-encompassing strategy for incorporating green infrastructure in Iskandar Malaysia to excel in the challenges they encountered. The method outlined in this plan is multi-dimensional and begins with the promotion of the public and private sectors' collaboration. By collaborating and partnering to leverage the strengths and resources of both sectors, the realization of sustainable infrastructure projects can be expedited. This method can bypass the issue of finance, streamline processes, and energize imagination.

DISCUSSIONS

In the first place, taking Chinese studies as an example, "ecological security" studies typically apply concepts such as continuity and multi-functionality alongside the precepts of landscape ecology like the patch-corridor-matrix (Wang et al. 2018). Furthermore, Asian studies have suggested that sacred sites like temples and cemeteries, and urban green spaces like parks, gardens, campuses, and greenways need to be preserved to ensure biodiversity (Qiao et al. 2019). Some examples of how GI studies in Asia exhibit positive health impacts are the utilization of leftover forests for environmental variables (Foo, 2016), a decrease in stress induced by visits to parks (Paul and Nagendra, 2017), and increased physical activity and social bonding through local greenspace (Paul and Nagendra 2017).

To begin, based on Iskandar Malaysia, this study determines eight various forms of green infrastructure. These include a range of features, including courtyards, bioswales, hill forests, parks, pocket spaces, water features, and loose-fit areas (Zhang et al., 2019). These are ordered according to their mean scores, demonstrating how the parks, sports fields, pocket spaces, and water bodies in the area are all connected. The study also sheds light on how green corridors will help increase the sequestration of carbon as well as reducing the impacts of greenhouse gas emission in urban environments. Green corridors include permeable pavement, bioswales, home and roof gardens, as well as community open spaces. It does acknowledge the loss of vegetation along the

corridors of a city and proposes replanting and reforestation policies for reversing this tendency. The study finds many of the infrastructure components required for the development of Iskandar Malaysia, which are compared with green infrastructure requirements set in the UK and Germany. Permeable pavements, green roofs and walls, play spaces, greening of infrastructure, street trees, and urban parks are just a few of them (Foo, 2016).

The report also analyses ten other green infrastructure components that are essential for Iskandar Malaysia in mitigating successfully environmental issues like climate change and global warming. These include garbage bins, recycle bins, EV charging stations, rainwater collection systems, bike lanes, building complex fountains, covered pedestrians' walkways, retention ponds, and electric buses. Ngulani and Shackleton (2019) found that despite the potential advantages, Iskandar Malaysia's green infrastructure development is restrained by structural and cultural barriers. These barriers include financial limitations, maintenance expenses, jurisdictional disputes, and high implementation costs for developers.

It was the second instance for this study to enumerate fifteen green infrastructure values and benefits in Iskandar Malaysia. The 15 green infrastructures found are ranked from the highest to the lowest benefit and value, and some of these are (1) enabling physical health; (2) flood and stormwater management mitigation; (3) local air quality enhancement; and (5) investment attraction to the area. Reducing overheating, improving biodiversity, creating connectivity with nature and humans, sustaining tourism, facilitating active transport, fostering social cohesion, saving private and public funds, improving mental health of people, providing goods and products, and attracting skilled employees are just some of the benefits.

Urban green infrastructure offers the advantage of regulatory environmental governance to city dwellers. The presence of green spaces in Bangalore, for instance, lowers the temperature of the city by 3 to 5 degrees Celsius through the minimization of pollutants and suspended particulate matter, thereby improving the city's air quality, as stated by Gopal (2011). A further example of microclimatic control is provided by the Addis Ababa residential urban morphological types (UMT) mapping project through the regulatory services in addition to the context (Cavan et al., 2014).

CONCLUSION

There was a careful analysis of fifteen values and advantages of green infrastructure in the Iskandar Malaysia research. These are the material advantages, such as improvements to local air quality, which directly add to the physical well-being of people. And, in an area with these kinds of natural hazards, green infrastructure is essential for flood control and stormwater management. Along with this, it also brings in investment and maintains economic programs

of growth and sustainability. Less overheating and the stimulation of biodiversity, green infrastructure also enhances environmental resilience and the quality of life for residents overall. Connectivity is another significant benefit that encourages community spirit and awareness of the environment alongside making tangible connections between humans and nature. By ensuring an infrastructure that supports active travel, it reduces dependence on motorized transport and the ensuing environmental impacts. In addition to social cohesion and recreational aspects, green infrastructure enhances the psychological well-being of individuals in the community. Furthermore, in offering solutions for all natural causes of an array of concerns, including erosion prevention and minimizing the urban heat island effect to further improve performance, it enhances public and private savings.

Furthermore, a critical scrutiny of the topography of Iskandar Malaysia revealed an intricately intertwined tapestry of green infrastructures throughout the area. On examination, eight different types of these infrastructures were found, each of which made a distinct contribution to the ecological resilience and sociocultural vitality of the area. At the top of this hierarchy are beautifully groomed parks and large playing fields that are great centres for recreation and socialization, encouraging physical health and social integration in the midst of the city's bustle. With further investigation, the understated elegance of neighbourhood parks, rooftop gardens, and home gardens is uncovered. Each is a testament to its elegance and promotes a deep connection with nature amidst urbanization. Despite the above evident benefits, the study indicates a number of constraints to the construction of green infrastructure in Iskandar Malaysia. These include cultural and behavioural factors, technology factors, contextual limitations, structural limitations, and regulatory barriers. These barriers need to be established for green infrastructure projects to be properly implemented and maintained.

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