

## Government Green Procurement in Sustainable Infrastructure Development

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### Abstract

Infrastructure development is becoming more significant to an economic growth in many countries. A systematic delivery system regardless by traditional or non-traditional procurement methods is a common condition which has considerable impact on project outcome. In recent times, Government Green Procurement (GGP) has received a great attention among stakeholders in procuring products, services and construction works, particularly in public sector. In developing countries such as Malaysia, GGP have been beneficial by enhancing environmental concern to conserve natural resources, however, the evidence in terms of its implementation is still undiscovered. Due to this deficiency, this paper aims to determine the significant attributes of GGP, and to address the significant strategies of GGP in infrastructure project development. Exploratory study was conducted by reviewing literatures extensively and followed with expert interviews. Content analysis method was used to analyse the data. The results reveal that environmental is to be likely the most significant attributes of GGP, meanwhile, GGP Long-Term Action Plan (LTAP) is seemed to be the most important strategy used in promoting green procurement. This paper provides new insights to the literature in relation to green practice strategies and it is potentially to be useful for the stakeholders in prioritizing further efforts of green-oriented public infrastructure development in the future.

**Keywords:** Government green procurement, sustainable infrastructure, development strategies, construction industry, Malaysia

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### 1.0 INTRODUCTION

Infrastructure projects refers to the development and maintenance of services, facilities, and systems of multiple phases and it involves diverse of stakeholders. Government Green Procurement (GGP) for infrastructure projects focusses on procuring of products, services and construction works in public sector. Procurement method has been acknowledged as one of the important stages, mainly in the selection process (Bohari, 2017) and plays a significant role in the process of obtaining a supply or service. From the perspective of construction industry, procurement has been defined as a process of securing projects for establishing a service and facility according to predetermined criterias in contract (Ruparathna & Hewage, 2015). It is a streamlined trend to determine construction project are carried out to meet client's needs and objectives (Berry & McCarthy, 2011).

Currently, issues in relation to global warming has become a worldwide phenomenon due to earth temperature changes and human activities. These problems have been often associated with construction activities. Chua and Oh (2011) stated that building infamously make a significant contribution to global warming by causing one-third of the carbon dioxide (CO<sub>2</sub>) emission worldwide. This indicates construction projects have significantly contributed to negative impacts to the environment and an effective way is needed as mitigation.

Since environmental factors have received a great attention in construction process worldwide including developing countries, Malaysia has also acknowledged efforts on climate change challenges particularly on resources management, waste minimization and through guidelines implementation on managing sustainable resources (Adham & Siwar, 2012). A key strategy is to curb the environmental issues and effects in Malaysia known as Government Green Procurement (GGP). In essence, GGP refers to the procurement method for a product, service and work that includes the environmental standards into consideration (MEGTW, 2009).

The construction industry is no exception in which it has been recognised as a crucial stage for any construction project development (Kamar & Hamid, 2011). Through GGP, it has potential to conserve the environment and assist the country to improve current practices towards green-oriented development. By considering this scenario, government procurement in Malaysia plays a crucial role as a catalyst for socioeconomic development as it represents 24% to 33% of National Gross Domestic Product (GDP) (Adham & Siwar, 2012). Although traditional procurement has been widely used for government infrastructure construction projects, limitation of specific

guidelines on environmental preservation and sustainable practices has hindered the entire implementation. This has led to a highly demand on the efforts for enhancing environmental practices in delivering building and infrastructure projects (Bohari & Xia, 2015).

Procurement is an imperative tool to incorporate sustainable practices to be integrated when delivering a project. However, in today's practices, there is a significant lack of adopting for green building (Qiao & Wang, 2011). Therefore, procurement can be seen as the vital tool necessary on embedding the concept of green building in projects. Although, there are studies on green procurement, however, studies on how GGP has been promoted and achieved currently is far from sufficient. To bridge the gap, this study aims to address research objective by identifying the significant attributes of Government Green Procurement (GGP) as compared to traditional procurement; and examining implementation strategies for promoting GGP in sustainable construction of government sector.

## 2.0 LITERATURE REVIEW

This section discusses on the current state of theoretical underpinning on literature of this study's research objectives. Outcomes from past studies are used as a foundation to develop understanding on the practices of green procurement in construction projects. Basically, the literature reviews conducted based on several keywords in relation to attributes of GGP, traditional procurement, and implementation strategies of the GGP. Generally, there are three principles of sustainable construction which are environment, economy, and social aspects as stated by Abolore (2012). These principles apply in determining the project reaches the level of sustainable construction standards. Environmental principles refer to environmental protection in the aspect of built environment and natural environment.

The environmental perspective deals with tackling greenhouse emission, level of pollution, disposal of waste and managing natural resources. Meanwhile, built environment is seen as activity in construction projects, and without properly controlled may result in adverse effects on the natural environment. Environmental principles also refer to the use of natural resources. Additionally, parties involved in sustainable construction can help to control the use of natural resources or resources by utilizing renewable sources of resources and more efficient use of resources.

### 2.1 Sustainable Construction Concept

Traditional procurement focused upon value for money considerations such as price, quality, functionality, and availability to source the materials or products. On the other hand, sustainable procurement is the process by which organisations buy assets, supplies, services and works by taking account several factors including value for money, whole life cycle of products with a focus on integrating environmental aspects and social considerations in the purchasing process.

Sustainable in construction is defined as a concept to minimize negative impacts to the environment and enhances positive impacts to achieve economic, social, and environmental balance (Abidin, 2009). Further, sustainable construction also defined as construction practices in terms of material selection, resources, construction methods and designs to improve performance, reduce project load on the environment, reduce resource waste and more environmentally friendly construction (Zainordin & Tan, 2015).

Another study defined sustainable construction as a concept of construction which aims to preserve the environmental in undertaking construction project (Du Plessis, 2007). This clearly shows that the application of sustainable construction in development can conserve and protect the environment. In other words, sustainable construction could minimize the negative impacts on the environment without reducing the positive impact on economy and social.

Generally, there are three principles of sustainable construction which are environment, economy, and social aspects as stated by Abolore (2012). These principles apply in determining the project reaches the level of sustainable construction standards. Environmental principles refer to environmental protection in the aspect of built environment and natural environment. Meanwhile, built environment is an activity in construction in which without properly controlled may result in adverse effects on the natural environment. Environmental principles also refer to the use of natural resources. Additionally, parties involved in sustainable construction can help to control the use of natural resources or resources by utilizing renewable sources of resources and more efficient use of resources.

In contrast, social principles refer to the benefits of sustainable construction to humans such as satisfaction, comfort, safety, health, and quality of human life. Social perspective refers to the community values on health, safety, and well-being. The third principle, economy, refers to the aspect of sustainable construction benefits to the improvement of the economy. The microeconomic aspects refer to activities that lead to the profitability of the sustainable construction while macroeconomic aspects refer to the benefits derived from the success of a sustainable construction project to the parties involved. Economical perspective refers to cost effectiveness that embodies building sustainably.

### 2.2 Government Green Procurement Method

Each procurement method used for a construction project is selected based on the client's needs, the type of project, the level of risk involved by the client, the resources and the organizational structure involved in the construction project. Most of the construction projects under government sector are carried out through conventional procurement method and therefore it has become a typical method in Malaysian construction industry. Based on Ministry of Finance (MOF) Malaysia, three categories of government procuring in the Pekeliling Perbendaharaan (PK1) namely work, supply and services.

The GGP was established as one of the measures to promote the use of green or sustainable products and services locally. Additionally, the Government Green Procurement is one of the steps taken by the government within its path towards sustainable development. This initiative was introduced in 2012 by the Ministry of Energy, Green Technology and Water Malaysia (KeTTHA) (or

currently known as KASA). The establishment of the Government Green Procurement is in line with the establishment of the National Green Technology Policy which is the catalyst for green technology growth in this country (Adham & Siwar, 2012).

Government Green Procurement (GGP) in the context of Malaysia refers to procurement of supplies, services and jobs in the government sector that considers environmental criteria and standards. This procurement method is aimed at conserving the environment and natural resources and minimizing or reducing the negative impacts on the environment and natural resources arising from human activities (Geng & Doberstein, 2008). Green procurement builds on the traditional procurement practice, which it seeks to extend through the adoption of sustainability principle (Bohari, 2017). Practicing green procurement means that organizations should commit to minimizing the environmental consequences of construction activities. It underlines the practice of acquiring a selection of products and services that minimize environmental impact and requires the assessment of the products at all the various life cycle stages.

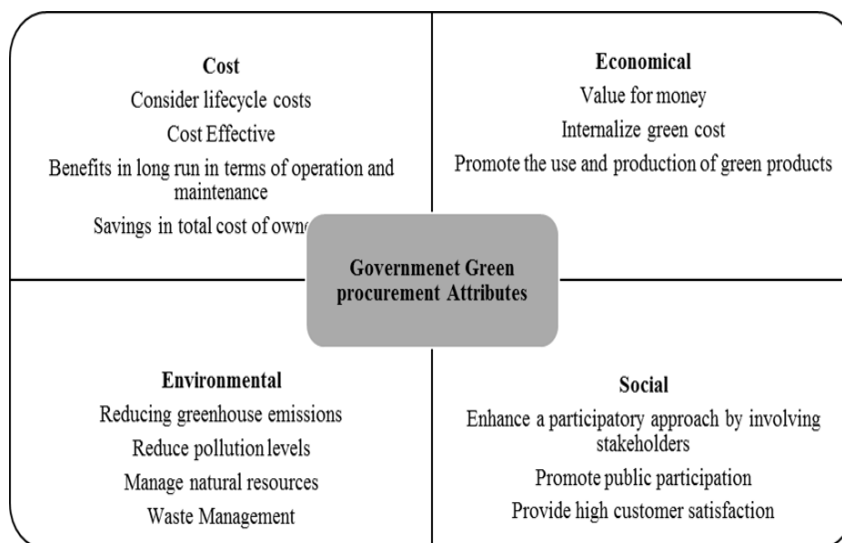
### 2.3 Exploration on Government Green Procurement Attributes

Environmental aspects considered in procurement cover aspects of minimizing negative impacts on environmental quality, providing a healthy environment for all living, saving energy and natural resources, and promoting renewable resources (Abolore, 2012). Among the principles in the Government Green Procurement are such as emphasizing on pollution prevention in the environment. The action on environmental prevention is as early as the procurement process begins. This is to avoid conditions that can bring pollution to the environment. Additionally, the next principle is the emphasis of the environmental aspects in the product life cycle. Various aspects of the environment are considered throughout the lifecycle of products and services such as the use of efficient and energy-saving resources, the use of eco-friendly natural resources, material reuse and recycling of materials used (Walker & Brammer, 2009).

The objectives to be achieved in the implementation of the Government Green Procurement in Malaysia, according to the Ministry of Energy, Green Technology and Water Malaysia (KeTTHA or currently known as KASA) is green economic development. By creating product development and the use of green services, it will indirectly help to develop the green economy sector in Malaysia. Second, the efficient use of natural resources. Natural resources will be used efficiently by encouraging the reduction of natural resources in the production process. The re-use and recycling aspects of the materials will also be applied. Other than that, is to raise public awareness and concern for the conservation of the environment. The awareness of environmental conservation among the community will be enhanced to ensure the effectiveness of green practices in the community's environment.

Government Green Procurement obviously have major advantages over the conservation of the environment in general. However, it does not only focus on the environment but also the economic and social aspects. According to Adham and Siwar (2012), one of the advantages or benefits of the Government Green Procurement is to promote the use and production of green products. Given the use and production of green products, it will assist in conserving the environment and saving the use of natural resources. Figure 1 is author's compilation of significant attributes of implementing Government Green Procurement from Ofori (2010), Morris (2007), Adham and Siwar (2012), and Bohari (2017).

There are many factors on different level of uptake costs to integrate components of designing sustainably that may be due to location of a project, locality weather conditions, location of site and staff experience. Morris (2007) suggested to examine building for green infrastructure and construction through team members commitment in delivering a project to achieve value for money. Sustainability objectives and budgets must be chosen during project planning phase. Government Green Procurement will help promote private sector and the public awareness towards green practice (Musa et al., 2013).



**Figure 1** Attributes of Government Green Procurement  
(Data compiled from Ofori, 2010; Morris, 2007; Adham and Siwar, 2012; and Bohari, 2017)

From economical aspect, Government Green Procurement could assist in the practice of purchasing green products and services. However, the practice can be cause issues as it a necessity for engagement from project delivery team in building green from pre-construction stages (Bohari, 2017). Procuring sustainable materials and services also requires an interface between subcontractors and suppliers to achieve effectiveness of green implementation. Most of the accreditation process emphasized on recycling materials in attempt to reduce waste disposal and sourcing raw materials.

Ofori (2000) highlighted procuring to build should be done by disclosing environmental attributes of products or services. This type of procurement can be implemented with recommendation guidelines on eco-labeling. Classification of produce enable information of compliance on environmental standards on a product or service (Li & Geiser, 2005). In Malaysia, this initiative is provided by MyHijau implementation to improve the procurement of environmental products and services (Adham & Siwar, 2012).

In relation to construction, Government Green Procurement consist of green practices integrated from previous research. One of the tools in assessing Government Green Procurement is through the Life Cycle Costing (LCC) analysis (EPU, 2016). LCC is an important instrument to support GGP implementation, it is a procurement method that considers the acquisition cost and other costs such as operation, maintenance, and disposal throughout the lifecycle of products, services and works. This means the implementation of LCC is an attempt to minimize costs and optimize performance.

#### **2.4 Government Strategy on Implementing Government Green Procurement (GGP)**

The government has shown a strong commitment by implementing various initiatives to support the implementation of this Government Green Procurement. The National Green Technology Policy (NGTP) was established to support Malaysia's direction towards sustainable development. It focuses on four pillars namely energy, environment, economy and social. The main objective of this policy is to reduce carbon emission up to 45% by 2030 based on year 2005 level (EPU, 2015). The construction industry is among the important industries in the development of the country.

The Construction Industry Transformation Program (CITP) 2016-2020 has outlined the importance of conserving the environment in implementing a construction. The Ministry of Energy, Green Technology and Water Malaysia (KeTTHA) (or currently known as KASA) also has endorsed the MyHIJAU initiative, which is Malaysia's official green label scheme to bring together certified green products and services that meet local and international environmental standards under one single mark.

Construction Industry Development Board (CIDB) has also drafted various plans and plans to support the implementation of the Government Green Procurement (Khairi, 2012). Among them, in 2010, the Jawatankuasa Teknikal Amalan Terbaik Teknologi Hijau Dalam Industri Pembinaan, a technical committee was set up which comprised professionals involved in the construction industry. The establishment of this committee aims to assist the Construction Industry Board of Malaysia (CIDB) in providing the construction industry guidelines, manuals and standards related to green technology in the construction industry.

The purpose of CITP 2016-2020 launched by CIDB Malaysia is to acknowledge the priority of sustainable development. To boost the industry's productivity rate, several measures had been introduced in CITP to facilitate the industry's transition from a labour-intensive sector to one based on technology. CITP consists of four thrusts which are quality, safety, and professionalism; environmental sustainability; productivity; and internationalization. This initiative prepared a platform to drive innovation in sustainable construction and compliance to environmental sustainability ratings.

Green technology-related programs under construction have also been introduced by the CIDB. The current program is a green labeling program for construction products known as the CIDB Green Label. The program aims to promote the production of green or environmentally friendly building products by the manufacturers of building materials in the country. The Sustainable Infrastructure Rating Tool (Sustainable INFRASTAR) meanwhile covers the gap in addressing environmental concerns for greener infrastructure in the construction industry. These are among the initiatives CIDB has undertaken to support the implementation of Government Green Procurement.

In line with the green labeling, a green building certification has been established which is Green Building Index (GBI) on May 21, 2009. This recognition is established to promote sustainable or environmental-conservative concepts in a built-up environment and create awareness among the parties involved in the construction industry on the importance of the environment. Other than GBI, CIDB and PWD has also developed their rating tool namely MyCREST and PWD Green Rating Scheme (pH-JKR). Table 2 shows a summary of the strategies undertaken by the government towards the implementation of Government Green Procurement.

Based on Table 2, it shows that government has played its role in promoting initiatives and practices towards green-oriented practices and procurement, eventually leading to a more conclusive initiative which is the Government Green Procurement. Malaysian government framed and drafted initiatives that could help to boost the acceptance and awareness on Government Green Procurement. Through its agencies, each of them took part in adopting green-practiced to their existing practice to help the initiative to be made known to industries and public. The adoption of a sustainable consumption and production concept as outlined in the 11th Malaysia Plan is targeted to see at least 20% of government procurement going green by 2020. According to the 11th MP 2016-2020 development plan unveiled by former Prime Minister Datuk Seri Najib Tun Razak; the private sector will concurrently be encouraged to emulate government efforts in green procurement.

According to the Eleventh Malaysian Plan (11MP), Government Green Procurement will be made mandatory for all government ministries and agencies. The GGP will create the demand for green products and services, encouraging industries to raise the standard and quality of their products to meet green requirements. The government will act as a catalyst to create green markets in products and services as well as buildings. A government-driven push will encourage local industries, especially small and medium enterprises, to develop green products and services, eventually leading to further greening of the supply chain.

Other targets set under 11MP include reducing green-house gas (GHG) emission intensity of GDP by up to 40% compared to 2005 levels by 2020 and conserve at least 17% of terrestrial and inland water areas as well as 10% of coastal and marine areas as protected areas.

In construction industry at government sector, government regulatory body, Ministry of Works had issued a letter dated 23rd September 2015 to instruct all government development projects by JKR in RMK11 need to obtain green building rating scheme by either Penarafan Hijau JKR (pH-JKR) or Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCREST) (EPU, 2016).

**Table 2** Government strategies on implementing Government Green Procurement (GGP)

Source of GGP Initiatives	Strategies
<b>Twelfth Malaysia Plan (12MP)</b>	<ul style="list-style-type: none"> <li>- Align with the Shared Prosperity Vision 2030 with the goal of sustainable development</li> <li>- Focus on fair and inclusive economic distribution to all income groups, ethnicities, territories, and supply chains</li> </ul>
<b>National Construction Policy (NCP) 2030</b>	<ul style="list-style-type: none"> <li>- Digital construction from the planning stage within the development phase until the maintenance and demolition phase.</li> <li>- Support the adoption and adaptation of technology in work processes, standardisations, and mechanisms</li> <li>- Provide quality infrastructure including quality and safety, environmental sustainability, productivity of human capital, internationalisation and infrastructure maintenance</li> </ul>
<b>Shared Prosperity Vision (SPV) 2030</b>	<ul style="list-style-type: none"> <li>- Maintain sound economic development while protecting vital natural resources and environment</li> <li>- Promote resilience and inclusive infrastructure which are sustainable can change human lives.</li> <li>- Effective use of financial resources, carbon footprint consideration, social cohesion and stewardship of natural ecosystems</li> </ul>
<b>National Green Technology Policy (NGTP)</b>	<ul style="list-style-type: none"> <li>- Prioritize green conceptual products and promotes green services</li> <li>- Zero Green House Gases (GHG) emissions</li> <li>- Promote the use of natural resources</li> </ul>
<b>Eleventh Malaysia Plan (11MP)</b>	<ul style="list-style-type: none"> <li>- Focus on green growth that is resource-efficient, clean, and resilient.</li> <li>- Prioritize environmental-friendly goods and comply with green technology standards Commitment to pursue development in a more sustainable manner from the start</li> </ul>
<b>The Ministry of Energy, Green Technology and Water Malaysia (KeTTHA) (or currently known as KASA) Strategic Plan (2010-2015)</b>	<ul style="list-style-type: none"> <li>- Implement the Government Green Procurement procedure</li> <li>- Establishment of MyHIJAU Procurement, MyHIJAU Directory and MyHIJAU Labeling</li> <li>- Establishment of the Green Building Index (GBI)</li> </ul>
<b>Construction Industry Development Board (CIDB)</b>	<ul style="list-style-type: none"> <li>- Establishment of CIDB Green Label</li> <li>- Formation of Jawatankuasa Teknikal Teknologi Hijau Industri Pembinaan</li> <li>- Construction Industry Transformation Program (2016-2020)</li> <li>- Sustainable INFRASTAR</li> </ul>
<b>Public Works Department (PWD/JKR)</b>	<ul style="list-style-type: none"> <li>- Establishment of Environment and Energy Efficiency Branch</li> <li>- Green rating scheme/tool, pH-JKR</li> </ul>
<b>GGP STAP and LTAP</b>	<ul style="list-style-type: none"> <li>- STAP provides the transformation steps, pursues the realization of GGP in practice and definition of green criteria for first product groups.</li> <li>- LTAP further expands product group and list initiatives to be carried out involving products, services and new added works/construction aspects</li> </ul>



### 3.0 METHODOLOGY

This research adopts qualitative method. There are two types of methods to collect data and information to answer the questions and to achieve objectives of the study: (1) identifying significant attributes of Government Green Procurement (GGP) as compared to traditional procurement in sustainable construction; and (2) examining the implementation strategies for GGP in sustainable construction of government sector. The first method was applied to retrieve primary data while the second method was implemented to obtain secondary data. Primary data involves preliminary interviews and secondary data involving extensive literature review. The research instrument chosen to obtain and collect data for this research is through the semi-structured interview method. Interview is a method of collecting data based on the experiences of other people or individuals involved (Saunders et al., 2009) while population refers to the focus of a group on a place or area to be studied.

Qualitative analysis emphasizes sense-making to understand the experience. For researchers using qualitative analysis, it is imperative to have a creative, ethical, investigative, and participant-in-context attitude (Miles & Huberman, 1984). With this study, Creswell (1998) suggests that as findings emerge due to the interactions between the researcher and the participants (i.e., GGP practitioners); the research also progresses because subjectivity is valued. This acknowledges that the research participants in qualitative research are human and incapable of total objectivity because their reality is constructed by subjective experiences within certain situations. Therefore, the values held by the researcher, the questions asked of the participants and the generated and interpreted findings all allow the research to be value-bound. In choosing the interpretive paradigm, certain assumptions and perspectives need to be accepted. Communication and interpretation are considered cognitive and interactive processes that can be tacit and subconscious whilst occurring within a specific context. If reduced to quantitative measures, such processes would not be capable of maintaining their embedded and essential features.

The sample of the study involved experts of the Construction Industry Development Board of Malaysia (CIDB), UiTM Sarawak and Sustainable Consumption and Production (SCP). Data analysis is the ability to process data into correct information (Howitt & Cramer, 2011). In this study, qualitative approach using content analysis method is used to analyze from interviews in which the data that were processed should be easily understandable in the form of transcripts to achieve the objectives of this study. Data collection was done through face-to-face interviews and through telephone. Feedback was recorded using a voice recorder and note-taking. The interview process took about 30 minutes to 45 minutes. This section describes the background of the interview participants comprising the expert representatives of different organisations who have been involved in GGP. All three-interview participant possessed high qualifications with expertise in the field of study. The interview participants have been carefully selected to ensure they are experts specialising in Government Green Procurement (GGP). The interview questions are on significant attributes of implementing Government Green Procurement and strategies for Government Green Procurement in sustainable construction. Details of interview participants shown in Table 3.

**Table 3** Interview participants' background information

Interview participants (GGP Experts)	Position	Agency/Department	Years of Experience
R1	Senior Lecturer	Quantity Surveying Program, Faculty of Architecture, Planning and Surveying, UiTM Sarawak	10 Years
R2	Strategist/Coordinator	Sustainable Consumption and Production, Deputy Secretary, Biodiversity and Forestry, Division Ministry of Water, Land and Natural Resources	10 Years
R3	Assistant Engineer	Safety, Health and Environment (SHE) Unit, CIDB	3 Years

### 4.0 DATA AND RESULTS

This section discusses the data analysis of the results of the study through the data obtained through the methodology of the study conducted. The data analyzed were based on interviews conducted on interview participants.

#### 4.1 Attributes of Government Green Procurement Compared to Traditional Procurement in Sustainable Construction

Data obtained for this study were analysed to determine significant attributes of Government Green Procurement compared to traditional procurement and to examine implementation strategies for the Government Green Procurement.

##### 4.1.1 Cost Attributes

All interview participants agreed that GGP is cost effective in general, but it may not be happening currently. R1 explained that: *“It is an unclear situation if its cost pertaining to GGP. It is supposed to be cost-effective because we are looking at not only the purchasing cost, but it includes the life cycle costing for purchasing. What happens now is that cost increase because of the quantity of suppliers, quantity*

of materials, competition in the market and support from the industry itself that cause the cost-effectiveness of the GGP is hard to achieve” (R1).

R2 and R3 also shares the same perspective, that cost effective is achievable but now due to lack of materials and implementation may increase the initial cost slightly higher. Their responses are:

“We should look GGP from cost wise as the total cost of ownership. We cannot look it as only upfront cost because when we talk about upfront definitely GGP seems to be more costly. But if we look at it for long term, as a lifecycle costing it will be bringing benefit in long run. Many studies indicate that around 1-2% saving by using green products and services” (R2).

“It is cost-effective. GGP may incur more cost, but it is only at the beginning” (R3).

Carlsson and Waara (2006) stated that despite the many advantages that can be gained from green products and services, its preparation is costly in the early stages Procuring green products and services would require slightly higher cost due to external factors. However, this indicates that cost factor is one of the attributes for this procurement.

#### 4.1.2 Economic Attributes

An economic aspect relates to the concept of value for money, which also internalizes green cost (Bohari, 2017). Respond from R1 indicated that with the implementation it projects a signal to market that government is shifting towards green economy. R1 stated that:

“GGP as a tool gives the signal to market and stakeholders that the government is now moving towards green, and you need to prepare for that. GGP can be a tool that triggers awareness and provide market demand for that” (R1).

R2 and R3 agreed that economical aspect can be gained through the implementation of Government Green Procurement:

“If we look at our current expenditure, more than 12% is for procurement. So, we can make use of this huge spending to influence market” (R2) and “Market can gain benefits from introduction of GGP. We need to push the private sector to join the movement as private projects account for 80% and remaining is public project type” (R3).

The responses are consistent with previous research that mentioned on economical aspect gained from Government Green Procurement through promoting the use and production of green products (Adham & Siwar, 2012).

#### 4.1.3 Social Attributes

Social aspect is greatly considered in Government Green Procurement, in fact it is an aspect that makes it differ from conventional procurement (EPU, 2016). Taking into consideration of human well-being, quality of life and promote sustainable livelihood. Interview participant 1 in her opinion stated that:

“First, we are promoting the environmental- friendly ambience. Also, after building is completed, they can improve the end user experience including the quality of life” (R1).

R2 emphasized on these aspects as crucial to consider and mentioned that conventional procurement does not account for this aspect. He stated: “Part of GGP requirement is actually on the people’s wellbeing. How you treat your worker, do you give any sufficient wage to them? Current conventional procurement does not consider the social aspect” (R2).

Affirming the above statement, the third interview participant also agreed that Government Green Procurement can enhance society social aspect. He stated: “GGP as whole, take the consideration of human well-being and social life” (R3).

Government Green Procurement can improve company’s reputation and social image. The statements are as follows:

“Definitely, if you become a pioneer company in promoting GGP that gives positive impacts to society of course you will gain reputation from it” (R1).

“Companies that implement GGP can make the society to give a good and positive perception” (R2).

“GGP will have effect on people’s awareness in green rated building. It can improve their image as it has an added-value” (R3).

#### 4.1.4 Environment Attributes

Environmental aspects are the most significant attributes of Government Green Procurement. Not only it considers the environmental aspects, but it also promotes various green practices (Dobson et al., 2013). The statement is supported by all interview participants in their following statement:

“Definitely in terms of how building is designed, they will include the green building criteria and purchasing of green materials. Also, the contractor for example must be certified green” (R1).

“GGP needs to take account the environmental criteria. Not only criteria, but it also needs to promote the use of standard, the use of EMS, and promote responsible producer” (R2).

“Yes, it aligns with government initiative to make Malaysia sustainable. It helps in reducing carbon emission and other aspect such as water efficiency. It will also be better for green product as it becomes cheaper, and easy to procure” (R3).

Purchasing of green products and materials, environment management system are the examples found from previous research to reduce environmental impact (Geng & Doberstein, 2008). All interview participants agree to this statement, and they responded as follows:

“The GGP act as a tool to consider environment aspect of procuring or purchasing in every level of construction throughout its lifecycle. It rules out the elements of green purchasing for stakeholders to understand the concept of reducing environmental impact” (R1).

“Green products and services used by consumer; construction industry can eventually produce better environment quality” (R3).

This indicates that environment is the most distinct attributes and consistent with previous research that integrate environment into purchasing policies, programs, and action of procurement. Based on interviews, responses of analysis are categorised in four aspects as Cost, Economic, Social and Environmental attributes with summary shown in Table 4.

**Table 4** Summary of attributes of Government Green Procurement

Attributes	R1	R2	R3
<b>Cost</b>	<ul style="list-style-type: none"> <li>- GGP is cost effective but due to industry cost to increase</li> <li>- Life cycle costing considered in purchasing/procuring.</li> </ul>	<ul style="list-style-type: none"> <li>- In total cost of ownership GGP in long term can benefit in saving around 1-2%</li> <li>- LCC throughout the lifespan we will get benefits.</li> </ul>	<ul style="list-style-type: none"> <li>- Initially costly but throughout the life cycle is cost effective</li> <li>- Monitor LCC once GGP implemented.</li> </ul>
<b>Economical</b>	<ul style="list-style-type: none"> <li>- GGP can be a tool that triggers awareness and provide market demand.</li> <li>- Cost-saving during the lifecycle.</li> </ul>	<ul style="list-style-type: none"> <li>- We can make use of this government huge spending to influence market.</li> <li>- Assist for government in prudent spending.</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of GGP will cause market-drive but it is still slow.</li> <li>- We can expect the emergence of green services company.</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>- Products are better in durability, and it will help the society to become aware on the green movement.</li> <li>- GGP gives positive impacts to society of course you will gain reputation from it.</li> </ul>	<ul style="list-style-type: none"> <li>- GGP requirement is on the people's wellbeing</li> <li>- Current procurement does not include social</li> <li>- GGP can make the society to give a good and positive perception.</li> </ul>	<ul style="list-style-type: none"> <li>- Take into consideration of human well-being</li> <li>- Job opportunity</li> <li>- Gives good image to companies that implement GGP.</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>- Green building criteria and purchasing of green materials. Also, the contractor for example must be certified green.</li> <li>- GGP act as a tool to consider environment aspect of procuring or purchasing in every level of construction throughout its lifecycle.</li> </ul>	<ul style="list-style-type: none"> <li>- GGP needs to take account the environmental criteria. Not only criteria, it also needs to promote the use of standard, the use of EMS</li> <li>- Conventional approach is more to correcting than preventing.</li> </ul>	<ul style="list-style-type: none"> <li>- It helps in reducing carbon emission and other aspect such as water efficiency</li> <li>- Materials used by conventional procurement emitted toxic substances</li> <li>- GGP can help in reducing carbon footprint, increase efficiency in water and energy consumption.</li> </ul>

## 4.2 Implementation Strategies for Government Green Procurement in Sustainable Infrastructure

The second objective of this study is to examine implementation strategies for the Government Green Procurement for sustainable infrastructure projects in the government sector.

### 4.2.1 National Green Technology Policy

The National Green Technology Policy focuses on aspect of energy, social, economy and environment (EPU, 2016). Interview participant 1 in her views stated that NGTP is where it all started.

*“Launched in 2009, part of 9th Malaysia Plan where everything about green and sustainability started and promoted. At that time, GGP is not in the picture yet, but it is where green initiative for construction started”* (R1).

Interview participant 2 and 3 also agrees that NGTP was the pioneer of green initiative to start in Malaysia, though it is not specifically directed to construction industry. They stated:

*“One of the key strategies is to promote GGP”* (R2) and, *“It is aligned, as it both consider products and services that is environmentally friendly”* (R3).

Interview participant 3 added some of the aspects that NGTP: *“It focuses on at first zero Green House Gases (GHG) emissions, conserve energy as well as promoting the renewable energy. It is quite like GGP in terms of aspects that is being considered”* (R3).



#### 4.2.2 GGP Long-Term Action Plan

GGP LTAP is a new strategy, drafted as guideline to industry specifically for construction industry. It outlines the initiative that involved procurement in construction works (EPU, 2016). This is a new finding and questions are asked to further understand the implementation of this strategy. For LTAP in construction procurement, initiatives involve three stages of (1) design phase, (2) construction phase, and (3) operation phase. These stages are the basic process involved in construction project.

Firstly, in design phase, industry players are recommended to register their projects at the early phase with green rating tools available. R1 stated that by implementing this action, it acknowledges their capability.

Secondly in construction phase, LTAP plans to incorporate green materials and the use of Environmental Management System (EMS), ISO14001 into construction of projects. Consideration of EMS and incorporating the green material during the construction would help to improve overall project performance (Adham & Siwar, 2012).

Finally, the operation phase includes the aspects of managing projects, maintenance, and day-to-day operation of building. During this term, stakeholder need to maintain conducive and well maintain condition of their buildings.

#### 4.2.3 CIDB & Public Work Department (PWD) Initiatives

CIDB and PWD are the regulatory body in Malaysian construction industry serving private and public sectors. In relate to Government Green Procurement, both of this agency has drafted their own initiatives to help promote the Government Green Procurement. CIDB for instance, come up with Green Labelling program, as well as Construction Industry Transformation Program (CITP) to boost Government Green Procurement in a larger impact. PWD on the other hand, set up new branch of management which is the Environment and Energy Efficiency Branch as well as PWD Green Rating Scheme or known as pH-JKR

R1 agrees that initiative done by CIDB & PWD is beneficial and is a great move towards sustainability though in Malaysia, Sabah and Sarawak is lacking in performance. Her response is:

*“When government started any policies or initiatives, they are telling the industry that this is the time for construction players to support and participate to what they have initiated. It helps to promote practices such pH-JKR that it is align with GGP. GGP and these initiatives need each other’s support”* (R1).

R2 and R3 on the other hand, mentioned that CIDB Green Labelling program is not in place now due to being underperforming. New green labelling program MyHIJAU, has now been placed to integrate green-labelled products under a single mark.

*“CIDB Green Labelling is not in place at this moment. What we have now is MyHIJAU labelling. It focuses on various products, including construction materials”* (R2).

*“Green-Labelling is not performing as it should as inventory, we have is lacking”* (R3).

R2 emphasize on the green rating tool from PWD as a crucial tool in promoting Government Green Procurement. R3 stated that current initiative is not sufficient as some of it only focuses on certain area or sectors. Table 5 summarises the information obtained from interview participants through data collection process.

**Table 5** Implementation strategies for Government Green Procurement in sustainable infrastructure

Strategies	R1	R2	R3
<b>National Green Technology Policy (NGTP)</b>	<ul style="list-style-type: none"> <li>- Part of 9th Malaysia Plan where everything is about green and sustainability.</li> <li>- Prudent management of natural resources and environmental conservation.</li> </ul>	<ul style="list-style-type: none"> <li>- One of the key strategies is to promote GGP.</li> <li>- To enhance public awareness, creating conducive market for green technology.</li> </ul>	<ul style="list-style-type: none"> <li>- Aligned with GGP, as it both consider products and services that is environmental-friendly.</li> <li>- Focuses on zero Green House Gases (GHG), conserve energy and renewable energy.</li> </ul>
<b>GGP LTAP Design Phase Green Rating Tool</b>	<ul style="list-style-type: none"> <li>- Acknowledge capability and competency of green project.</li> <li>- Good strategy if made compulsory for owners.</li> </ul>	<ul style="list-style-type: none"> <li>- GGP needs to be incorporated as early as design phase.</li> <li>- Green rating tool outline criterias to be fulfilled.</li> </ul>	<ul style="list-style-type: none"> <li>- Registered projects will initiate the building to go green.</li> <li>- Criteria assessed in green rating tool reflect the GGP.</li> </ul>
<b>GGP LTAP Construction Phase ISO14001, Green materials</b>	<ul style="list-style-type: none"> <li>- Standard that gives signal products or services is a good product.</li> <li>- Efficient to execute.</li> </ul>	<ul style="list-style-type: none"> <li>- Incorporate green materials in their construction.</li> <li>- Selecting qualified contractor fulfilling EMS aspects.</li> </ul>	<ul style="list-style-type: none"> <li>- ISO 14001, alignment with GGP in construction.</li> <li>- Ensuring implementation beyond design stages.</li> </ul>

<p><b>GGP LTAP Operation Phase Periodic maintenance, Green Solutions</b></p>	<ul style="list-style-type: none"> <li>- Lifecycle-analysis, maintenance, and inspection.</li> <li>- For Green Solutions we do not go to that extent yet.</li> </ul>	<ul style="list-style-type: none"> <li>- Information system software to improve facilities management.</li> <li>- Green solution require in depth study and pilot implementation.</li> </ul>	<ul style="list-style-type: none"> <li>- Green rating tool consist of periodic maintenance.</li> <li>- Operation and maintenance stages to be renewed in 2 years.</li> </ul>
<p><b>CIDB &amp; PWD Initiatives</b></p>	<ul style="list-style-type: none"> <li>- Promote practices such pH-JKR.</li> <li>- Align with GGP Industry with feedback on green-labelling.</li> </ul>	<ul style="list-style-type: none"> <li>- CIDB Green Labelling is not in place. What we have now is MyHIJAU labelling.</li> <li>- Green rating tool is critical in promoting GGP.</li> </ul>	<ul style="list-style-type: none"> <li>- Not sufficient where pH-JKR green rating tool is only applied to government projects.</li> <li>- CIDB Green-Labelling is not performing for inventory.</li> </ul>

## ■ 5.0 DISCUSSION AND FINDINGS

Based on the results obtained from the data analysis, the significant attributes of Government Green Procurement compared to traditional procurement is reaffirmed and aligned with findings from previous research. Each interview participant acknowledged the attributes and most distinguish aspect is environmental especially regarding construction industry. Based on data analysis, the main attributes that needs to be considered in the implementation of Government Green Procurement is the aspect of environmental.

Utilizing life cycle costing and environmental management system can be a strong pair to support the implementation of the Government Green Procurement. The information obtained further verify mentioned attributes in previous studies. The strategy that currently leading the Government Green Procurement implementation is through the Long-Term Action Plan (LTAP). LTAP further expands the product group and listed initiatives to be carried out specifically for construction aspects. LTAP is a new strategy that outlines the initiative involved for procurement in construction works. This is a new finding and have never been discussed in previous research.

Results of the interviews and analysis of data show that the first objective in this study has been achieved on identifying significant attributes of Government Green Procurement (GGP) as compared to traditional procurement. Attributes of Government Green Procurement, which is cost, economic, social and environment has been identified. The most significant attribute is environmental. GGP outline environmental aspect and its advantages through procurement system whether product, services or works and all interview participants acknowledge this statement. These attributes are motioning for change from the present procurement practice which does not consider the sustainable triple bottom line aspect, which is economic, social, and most important aspect, environmental. Utilizing life cycle costing and environmental management system can be a strong pair to support the implementation of the Government Green Procurement. The information obtained further verify mentioned attributes in previous studies.

The most important strategy is the Government Green Procurement Long-Term Action Plan (GGP LTAP) framework. GGP LTAP is an extension of STAP, and for this document it has been extended to works procurement. It is the closest guideline available now specifically for construction industry. This framed strategy covers every stage of a sustainable construction project through its lifecycle. It outlines the planned programs for the industry. Few initiatives have been identified including:

- Implementation of GGP pilot projects for works procurement
- Development of GGP Guideline on works procurement
- Sustainability specs mandated for all public projects
- Development of tender documents with green specifications
- Sustainable procurement in works module training development

This suggests that this framed strategy is to be used extensively in a sustainable construction project rather than focusing on just one level or criteria. In making the LTAP effective, Government Green Procurement uses lifecycle-costing tool (LCC) based on the information obtained from this survey. However, the level of this strategy is still low. Each interview participant stated that the implementation strategy is still in the initial stage and takes time to be fully implemented. This is because the construction project is a complicated and complex process. So, to apply something new, it requires a specific and orderly design. The information obtained through detailed interviews for the objective of this study is consistent with previous study. This paper highlights more opportunities for exploring sustainability principles by focusing on the Government Green Procurement approach. Therefore, recommendations are made for future research:

- Acceptance of contractors on implementation of the Government Green Procurement for construction projects
- Studies focusing on the performance of Government Green Procurement for construction projects initiated
- Identifying the level of readiness of stakeholders in implementing Government Green Procurement.

It further posits that this framed strategy is to be used extensively in a sustainable construction project rather than focusing on just one level or criterion. In making the LTAP effective, Government Green Procurement uses the life cycle-costing tool (LCC) based on the information obtained from this survey. However, the level of this strategy is still low. Interview participants stated that the implementation strategy is still in the initial stage and takes time to be fully implemented due to complexity in construction projects. The results are found

to be consistent with previous studies (e.g. Bohari & Xia, 2015) that implementation of green procurement is still in its infancy and faces lack of knowledge as one of the key challenges.

## 6.0 CONCLUSION

In conclusion, this paper paves some information that various parties are responsible in the implementation of the Government Green Procurement. Additionally, the findings would also be beneficial in overcoming the obstacles that hinders the implementation of Government Green Procurement towards enhancing sustainable construction projects particularly in developing countries such as Malaysia. Interestingly, the environmental found as the most significant attributes provides a significant signal for the policy makers to allocating more concern in ensuring that the implementation of GGP can be successfully delivered.

This paper also addressed that the significant attributes and implementation strategies of the GGP that will be useful for promoting and enhancing current sustainable construction projects in the government sector. The outcome of this paper contributes to the literature of green practice strategies and is useful for the stakeholders to prioritize more efforts of green-oriented public infrastructure development in the future especially in developing countries. To extend the idea regarding promoting the GGP in construction industry, a quantitative approach from different countries perspectives will be beneficial for validation of findings and for future work.

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