Challenges of implementing green procurement in public construction projects in Malaysia

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Abstract. Although the concept of green procurement is increasingly debated as environmental policy instrument that considers the impact of procurement as well as the purchasing process for the sustainability of project development. However, the concept in Malaysia is still in its infancy and facing various barriers and challenges to make a paradigm shift towards greener approach. Therefore, this paper tends to determine the challenges that hinder the green procurement implementation. In addition, this study aims to develop a roadmap for implementing green procurement in building and infrastructure projects. This could pave the road to establish a transformation plan that could gradually overcome the current challenges in order to reach to the holistic level. The study is based on a survey conducted in Malaysian organizations at which 100 organizations were surveyed to determine their perspective on 40 pre-determined challenges. A number of 89 questionnaires were returned and 76 were valid responses. Results revealed that an excellent consistency on the significance of the current challenges. These are mainly due to the higher upfront cost associated with eco-products and services, gap existence between policy formulation and actual project delivery, lack of legislation to introduce mandatory influence for green adoption.

1. Introduction
In construction industry, sustainability is no longer an option but an imperative. It turns to be essential element for project stakeholders. Indeed, it is debated as an indicator for the advancement of nations. Construction sector is considered as one of the major contributors to the environment degradation. Construction of buildings and infrastructures plays a major role in producing 40% of CO2 emissions, 30% solid wastes and 20% water pollution in the world [1]. The basic idea of sustainable development is to make effort to save energy and resources, promote recycle of materials, reduce the emissions of toxic substances and to enhance the indoor quality of human life whilst maintaining and sustaining the capacity of the ecosystem at both levels locally and globally throughout its life cycle [2]. Recently, the construction industry is no exception whereby there are urgent calls towards sustainable development to minimize the impact on the environment. This relates to social, economic and environmental sustainability which has become one of the topmost agenda on government policies. According to [3] Green Procurement is defined as “The act of obtaining or disposal and recognition of goods, services, engineering and construction work. It also encompasses the integration and
implementation of environmentally friendly practices throughout the processes involved in producing a construction output such as a building or infrastructure”. Malaysia commits to reduce 40% in carbon emissions by 2020 as compared to 2005. However, a few strategies were recognized by Malaysian government to preserve the environment. One of the strategies, the green procurement which was introduced under the National Green Technology Policy 2009 [4]. Green procurement is relatively new in Malaysia and has not been studied widely [5]. Although Green procurement provides a wide range of benefits for the society, the implementation is facing various challenges in developing countries including Malaysia.

It is stated that an effective and precise preliminary planning is essential requirement for developing a green building due to the challenges and uncertainty measures that are faced by the stakeholders [6]. In practice, no much of stakeholders focus on achieving sustainability through the procurement process. In fact, green public procurement may act as an engine for innovation and a crucial instrument to create market entrance opportunities for new green Malaysian products and services. Although green procurement may provide an opportunity to move forward towards sustainable construction, but studies on their actual delivery and practicability have not been conducted widely in Malaysia [7]. Based on [8] there are 60 green procurement practices are identified and could help the industry practitioner to plan their green procurement implementation in Malaysia, however, there are various barriers and challenges face the implementation of green procurement practices. The concept faces several obstacles including the level of knowledge and awareness of project stakeholders as well as the fragmented strategies and isolated practices to promote green buildings and infrastructure. This makes the integration of these isolated practices into green procurement as a challenge [3], [8], [9].

Currently, the guidelines for Green Procurement are fragmented, no practical guidelines for stakeholders towards green procurement project [3]. It is stated that research discussion on “Green Public Procurement (GPP) has mostly focused on the specific impacts of GPP implementation, while the discussion on GPP as compared to other environmental policy tools, in terms of efficiency and innovation is still lagging behind” [11]. Moreover, there are no practical guidelines for stakeholders to procure environmental-friendly construction projects which results in isolation between policy formulation and actual project delivery [12]. Higher upfront cost associated with eco-products and services, lack of legislation to introduce mandatory influence for green adoption are also challenges hindering the adoption of green procurement in building and infrastructure projects.

2. Literature Review and lead of research

It is obvious that the construction activities are rapidly increasing in Malaysia and there are various efforts towards a greener approach. The introduction of green procurement, which is promoted under the Malaysian Government’s MyHiJau initiative, is one of the fruitful efforts in this context. If well employed, green procurement is considered as one of the effective tools to make a paradigm shift towards sustainable approach. However, recently, it is reported by Construction Industry Transformation Program (CITP) 2016-2020, that the current market demand for sustainable building solutions is low which has resulted in a weak ecosystem for sustainability. This causes higher carbon emissions and energy usage of buildings which make a challenge to meet the 2020 sustainability outcomes of 4 Million ton (Mt) CO2 reduction per annum. Furthermore, achieving the target of 100% of large infrastructure and building projects to exceed sustainability requirements will also be challenging if the issue is not addressed [16].

Therefore, there is a significant need to diagnose the current barriers and challenges in order to propose the effective solutions that could enable the implementation of green procurement in public construction projects. In addition, investigating the challenges could pave the road for identifying the key success factors that could enhance the green procurement practices and encourage moving forward to reach higher green performance levels. The outcomes of this study provides insights for construction players towards green orientation. Achieving the goal of this study will be in line with Malaysian long-term goals of sustainable development particularly what has been recently emphasized by JKR’s Aspiration known as “Transformasi National 2050” on the Transformed Public Procurement. To the best of the author’s knowledge, there are a limited efforts have been undertaken
to explore the challenges that hinder the adoption of green procurement in building and infrastructure projects. In addition, there is also a lack in understanding the current scenario and procurement practices and how to prioritize the current procurement into greener approach. Therefore, investigating the affecting factors among professionals in construction industry is the main focus of this study. The research outcome promotes the adoption of green procurement and purchasing of green products, materials and services among construction organizations in Malaysia.

3. Research Methodology
In this quantitative study, a questionnaire was developed based on the findings from the variable elements identified in the literature review and designed to explore the participant background, involvement in green projects and project profile. The target was to establish a platform for different construction professionals about their prospective and point of views about the potential success factors for implementing green procurement. The questionnaire survey adopted in this research was distributed to a number of construction professionals participating in International Construction Transformation Conference 2019 (ICTC 2019) and attending (Eco-Build Exhibition 2019) which was held in conjunction with International Construction Week 2019 during 18-21 March 2019 at MITEC-Kuala Lumpur. In this research, participants were from different backgrounds and different organizations. This involves public clients, developers, architects, contractors, consultants, quantity surveyors, facility managers and participants from government organizations such JKR and CIDB. The conference put greater emphasis on reinventing construction: “how we build the future which emphasis on greening the construction industry beyond 2020”.

The questionnaires were distributed to 150 participants from different construction industry. Only 89 questionnaires were returned and only 76 questionnaires were valid for further analysis and discussions as they fulfil the requirements of this research.

4. Data Analysis and discussion
In this section, the data analysis of respondents’ background, project profile and key success factors are discussed and elaborated accordingly.

4.1. Respondents’ Demographic Characteristics

The profile of the respondents is explored as part of the data assessment. The purpose of analyzing the demographic profile of the respondents is to understand and describe the characteristics of the respondents. Meanwhile, the first part of the questionnaire was established to classify respondents according to their designation, position in the project, educational qualification, years of experience, involvement in green project and establishment of their organizations. Table 1 presents a summary of respondents in terms of their position on the project, their level of experience in the construction industry and green construction. Demographic information has no impact on the level of analysis of this study but reporting this is important to show the reliability of the respondents that are involved in this study. It can be observed from the collected data that 28% of the respondents are executive management, 28% are senior management, 7% are directors, 15% are engineers and 8% are junior management and 11 academician. It is a solid sign that the expected is quality data that is reliable due to the highest percentage among the respondents from executives and senior management. The current professional background of the participants is consultant which includes engineers and green consultants (22%), followed by public client/government (22%), followed by quantity surveyor (18%), followed by a similar percent for developers and contractors (9%), followed by architects and suppliers with (8 percent), facility manager (3 percent) and project procurement officer (1 percent). This is important to ensure that the responses received were from a trusted source. Having respondents with a variety of backgrounds is an advantage because the findings of this research will be from a holistic point of view.
On the other hand, the respondent’s background of studies and their experience in the construction industry is also indicated. The respondents’ working experience in the construction industry defines their level of expertise and knowledge. Most of the respondents (43 percent) are experienced, meaning they have been involved in the construction industry more than 10 years, which is good for an opinion-based survey analysis. Another 25 percent and 32 percent were within 5 to 10 years and less than 5 years’ experience respectively.

Table 1. Respondents’ background

| Demographic Features               | Frequency | Percent (%) |
|-----------------------------------|-----------|-------------|
| **Designation**                   |           |             |
| Executives                        | 21        | 28%         |
| Directors                         | 5         | 7%          |
| Senior Management                 | 21        | 28%         |
| Junior Management                 | 6         | 8%          |
| Engineers                         | 15        | 20%         |
| Academician                       | 8         | 11%         |
| **Position in the project**       |           |             |
| Consultant                        | 17        | 22%         |
| Public Client / Government Body   | 17        | 22%         |
| Procurement officer               | 1         | 1%          |
| Developer                         | 7         | 9%          |
| Architect                         | 6         | 8%          |
| Contractor                        | 7         | 9%          |
| Quantity Surveyor                 | 14        | 18%         |
| Facility Manager                  | 2         | 3%          |
| Supplier                          | 6         | 8%          |
| **Educational Qualifications**    |           |             |
| Diploma                           | 11        | 14%         |
| Bachelor’s degree                 | 47        | 62%         |
| Master’s degree                   | 16        | 21%         |
| PhD                               | 2         | 3%          |
| **Experience in construction industry** |       |             |
| Less than 5 years                 | 24        | 32%         |
| 5 to 10 years                     | 19        | 25%         |
| More than 10 years                | 33        | 43%         |
| **Involvement in green project**  |           |             |
| First Project                     | 8         | 11%         |
| More than Project                 | 28        | 37%         |
| None                              | 40        | 53%         |
| **Organization Establishment**    |           |             |
| Public                            | 39        | 51%         |
| Private                           | 36        | 47%         |
| NGOs                              | 1         | 1%          |

Respondent’ Demographic Profile (n =100)

Given the diversity of respondents’ professional backgrounds and their roles in their project planning and execution and the fact that all of the respondents have experience in green projects within the Malaysian construction industry suggest that their views represent the Malaysian context.
The respondents’ experience in green projects signifies the reliability of their response, which added to the data quality. In about 37 percent of the respondents indicated, they have been involved in more than one project, and 11 percent indicated that they had been involved at least once in green projects. However, more than half (53 percent) have not yet been involved in green projects. This variation indicates the importance of investigating the awareness level of respondents and shows that respondents are aware and possess knowledge on the research area but yet facing some barriers and challenges to implement green projects. In terms of organizational establishment, 51% are from public organizations such as JKR and CIDB where the targeted projects are the public projects whereas 47% are respondents from private organizations. It is a good sign when the respondent’s opinion is valid and reliable due to their knowledge in the research area.

4.2. Project’s Profile
Table 2 summarizes the project profile that is referred to by the respondents in answering this questionnaire. The number of cases and percentage are as shown in table 2. As can be seen from the table, the project location where the majority of those projects are located in different states of Peninsular Malaysia with overall of (92 %) where most of the project are located in Selangor, Kuala Lumpur and Johor by 32%, 26% and 8% respectively. However, the rest of 44% projects located in Peninsular Malaysia are located in different states where the range is between 3 to 4 percent. On the other hand, there are 8% of the overall projects are located in Sabah and no project was located in Sarawak.

The types of building were categorized based on the building function such as industrial, health, commercial and institutional. In addition, infrastructure projects are within the scope of this study. It is found that 33 percent of the respondents refer to the infrastructure projects. Meanwhile, the building projects were referred as 28%, 17% for residential and commercial building respectively. Whereas 9% and 3% referred as an institutional and mix development projects, 1% was for healthcare project and 3% for others.

Table 2 shows the percentage of respondents who were involved in a certified green building project in Malaysia. About 5 percent of the respondents were involved in platinum certified projects, gold and silver certified projects were 8% and 4% respectively. However, the majority of green projects are green certified with 17% and 8% under application stage. Most of the certified projects are based on GBI rating tool, however, some are certified with other rating tool such as GreenRe, BREEAM, LEED and some indicated that they were unsure which certification had been used by the project. In contrast 58% of projects are none certified.

The findings show that almost half of the respondents were not experienced in green construction, but the rest of 42% have experienced in green construction and thus their opinions were reliable. About 53 percent of the respondents highlighted that their projects used traditional methods as a procurement route, while around 28 percent used design and build, 9 percent construction management and 4 percent used private finance Initiatives (PFI). This reflects the fact that traditional methods are the most common type of procurement route used to procure green projects in Malaysia.

Most of the project are owned by state, federal government by 41% and 30% respectively. Whereas 22% of the projects clients are from the private sector. In terms of project size, the highest percent of the project is the project with the value greater than RM10 million with 25% followed with 20% for projects ranged between RM5 million to less than RM10 million as shown in table 2.
Table 2. Project’s profile

| Project’s profile                | Frequency | Percent (%) |
|---------------------------------|-----------|-------------|
| **Project location**            |           |             |
| Peninsular Malaysia             | 70        | 92%         |
| Sabah                           | 6         | 8%          |
| Sarawak                         | 0         | 0%          |
| **Project type**                |           |             |
| Residential Buildings           | 21        | 28%         |
| Commercial Buildings            | 13        | 17%         |
| Industrial buildings            | 4         | 5%          |
| Institutional Building          | 7         | 9%          |
| Healthcare Buildings            | 1         | 1%          |
| Mix Development                 | 2         | 3%          |
| Infrastructure                  | 25        | 33%         |
| Other                           | 2         | 3%          |
| **Green recognition**           |           |             |
| Platinum certification          | 4         | 5%          |
| Gold certification              | 6         | 8%          |
| Silver certification            | 3         | 4%          |
| Certified certification         | 13        | 17%         |
| Application Stage               | 6         | 8%          |
| None Certified                  | 44        | 58%         |
| **Contract Strategy**           |           |             |
| Traditional Procurement         | 40        | 53%         |
| Design and Build                | 21        | 28%         |
| Project Management Agency       | 7         | 9%          |
| Private Finance Initiative (PFI)| 3         | 4%          |
| Other                           | 5         | 7%          |
| **Project Client**              |           |             |
| Federal Government              | 23        | 30%         |
| State Government                | 31        | 41%         |
| Local Authorities               | 4         | 5%          |
| Private Sector/Developer        | 17        | 22%         |
| Other                           | 1         | 1%          |
| **Project Size**                |           |             |
| ≤ RM200,000                     | 3         | 4%          |
| ≤ RM500,000                     | 7         | 9%          |
| ≤ RM1 million                   | 8         | 11%         |
| ≤ RM3 million                   | 7         | 9%          |
| ≤ RM5 million                   | 8         | 11%         |
| ≤ RM10 million                  | 15        | 20%         |
| ≥ RM10 million                  | 19        | 25%         |
| N.A                             | 8         | 11%         |

Respondent’ Demographic Profile (n =100)
4.3. Green Procurement Challenge in Construction

Construction industry in Malaysia is still significant challenges to implement green procurement in building and infrastructure projects. The challenges are various and 40 challenges were observed and recorded with the code CH01 to CH40. Among the significant challenges are the higher upfront cost associated with eco-products and services, gap existence between policy formulation and actual project delivery and lack of legislation to introduce mandatory influence for green adoption. The challenges have been statistically analyzed through descriptive analysis whereby the mean, standard deviation and ranking are shown in Table 3. Therefore, 40 factors were exploded from literature to define the most important challenges that could lead to identifying the key success factors towards effective adoption. The responses were tested for consistency and result shows an excellent consistent according to Cronbach's Alpha test of 0.913. The analysis revealed a high mean greater than 3.50 and high slandered deviation greater than 0.5 as shown in Figure 1. This explain that the factors identified are significant to influence respondent decision to implement green procurement but they indicate that the factors are spread out over a wider range of values.

![Green Procurement Challenges](chart.png)

*Figure 1. Challenges of Implementing Green Procurement*

In addition, the challenges were analyzed through descriptive analysis and the mean, standard deviation and ranking of the factors are tabulated in Table 3.
## Table 3. Challenges of Implementing Green Procurement

| Code | Challenge                                                                 | Mean  | Std. Dev. | Rank |
|------|---------------------------------------------------------------------------|-------|-----------|------|
| CH20 | Higher cost of eco-products and services and influx of foreign products.  | 3.88  | 0.69      | 1    |
| CH11 | Higher initial costs for implementing sustainable procurement.             | 3.84  | 0.90      | 2    |
| CH27 | Gap existence between policy formulation and actual project delivery.      | 3.84  | 0.71      | 3    |
| CH5  | Lack of legislation to enforce the adoption of sustainable procurement.    | 3.80  | 0.86      | 4    |
| CH16 | Achieving value of money on a whole life basis (life cycle costing).       | 3.80  | 0.85      | 5    |
| CH21 | Lack of financial resources, funding support and project budget constraints.| 3.78  | 0.78      | 6    |
| CH36 | Lack of capacity of small scale suppliers/contractors to innovate green solutions. | 3.78  | 0.84      | 7    |
| CH30 | Absence of internal management structures for green procuring.             | 3.75  | 0.79      | 8    |
| CH31 | Lack of social drive and lack of client demand.                           | 3.74  | 0.90      | 9    |
| CH4  | Inadequate policies, regulations and lack of government leadership.         | 3.72  | 0.87      | 10   |
| CH25 | Absence of detailed specifications and difficulties on monitoring process. | 3.72  | 0.74      | 11   |
| CH2  | Integrating quality environmental management into planning and operation.   | 3.71  | 0.86      | 12   |
| CH10 | Improve organizational competitiveness and build a business reputation.     | 3.71  | 0.88      | 13   |
| CH18 | Lack of tendering procedures to guide organizations to select green sources. | 3.71  | 0.75      | 14   |
| CH8  | Achieving the financial impact of sustainable procurement performance.     | 3.71  | 0.95      | 15   |
| CH40 | Low technical and management capacity to formulate product specifications. | 3.70  | 0.89      | 16   |
| CH3  | Lagging of environmental policy tools for efficiency and innovation.       | 3.70  | 0.78      | 17   |
| CH19 | Separation between capital budget and operating budget.                   | 3.67  | 0.84      | 18   |
| CH7  | Achieving the operational impact of sustainable procurement performance.   | 3.67  | 0.79      | 19   |
| CH35 | Lack of procurement managers skills to formulate product/service specifications. | 3.67  | 0.76      | 20   |
| CH26 | Creating new, vibrant markets to boost supplier’s readiness.               | 3.67  | 0.82      | 21   |
| CH32 | Inadequate consideration of stakeholders’ requirements, expectations.      | 3.67  | 0.79      | 22   |
| CH13 | Lake of practical guidance for stakeholder to consider environmental criteria. | 3.67  | 0.85      | 23   |
| CH9  | Lack of organizational management, support towards capacity building.       | 3.66  | 0.78      | 24   |
| CH1  | Unfamiliarity of “Sustainable Procurement” concept and low level of awareness. | 3.64  | 0.93      | 25   |
| CH33 | Low multi-stakeholder approach and lack of collaboration and engagement.   | 3.63  | 0.75      | 26   |
| CH15 | Exploring new local market and increase competitiveness.                   | 3.63  | 0.85      | 27   |
| CH38 | Reluctance of stakeholders to change behavior towards sustainable practices.| 3.62  | 0.88      | 28   |
| CH14 | Reducing the use of natural resources and reduce waste.                    | 3.61  | 1.01      | 29   |
| CH17 | Lack of a balanced approach to consider all dimensions of sustainability.  | 3.61  | 0.71      | 30   |
| CH22 | Insufficient integration and linkup in the industry.                       | 3.61  | 0.91      | 31   |
| CH29 | Conflict of priority and absence of strategic approach.                   | 3.61  | 0.80      | 32   |
| CH12 | Lack of top management support, incentives for green procuring.            | 3.59  | 1.01      | 33   |
| CH39 | Lack of structured frameworks to assist in sustainable project delivery.   | 3.59  | 0.85      | 34   |
| CH34 | Low level of commitment and risks of different views towards sustainability.| 3.58  | 0.75      | 35   |
| CH23 | Lack of benchmarking of sustainable procurement and green best practices.  | 3.57  | 0.72      | 36   |
| CH28 | Complying with environmental and social legislations and corporate strategy.| 3.54  | 0.76      | 37   |
| CH6  | Achieving the environmental impact of sustainable procurement performance. | 3.54  | 0.81      | 38   |
| CH24 | Fragmented and isolated strategies to promote sustainable procurement.     | 3.53  | 0.84      | 39   |
| CH37 | Unavailability of eco-products list and materials quality concern.         | 3.50  | 1.01      | 40   |
5. Conclusion
This research investigates the key barriers and challenges that hinder the adoption of green procurement in buildings and infrastructure projects. Determining the challenges is the cornerstone towards identifying the key success factors that could drive and enable the implementation of green procurement in public construction projects in Malaysia. The investigation was carried out using a questionnaire survey. Results revealed that green procurement adoption implementation in Malaysia is still not prioritized and the adoption still has not reached the holistic level. Meanwhile, there are a willingness towards green orientation, but organizations are still facing difficulties to implement green procurement practices. This is mainly due to the higher upfront cost associated with eco-products and services, gap existence between policy formulation and actual project delivery, lack of legislation to introduce mandatory influence for green adoption. This next stage of this study is to examine the key success factors that could gradually overcome the current challenges and encourage professionals towards green orientation. Financial support from government through subsidizing green projects and initiative to implement green procurement for all public large projects and benchmarking green projects and more mandatory influence are among the factors which needs to be investigated. Undoubtedly, raising the awareness and capacity building through training, institutional organizations may also bridge the existing gap towards a better adoption. In addition, organizations may need to adopt best practices from experts and develop individual transformation plan to cope up with the international trend towards achieving sustainable construction in order to gradually overcome the challenges.

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