INCORPORATING SUSTAINABLE PROCUREMENT PRACTICES IN THE SRI LANKAN CONSTRUCTION INDUSTRY: CHALLENGES AND BENEFITS

MASTER OF SCIENCE

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CONSTRUCTION PROJECT MANAGEMENT

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Declaration

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Abstract

To achieve the Sustainable Development Goals (SDG), new thinking is essential. This applies to every country in the world who is a signatory to the United Nations 2030 Agenda and cuts across all key sectors. In line with the 2030 Agenda, the Government of Sri Lanka adopted the Sustainable Development Goals agenda in September 2015, which includes 17 goals. (Government of Sri Lanka, 2017) The Construction industry dominate the major share in all of the goals. However, the disregard of the triple bottom line (TBL) of sustainability is a major drawback within the current construction procurement practice (Ruparathna & Hewage, 2015). Though sustainable procurement practices are a developing concept within the construction industry, it has the potential to enhance the performance of sustainability requirements within the industry.

There is little to no methodology to incorporate sustainable procurement elements in construction procurement within Sri Lanka. Sustainable procurement is not a popular topic in available literature. An empirical study that focuses directly on this topic in Sri Lanka is still to be carried out. Hence, a study on the sustainable procurement practices in the construction industry within Sri Lanka is timely and necessary. This study attempts to evaluate current practices, challenges and benefits to implement sustainable requirements during construction procurement. For this purpose, an online questionnaire survey covering public, private, semi-government and international organizations was conducted as a means of collecting data. The responses that were received constituted of diverse groups and ages within the construction sector. A statistical analysis software was used to rank the responses and to conduct the cross analysis.

Results of the analysis revealed that “Legislation (Government and regulations)” is the main driver of implementing sustainable factors in procurement while “Lack of funding” and “Unwillingness to incur higher capital cost” ranked as the main barrier for the implementation of sustainable procurement. “Reduction in harmful emissions and waste generation” ranked on top as main benefits of sustainable procurement.

Keywords: Sustainable procurement, Procurement, Construction

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LIST OF ACRONYMS

Acronyms	Description
ADB	Asian Development Bank
APUC	Advanced Procurement for Universities and Colleges
ASOSAI	Asian Organization of Supreme Audit Instructions
CECB	Central Engineering Consultancy Bureau
CIDA	Construction Industry Development Authority
CMC	Colombo Municipal Council
CSR	Corporate Social Responsibility
EIA	Environmental Impact Assessment
EMS	Environmental Management System
GBCSL	Green Building Council of Sri Lanka
GDP	Gross Domestic Product
GOSL	Government of Sri Lanka
ITC-ILO	International Training Centre of the International Labour Organisation
JICA	Japan International Cooperation Agency
LCC	Life Cycle Cost
NGO	Non-Governmental Organizations
NPA	National Procurement Agency
NWSDB	National Water Supply and Drainage Board
RDA	Road Development Authority
RFP	Request for Proposals
RFQ	Request for Quotations
SDG	Sustainable Development Goals
SEC	State Engineering Corporation
SLN	Sri Lanka Navy
TBL	Triple Bottom Line
UDA	Urban Development Authority
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme

UNGM	United Nations Global Marketplace
UNOPS	United Nations Office for Project Services
UOM	University of Moratuwa
WB	World Bank
WLC	Whole Life Cycle Cost

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CHAPTER 1

1 INTRODUCTION

In 2002, the United Nations marked a key milestone for sustainable development at the world summit on Sustainable Development in Johannesburg, South Africa. Out of the several pledges, one of the key declarations in the summit was "Improvement in building design and management, better mass transportation, adoption of advanced and innovative cleaner technologies, energy labelling and standards, and better public procurement policies ..." (United Nations, 2002). It was reinforced that all stakeholders need to take ownership to strengthen the pillars of sustainable development namely, economic development, social development and environmental protection at all levels, nationally and globally.

This review highlights that previous academic work on sustainable procurement has been well documented in many areas. This review also highlights sustainable procurement considerations related to environmental factors and life cycle costs.

The construction industry dominates a major share of the economy of any country. Construction related procurement is often a contentious issue if not undertaken properly under the right checks and balances. Therefore, it is important to consider the triple bottom lines of sustainability (social, environmental and economic sustainability) during the execution of procurement activities. This, of course, has indirect benefits apart from ensuring an effective procurement cycle. Incorporating sustainable procurement factors will be helpful to protect the planet by maximizing use of energy sources whilst minimizing the impact to the environment, society and economy.

Unfortunately, there is a dearth of research on sustainable procurement practices in the construction sector of Sri Lanka. Therefore, the intention of this research is to find a solution to fill the knowledge gap in sustainable procurement by weighing the benefits and challenges of sustainable procurement practices in Sri Lanka.

1.1 Background

The construction industry is recognized as an economic regulator in any country, which significantly contributes to the output of the national economy. Moreover, the interdependency of the construction industry with other sectors of the economy has been established (Turlin, 1978). However, the major contributor to environmental pollution is the construction industry, which consumes about half of the resources extracted from nature (UNEP, 2016).

Procurement is a key component in construction project management, which can significantly impact the triple bottom line (economic, social and environmental) of sustainability. Construction procurement is the process of acquiring goods and services, whilst considering key sustainable parameters (social, environmental and economic), based on pre-defined and agreed specifications (Ruparathna & Hewage, 2013).

The concept of sustainable development is centred on ensuring that the planet's resources are used responsibly vis-a-vis human development (UNEP,UNOPS, ITC-ILO, 2011). By combining purchasing power, organizations can ensure effective and efficient collaboration that contribute to sustainable and durable change. Through well-designed procurement actions, society will benefit from the value for money, energy efficient equipment, good and decent working conditions and a service that is delivered efficiently.

United Nations Global Marketplace (UNGM) describes sustainable procurement as the process that integrates procurement requirements that are compliant with parameters concerning the environment, society and the economy. (UNGM, 2016) Further, sustainable procurement must ensure efficient use of resources and improve the quality of products and services that in turn optimize related costs.

A key fact of sustainable procurement is that it places emphasis on the purchase of sustainable, costs efficient goods and services that are readily available. Moreover, it places importance on whether the purchase is absolutely required and what impact it would have economically in the short term, mid-term and long-term. To this end, the process incorporates the triple bottom line of sustainability, i.e. social, environmental and financial parameters, that enable value to be added.

Factors that need to be considered vis-à-vis sustainability include the following:

- Economic sustainability: best value for money considerations such as price, quality, availability, functionality, and life cycle of the product;
- Environmental sustainability or green procurement: the impacts to the environment that the product and service creates over its whole life-cycle, from cradle to grave; and
- Social sustainability: considers the consequences that certain purchasing decisions have on larger social issues such as poverty alleviation, equity in resource distribution, human rights and so on.

Implementing sustainable procurement systems in the Sri Lankan construction industry is a challenge, though a starting point could be through the introduction of a sustainable procurement policy to the industry. The implementation of sustainability usually starts with the planning stage of the project and this should continue through requirement definition, sourcing, procurement, and construction and operation stage.

Requirement definition is imperative to any given procurement case. At such an early stage, it is important to consider all parameters of sustainability mentioned above, which will also indicate the organization's stance vis-à-vis sustainability. The planning process should also explore suitable and available alternatives that would inform the sustainability of the process and its impact (UNGM, 2016). Solicitation documents must specify that the evaluation by whole life cycle cost, use of renewable energy, use of non-toxic substances and use of recyclable materials, etc. will be considered to select a supplier or contractor whose performance is expected to best meet the specified requirement and give the best value for money to the organization.

1.2 Research Problem

This study is guided by the following problem statement:
There is little to no use of sustainable procurement practices in the construction industry in Sri Lanka.

1.3 Objectives

The **principal objective** of this research is to identify and evaluate the challenges and benefits to incorporate sustainable procurement practices in the construction industry of Sri Lanka.

The **specific objectives** are to;

I. Review the current procurement practice in the construction industry;
II. Identify and evaluate challenges to implement sustainable procurement processes and procedures;
III. Analyse the benefits of sustainable procurements;
IV. Recommend a possible mechanism by which sustainable procurement procedures could be embedded in the construction industry.

1.4 Research Methodology

This study has obtained information from several target groups; namely government, semi-government and private sector officials primarily working within the construction industry in Sri Lanka and personnel from international organizations such as the United Nations (UN), World Bank (WB), Japan International Cooperation (JICA) and Asian Development Bank (ADB).

A comprehensive desk review, literature review and questionnaire survey was conducted as data collection methods.

To achieve the above objectives, the following steps were followed:

- Desk review: Conducted a review of the procurement manuals and guidelines published by National Procurement Agency (NPA) of Sri Lanka, Construction Industry Development Authority (CIDA) , World Bank (WB) and United Nations Office for Project Services (UNOPS) to identify current practice.
- Literature review: Undertook a detailed literature review to assess the current research details related to the objective of the research. It also provided an overview of what kind of information is available at present and existing data and process gaps.
- Questionnaire survey: Administered a survey among selected entities in Sri Lanka, which included, public institutions, private construction organizations, semi-

government and international institutions such as UNOPS, ADB, JICA and WB. An assessment of educational background and related qualifications of the procurement officials were also covered within the survey.

- Data analysis: Carried out data analysis by using SPSS software, Google Forms and Microsoft Excel.

1.5 Limitation of the Study

The focus of the study was to understand current procurement practices within the Sri Lankan construction industry and to evaluate the challenges and benefits of sustainable procurement practices. This study is limited to the data analysis received through the questionnaire survey. Furthermore, a financial analysis to evaluate the financial benefits is not a focus of this study and could be considered as an area for future research

1.6 Guide to Thesis

Following this introduction (Chapter 1), the report is organized as follows.

- Chapter 2 : Literature review

  The chapter discusses the results of similar studies carried out related to the research topic, in Sri Lanka and globally. The key findings are summarized.

- Chapter 3 : Research methodology, Analysis and Discussion

  Methodology used for the study, evaluation and analysis of the findings are discussed in this chapter. Analyzed data is graphically presented in this section.

- Chapter 4 : Conclusion and Recommendation

  Concluding remarks from the research study as well as recommendations for the implementation of Sustainable Procurement practices in Sri Lankan construction industry is summarized in this section.

CHAPTER 2

2 LITERATURE REVIEW

2.1 General

This section attempts to gather knowledge on the study topic, study various research carried out by researchers, study methodologies deployed to carry out research and list research findings related to the study topic.

The Global Construction Outlook 2020 reveals that the global construction industry is projected to grow from US$7.4 trillion in 2010 to US$8.5 trillion in 2015 and to US$10.3 trillion by 2020. The construction industry of countries in an emerging market are forecast to continue to grow at a much faster rate. According to Construction Intelligence Centre, the construction share will be above 50 percent of an emerging country's economy in 2020. (Construction Intelligence Center, 2016)

"Economists are calling for a significant improvement in productivity to build momentum in global economic growth, but productivity is a persistent issue for the world's economies and the construction industry, which represents 6 percent of global GDP. The construction sector's annual productivity improvements averaged 1 percent over the past two decades, compared with 2.8 percent for the total world economy and 3.6 percent for the manufacturing sector" (Turner & Townsend, 2017). Most construction companies commit to investing in productivity improvement for longer-term gains due to steady global economic growth, increasing demand for construction and a shortage of skills and labour, etc."

The Global Construction Outlook 2020 indicates that 88 percent of the construction industry is planned to adopt green construction in their projects over the coming years. 60 percent has highlighted energy efficiency as the main influencing factor for the implementation of green construction while 77 percent indicated building design and construction as highly preferred areas for green construction. 69 percent has stated higher initial costs as the biggest challenge faced by an organization when considering the implementation of green construction projects. (Construction Intelligence Center, 2016)

Infrastructure constraints limit productivity and access to jobs, markets, healthcare and education while quality infrastructure propels economic growth and social wellbeing. (Brauch, 2017). To achieve climate change objectives, infrastructure should be specially designed to mitigate economic, social and environmental risks and to generate economic, social and environmental co-benefits.

In Sri Lanka, the construction sector has contributed to around 5-8 percent of GDP during the last five years with a gradual increase (Government of Sri Lanka, 2017). This is a relatively low percentage when compared with developed countries. In the survey on construction industries conducted by the Department of Census and Statistics, Ministry of National Policies and Economic Affairs in 2015, 48 percent of the construction cost has been for the construction of Roads and Railways, 26 percent for the construction of buildings (residential & non-residential), 9 percent for utility projects and balance for the other sectors. The report has summarized the use of raw material as 44 percent for road and railways, 30 percent for buildings, 9 percent for utility projects and rest for the other sectors. (Department of Census and Statistics, 2015)

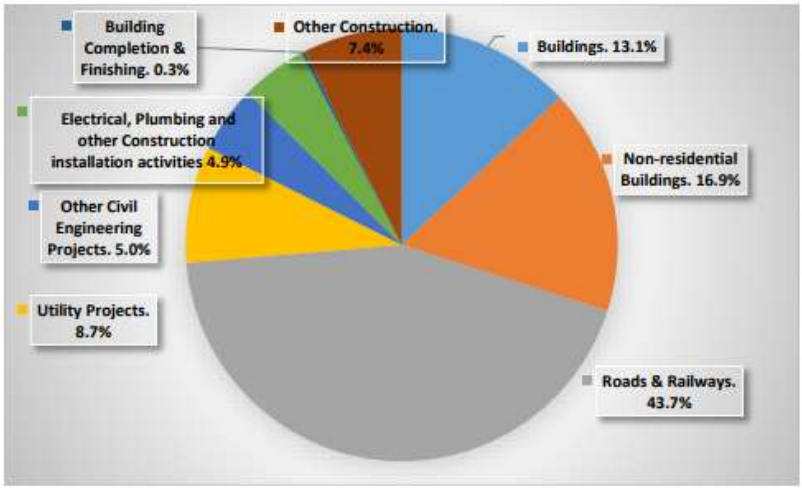

Figure 2-1: Distribution of raw materials consumed by type of construction activity – 2015 (Department of Census and Statistics, 2015)

The International Labour Organization (ILO) describes the construction industry as "a sector that produces a wide range of products, from individual houses to major infrastructure such as roads, power plants and petrochemical complexes. In most countries, the output is roughly equally divided between housing, other buildings and civil engineering projects.

Although attention is mostly focused on new construction, the renovation and maintenance of existing structures accounts for almost 50 percent of total construction output in some of the more developed economies and an even greater share of employment."

The Brundtland Commission's report defines sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs". The concept supports strong economic and social development, for people with a low standard of living. At the same time, it underlines the importance of protecting the natural resource base and the environment. Economic and social well-being cannot be improved with measures that destroy the environment. Intergenerational solidarity is also crucial: all development has to take into account its impact on the opportunities for future generations (UNECE, 2017). The SDGs, officially known as *Transforming our world: the 2030 Agenda for Sustainable Development*, is a set of 17 "Global Goals" (United Nations, 2017). Construction related themes are embedded in almost all the goals and the construction sector can be the leading sector to achieve the SDGs.

Sustainable construction can be defined as the practice of creating structures and using processes that are environmentally responsible and resource efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements conventional building design concerns of economy, utility, durability and comfort whilst at the same time enhancing social welfare.

In view of the above, there is a high possibility to address the SDGs through sustainable procurement practices. As the base for this study, a comprehensive literature review was carried out and the main findings are summarized below.

2.2 International Context

(UNEP,UNOPS, ITC-ILO, 2011) *Buying for a Better world, A guide on Sustainable Procurement* for the UN System was published by three UN organisations namely, United Nations Environment Programme (UNEP), United Nations Office for Project Services (UNOPS) and the International Labour Organization (ILO) in 2011. The guidance for sustainable procurement has been documented in the publication. The opening remarks of the book state that "Sustainable Development requires a well-balanced relationship between lasting human development and the sustainable use of planet resources" (UNEP,UNOPS, ITC-ILO, 2011).

The publication has listed six steps to embed the sustainable procurement within management:

1. Obtaining high level commitment to Sustainable Procurement
2. Setting up a sustainable procurement working group
3. Assessing sustainability risks in procurement and prioritizing spend areas
4. Developing a sustainable procurement policy
5. Setting targets
6. Implementing Sustainable procurement plan.

The advantage of the above management plan is that it can be used by any organization of any size.

The book has suggested including minimum sustainability criteria for the evaluation of tenders. The bids that comply with minimum sustainable requirements can be considered as technically compliant. In addition to that, evaluation criteria also can assign extra weights for bids that exceed the minimum sustainable requirements. A guidance on sustainable contract management has also been outlined in the publication. Overall, this is a well-documented guidance note to help initiate sustainable procurement practices in development organisations.

(Australian Government : Department of Sustainability, enviornment, Water, population and communities., 2013) has published a guideline on Sustainable Procurement. Key concepts of sustainable procurement are defined as;

a) Value for money: Achieving value for money is a core rule of Australian Government procurement, the value for money measured by considering financial and non-financial costs, benefits and alternatives.
b) Sustainable development: defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.
c) Wellbeing: combination of economic prosperity, community livability and environmental integrity.
d) Sustainability: maintaining or enhancing the wellbeing of society over time, and therefore requires that the total economic, social and natural capital is maintained or improved for future generations.
e) Environmental management: This refers to strategic arrangements to reduce the environmental impacts of an organization's operations.
f) Life-cycle thinking: Approaches that consider the whole life cycle of a good or service to help understand all the benefits and disadvantages of procurement decisions.

The guideline has listed the benefits of sustainable procurement as;

a) Benefits to the purchaser
    - Securing best value for money and achieving more efficient use of public resources.
    - Generating financial savings through greater energy efficiency; reduced waste disposal (including reduced packaging to waste); reduced water use; and reusing materials and products, thereby lowering the cost of a product over its life cycle)
    - Achieving positive publicity associated with the purchase and use of products, services and suppliers with good environmental and social responsibility records.
    - Providing government leadership to the community in demonstrating social and environmental responsibility through the purchase of sustainable products and services.
b) Benefits to the market:
    - Increasing the availability of sustainable products and services at more cost-effective prices.

- Expanding the market for sustainable products and services, with potential benefits for local businesses.
- Expanding market opportunities gained from stronger product and service differentiation.
- Reducing transport-related costs such as fuel, vehicle maintenance and road congestion.
- Supporting and encouraging innovation through demonstrating preference for more sustainable products and services.
- Encouraging industry to develop capacity to operate in a clean, green economy.

C) Benefits to the community

- Reducing adverse environmental and social impacts arising from procurement decisions.
- Reducing waste to landfill, saving water and reducing greenhouse gas emissions.
- Reducing air and water pollution.
- Reducing consumption of both natural and processed resources.
- Promoting health, safety and equality in the community.
- Influencing purchasing decisions to support issues such as recognizing equality and diversity, increasing employment and skills; and developing local communities and their physical infrastructure.
- Improving social inclusion and cohesion through creating employment and business opportunities for disadvantaged or marginalized groups.

Selecting the right supplier and evaluating suppliers' performance have been specified as key for good project outcomes (Araújo, Alencar, & Mota, 2017). Key considerations when selecting suppliers were cited as as Quality (9.2%), Cost/Price (8.2%) , staff features (7.9%), financial (7.9%) , Company management (7.6%) , experience (6.5%) and time (6.0%).

(Brauch, 2017) The report published by International Institute of Sustainable Development (IISD) has listed the following co-benefits of sustainability;

a) Economic co-benefits

- Optimize value for money
- Create employment across skill and income levels
- Help boost green economic development through creation of infrastructure

- Be affordable for governments, investors, taxpayers and users.
- Create opportunities for local suppliers and developers
- Create reasonable returns for investors across the lifecycle of the project

b) Social co-benefits
   - Generate income, particularly low-income households
   - Create jobs, including the generation of new specialization related to green jobs
   - Build skills and provide up-skilling and re-skilling
   - Reduction of poverty
   - Foster transparency and accountability
   - Ensure gender equality in the building and access to infrastructure
   - Promote increased access to basic services
   - Enhance public health and well being

c) Environmental co-benefits
   - Limit and lower air, water, soil and all other forms of pollution
   - Management of eco systems & biodiversity
   - Promote and use clean and environment-friendly technologies
   - Efficient use of natural resources
   - Mitigate greenhouse gas emissions
   - Transition to low-carbon economy
   - Consider climate change risks in design, maintenance and operation.

The publication emphasizes that flexibility in public-private infrastructure legal contracts is needed to maximize sustainability in infrastructure investment. The paper goes on to discuss about the Public-Private Partnerships modality as opposed to the client-consultant-contractor modality and opines that a partnership modality has more margin for negotiation and adjustments.

The author has suggested nine factors to consider for better integration of sustainability in infrastructure projects. These are:

1. Feasibility study and impact assessment
2. Economic obligations
3. Social obligations

4. Environmental obligations
5. Stabilization clause
6. Periodic review and re-negotiation
7. Grievance mechanisms and settlement
8. Transparency, reporting and public engagement and scrutiny
9. Penalties and termination

(Opoku & Fortune, 2011) has prepared a conference paper on Leadership in construction organizations and the promotion of sustainable practices for the International council for Research and Innovation in Building Construction (CIB), International Conference for the Management and Innovation for a Sustainable Built Environment, in Amsterdam, Netherlands. The paper discusses about the role, drivers and factors affecting leadership in the effective implementation of sustainable practices in construction organizations based in UK.

The paper widely discusses the leadership requirement for sustainable construction - "Leaders should embed sustainability in their organizational activities and make sustainable development part of their overall business strategy" (Ofori & Toor, 2008). Role of Sustainability leaders has been defined as, "helping to promote sustainable construction through training staff on sustainability; produce guidance notes and policies; ensure that sustainability is embedded in the business; sustainability monitoring and appraisal etc." (Opoku & Fortune, 2011)

The author has concluded the following key drivers that a sustainability leader should have:
a) company reputation or brand image;
b) win more contracts to remain in business;
c) position in the market place or competitive advantage;
d) legislation or legal requirement;
e) clients demand;
f) improve economic performance as a core value in corporate social responsibility.

A lack of full understanding of what sustainability truly means to their company due to key fundamental information gaps has been identified as a major challenge whilst lack of client

awareness; lack of business case understanding; lack of client demand; large company size and diversity are identified as other challenges for sustainability leadership.

(Mensah & Ameyaw, 2012) has done a study on Sustainable Procurement: The challenges of practice in the Ghanaian Construction Industry in Ghana. Traditional procurement has focused on initial value for money considerations only whilst Sustainable procurement involves achieving value for money on a whole life cycle basis by considering the economic, environmental and social sustainability. The study was based on one-to-one discussion with twenty five procurement practitioners and 12 interviewed having more than twenty five years of procurement and rest of the people between 10~25 years of experience. Lack of knowledge/experience on sustainability among the procurement professionals was identified as the main challenge. The researcher has summarized the challenges as;

a) Lack of understanding of the sustainable procurement concept;
b) Higher initial associated costs;
c) Lack of basic education about sustainable procurement;
d) The absence of governmental interest in ensuring the promotion of sustainable procurement;
e) Low technical and management capacity;
f) Low Multi-stakeholder approach;
g) Low stakeholder Education;
h) Absence of internal management structures;
i) Lack of political will;
j) Corruption existing among procurement practitioners;
k) Lack of social drive; and
l) Lack of capacity of small scale suppliers/contractors;

(Wong, Chan, & Wadu, 2015) study on factors that are important in enhancing green procurement in the construction process in Hong Kong discusses that mandatory environmental regulations by the government, client requirements in tendering, and government and non-governmental organization requirements as the top three significant factors. Furthermore, the importance of establishing a fully functioning green material market would promote the concept of green procurement and lower the costs of green material. In this study, 35 variables have been listed as key to facilitate the successful

implementation of green procurement in construction projects; these have been grouped into 10 factors as below;

Factor 1: Green principles and techniques to reduce environmental impacts

Factor 2: Efforts or initiatives taken by the industry and society

Factor 3: Executive management's commitments and requirements

Factor 4: Mutual collaboration between stakeholders

Factor 5: Establishment of a reliable database of green procurement

Factor 6: Regulations and standards of green procurement by the government

Factor 7: Green design incorporated with financial benefits

Factor 8: Green policies and management systems of the organization

Factor 9: Life-cycle considerations and green construction technology

Factor 10: Supports from mid-level managers

(Sourni & Sohail, 2011) identifies challenges and obstacles regarding public procurement in the United Kingdom. The aim of their study was to develop a theoretical framework to assist public clients in addressing sustainable construction in procurement. Two sets of semi-structured interviews were administered to sustainability professionals and experts as part of the roll out. The main findings that have been articulated in the report are:

a) Financial - funding shortfalls, cash flow problems, restrictions on expenditure and reluctance to incur higher capital cost when needed;
b) Lack of awareness, understanding, information, commitment and demand;
c) Insufficient/inconsistent policies, regulations, incentives and commitment by leadership;
d) Insufficient/confusing guidance, tools, demonstrations and best practice;
e) Vagueness of definitions and diversity of interpretations;
f) Separation between capital budget and operational budget;
g) Lack of sufficient time to address sustainability issues;
h) Lack of long-term perspective;
i) General perception that addressing sustainability always leads to incurring greater capital cost;
j) Resistance to change;
k) Insufficient integration and link-up in the industry; and
l) Insufficient research and development.

Whilst there are no solutions identified in the research, key stakeholders including government, academic and the private sector and users have been identified as those capable of lifting barriers.

(Ruparathna & Hewage, 2013) discusses the challenges and benefits in sustainable procurement in Canada. A mixed research method including qualitative and quantitative techniques was administered through a questionnaire survey with semi-structured interviews. The authors have referred to the benefits identified by (Sourni & Sohail, 2011) and benefits as summarized following (ASOSAI, 2006) as below:

a) Reducing the use of natural resources;
b) Meeting existing and forthcoming legislation around the climate change agenda;
c) Reducing harmful emissions and waste generation;
d) Improving in working conditions–labor standards, health, and safety;
e) Assisting disadvantaged groups in society;
f) Upskilling your workforce to meet the future needs of your organization;
g) Saving the long term by considering the whole LCC;
h) Meeting international obligations (e.g., Kyoto protocol);
i) Improving the efficiency and transparency of procurement procedures;
j) Stimulating the market for green technologies;
k) Reducing use of natural resources; and
l) Meeting existing and forthcoming legislation around the climate change agenda.

There is no framework developed in the research. Data analysis has showed that the three main challenges for sustainable procurement in Canada are; 1) lack of funding and unwillingness to incur higher capital cost; ii) lack of awareness, understanding, information, commitment and demand and; iii) Insufficient policies, regulations, incentives and lack of leadership. The reduction of harmful emissions and waste generation were highlighted as the main benefit of sustainable procurement in Canada. However the author has identified further research areas that impact on sustainable procurement of the construction project such as cost, quality and duration.

(Ruparathna & Hewage, 2015) study on current practices, drivers and opportunities of sustainable procurement in the Canadian construction industry is notable. Apart from an initial desk review, the research was administered through a mixed method approach that consisted of semi-structured questions in the survey. The main responsibility of managing

the procurement process is assumed as the responsibility of the project owner, representative or an authorized external party (Ruparathne & Hewage, 2015). Therefore the author has used the above listed categories in the construction industry as a sampling frame for Questionnaires and interviews.

During the document review the author has reviewed 58 numbers of Bid notices, Request for Quotations (RFQ), Request for Proposals (RFP), Tender documents and Contract documents of ten different providences in Canada.
The main research findings on the bid evaluation are :

a) 10 percent were using value-based procurements;
b) 83 percent has stated that initial cost is used to procure while 17 percent has stated use of life cycle cost for evaluation;
c) 30 percent has stated use of social and environmental factors for evaluation;
d) 17 percent has stated use of standard methods for evaluation social and environmental factors.

The results of the survey indicated the use of sustainable procurement factors in some public and private sectors for procuring construction. Use of social, environmental and life cycle costing sustainable criteria in bid evaluation was identified as a major weakness in the sustainable procurement process. Only 17 percent has stated use of life cycle cost for financial evaluation. Another major weakness is the use of previous experience in sustainable construction.

The main driver of sustainable procurement is implementation of government regulations as per the finding of the survey. This was followed by competitive edge in the market and client requirement was ranked third. Cost of ownership was ranked fourth overall.

(Brammer & Walker, 2007) has done an international comprehensive study on Sustainable Procurement Practices in the public sector. Two hundred and eight numbers of public procurement practitioners from twenty countries were engaged in the survey. A snowballing sampling strategy was used to conduct the survey. The following sustainability criteria that are incorporated in procurement activities were analysed in the survey.

a) Use life cycle analysis to evaluate the environmental friendliness of products and packaging;
b) Participation in the design of products for recycling or reuse;

c) Ensure the safe, incoming movement of product to facilities;
d) Request suppliers to commit to waste reduction goals;
e) Purchase from small suppliers;
f) Visit suppliers' plants to ensure that they are not using sweatshop labour;
g) Participate in the design of products for disassembly;
h) Ensure suppliers' locations are operated in a safe manner;
i) Reduce packaging material.

Analysis shows that a wide range of sustainable procurement practices were incorporated to some degree in public sector procurement practice around the world. Considerable variation of incorporation of above sustainable factors in the procurement was also highlighted. Discussions has suggested that if governments are committed more widely to use sustainable procurement, they are required to produce clear regulatory support for sustainable procurement. Additionally it was suggested to provide more budgetary flexibility to implement sustainable procurements, which has a long-term benefit.

(Loosemore, 2018) has published a study of Social Procurement in the UK Construction Project in 2015. In the publication, Social Procurement has been defined as follows: “Social Procurement differs from traditional procurement in the use of procurement to leverage extra social benefits and create social value in local communities, beyond the simple purchasing of product and service required” (Bonwick, 2014).

Four strategies have been listed as effective social procurement strategies:

1. A policy focus – developing and implementing social procurement policy
2. A contract focus – incorporating social value clauses and requirements
3. A supplier focus – involves engaging with organizations such as social enterprises
4. A market development focus – Where no sufficient expertise does not exist in the existing supply chain, developing the capability through JV, partnerships, training, finance and stimulating contracts.

Because of the study, main drivers of growth for social enterprises in engaging with construction projects are listed as; 1) Culture change in construction industry, 2) New social legislation and regulation, 3) Political impact of construction on society and environment, 4) Political trends, and 5) Changing public procurement practices.

The top five challenges are identified as: 1) Negative perception of social enterprises, 2) Rhetoric of CSR in the construction industry, 3) Resistance to change, 4) Existing procurement practices, 5) Lack of engagement between social enterprises and construction.

(Varnas, 2008) has done a study of enhancing environmental performance in construction through green procurement. The study explains that the construction sector is quite fragmented, with many different actors mainly organized in temporary and project based organizations. The contracting responsibilities are divided between the client and contractor in different ways. In traditional contracts, design is separated from the construction whilst in modern era design and building practice, the contractor is responsible for both design and construction.

Most of the projects in Sweden have applied environmental preferences in their infrastructure procurements. (Varnas, 2008). Waste handling, environmental plan, work environment and environmental management system (EMS) of the contractors has been used. However the environmental requirements were less frequent. Risk of delays in construction, simplification of tender documents and also effective competition were noted as reasons for less implications of environmental factors in evaluation criteria.

The researcher has suggested to include environmental procurement preferences to:

1. Communicate environmental requirements to contractors;
2. Increase awareness of environmental issues and high level of standards;
3. Enhance the interest of contractors to work in an environmentally sound way; and
4. Ensure that environmental ambitions of the client are incorporated in to client's EMS policy.

(Nepal, 2015) has done a study on comparison of Whole Life Cost (WLC) of construction materials in conventional vs. sustainable public facilities in Nepal in 2015. The features of sustainable building has been defined as, Passive solar design, Lighting, Water Management and waste management. Since new construction and renovation requires many materials, this is an opportunity to utilize the products that enhance the sustainability of the buildings. These products may be made of recycled content, sustainably grown and harvested wood and pulp materials, products that have low emissions, and products that are sourced locally.

These products enhance the sustainability of the buildings by supporting local economies and reduce the fuel needed to transport them long distances.

The research mainly discusses about the evaluation by Life Cycle Cost (LCC) and elements of LCC are listed as:

1. Planning cost - initial planning such as feasibility studies, Environmental Impact Assessment (EIA), cost benefit analysis etc.
2. Design and construction cost - cost of professional engineering services, site layout, delivery, construction and training cost if necessary.
3. Operations, maintenance and occupancy cost - cost associated with the cost during the service life of the building such as repair, utilities cost, cost of spare parts etc.
4. End of life cost- decommissioning, removal and disposal cost

Through quantitative analysis, the researcher has concluded that sustainable building is 16% cheaper than conventional building in Nepal. The % variance due to inflation and discounts are estimated as ±2%.

(Steinweg & Slob, 2008) has published a report on sustainable procurement in a European Context: practices of IT procurement in five EU countries. The report has discussed about IT procurement while it provides a broader background on public procurement.

"Public procurement can be a powerful tool to promote sustainability, considering the strong buying power of public institutions. When public institutions apply social and environmental criteria to the products they purchase, this promotes a more sustainable approach in an entire sector". (Steinweg & Slob, 2008)

The report discussed the Directives of the EU countries, following three countries specified Sustainable factors:

Germany: No social or environmental considerations have been mentioned in federal procurement law. However, some possibilities to include environmental criteria in accordance with certain eco-labels have been considered in supplementary regulations, but social criteria has not been mentioned.

Hungary: The policy document emphasises the need for environmentally sound procurement, in order to promote the wider use of environmentally friendly products and services. Promotes environmentally friendly management of public institutions, such as

schools, local governments, and cultural institutions, in order to boost overall environmental awareness. No social criteria specified, but the documents refers to ILO regulations with regarding the employment of work force.

Austria: Explicitly mentions the adherence to a number of ILO norms in its procurement law which are good social sustainability factors. All procurement procedures executed in Austria must meet the following social criteria: forced labour, Freedom of association and right to collective bargaining, labour clauses (Public Contracts), wage protection, equal remuneration, discrimination, minimum wage, worst forms of child labour and maternity rights.

The key recommendations given by the authors are as below;

a) Governments should continuously set targets for sustainable procurement, with particular attention to developing and applying social criteria.
b) Countries that have not already included sustainable criteria, they should completely transpose the Directives into national law.
c) Central governments should give a prominent place to sustainability in their procurement laws and develop specific guidance for public buyers on how to include environmental and social criteria.
d) Governments should adopt the best practices of surrounding countries.
e) Countries that have ratified ILO Convention No. 94[1] should actively implement.

(Araújo, Alencar, & Mota, 2017) explains that the construction industry is competitive and projects face adversity and uncertainty; contractors that do not adequately meet a company's needs increase the chance of delays, cost overruns, substandard work, disputes, or even bankruptcy. Moreover, cost, time, quality, staff features and financials are the most cited categories for supplier selection in highway projects. Relationship with stakeholders, company management, quality, staff features and time are the most-cited categories of criteria in the evaluation of suppliers in construction projects. The study reveals that 1.9 percent of citations were related to environmental criteria, 1.0 percent considered policy, society, regulations, and 0.4 percent cited risks.

[1] Labour Clauses (Public Contracts) Convention, 1949 (No. 94), ILO- Geneva

2.3 Sri Lankan Context

(Mohan, 2010) study on Public Procurement for Sustainable Development in Sri Lanka aimed to; i) review the range of targeted procurement procedures; ii) review and assess the current Sri Lankan government procurement arrangements; iii) identify constraints to the target procurement system and iv) identify what needs to be done in the longer term.

Social and environmental issues in public procurement could be tackled through four approaches. In the first, the purchaser or the buyer details social and environmental criteria in the contract inclusive of compulsory technical criteria that needs to be met. The second approach is the prohibiting of government contractors who have records of wrongdoing and failing to achieve laid social and environmental standards. In this approach the contractor(s) will be disqualified, in the event they are found to have noncompliance cases in previous contracts. A third approach is attempted to get tenderers to commit to social and environmental standards and measure their success towards following the implementation of sustainable standards prior to awarding the contract. The fourth approach focuses on implementing the requirements of social and environmental standards after awarding the contract. Therefore, the contract awardee must comply with the conditions of the contract during delivery. Therefore this also implies that there is little or no capacity building of the contractor to assist them to align themselves with the sustainability conditions of the contract.

The report also detailed the Sri Lankan Government's sustainable procurement framework as below:

a) Leadership and governance - it is important to consider governance elements related to procurement, which will influence public sector organizations.
b) Organizational integration – ensure sustainable procurements are integrated in the vision, mission, goals and policies of the organization. Ensure staff are also fully aware of their obligations toward sustainability, include same as key performance indicators and build their capacity accordingly. Staff should also be continuously made aware of how to access information sources to apply the principles, review the operational arrangements within the organizations that may impede implementation of sustainable procurement.
c) Policy and Process Development – Develop policies which consider sustainability factors during the procurement cycle, provide practical guidance and tools to assist

policies, ensure procurement programmes and processes involve measures to develop Sri Lankan strategic sourcing and market engagement.

d) Monitoring and Reporting - Establish a monitoring and reporting system that provides a way to measure progress and achievement

The author opines that the Government of Sri Lanka recognizes the importance of sustainability as a core component of effective procurement and have detailed an action plan that provides a clear direction on how to make progress towards better, more sustainable procurement.

(Rameezdeen & Silva, 2002) has discussed the change of procurement trends in the construction industry of Sri Lanka especially focusing on the building subsector. A written, structured questionnaire survey and unstructured interviews among professionals was used as information colleting methods. 73 percent of the total population of M1 & M2 contractors has participated for the questionnaire.

The study has mainly focused to understand procurement categories and the factors affecting the change in use of procurement system. This study is not directly related to this particular research study however, the information will be useful to understand the integration of sustainable factors into Sri Lankan procurement.

Construction procurement is defined as the organizational structure adapted to by the client for the management of design and construction of a project (Rameezdeen & Silva, 2002). Construction procurement systems are categorized into four broader classifications as, separated system, integrated system, management oriented systems, collaborative system.

Separated systems, also known as traditional systems, have a rigid separation of design and the construction process where the consultant appointed by the client carries out design and the consultant prepares bidding documents. Successful contracts enter into a contract with the client and carry out the construction under the supervision of consultant. Measure and pay or lump sum contracts modalities can be used in the separated system.

Integrated systems, also called design and build systems, use one contracting organization to undertake entire responsibility of the design and construction. Some even operate the constructed facility for some time. Clients appoint independent advisors to monitor cost and

quality. (Cox, Ireland, & Townsent, 2006). Constructions of industrial buildings such as pre-fabricated buildings are mainly under the integrated system in Sri Lanka.

Management Oriented System use separation between management function from design and construction. In this system client enters into an agreement with an external organization and they are responsible for management and coordination of design and construction. Only few projects have been implemented in Sri Lanka under this modality and all are under complex nature. International organizations are widely practicing this modality in Sri Lanka even for small-scale projects and their projects are successful in all aspects.

Collaborative systems require involvement between two or more parties to achieve successful implementation. Various forms of collaborations between parties through investment on capital and/or expertise also fall under this category. This is recommended for high risk, high value construction projects. This system has just been started by forming joint ventures between local contractors and international contractors.

Factors affecting the change in the use of procurement systems are summarized as, Economic and market aspects, Technological aspects, Government policies, Financial aspects and Socio-Cultural aspect.

(Wijewardana, Jayasena, & Ranadewa, 2013) has done a study on impact of Government policies and regulations when adopting alternative procurement methods which has similar information as (Rameezdeen & Silva, 2002). The author has summarized the facilitators and barriers in procurement systems following the APUC (Advanced Procurement for universities and colleges) guidelines.

Procurement system	Facilitators	Barriers
Separated systems	Client can control and maintain quality and specifications. Cost certainty. Direct contractual relationship with consultants and main contractor. Standard contract conditions available.	Clients' risk is high. Restrict cost controlling during construction works. Longer time scale.
Integrated systems	Shorter time scale. Clients' risk is low. Cost certainty. Standard contract conditions available.	Client is not allowed to do changes in designs. Clients' requirements are fully detailed before signing the contract. Support with negotiated tendering.
Management oriented systems	Client has the fully control of time. Shorter time scale. Client can manage controllable variations.	Client risk is high. No cost certainty. Lack of standard contract conditions.
Collaborative systems	Win win method. Suit for large scale projects.	Lack of standard contract conditions. Lack of awareness in construction industry.

Figure 2-2 : Facilitators and Barriers in Procurement Systems (Sources: APUC Guidelines, 2008)

(Perera & Karunasena, 2003) has undertaken a study on the application of value management in construction which is in reference to the industry practice in Sri Lanka. The topic itself is not directly related to this research topic, but the content of the research is very relevant to this study. The research was completed in 2003, prior to when sustainability became an emerging topic. Hence, the facts cited in the study was useful to formalize the background of this study.

The construction industry makes a significant contribution to the economy of the country both in terms of production output and the provision of employment. The construction industry of Sri Lanka provides employment to about 4 ~5 percent of the labour force.

In the economic context of 2003, it was necessary to identify initiatives that eliminated hidden costs, which did not contribute towards the visibility of future projects. In order to eliminate the extra costs during the project cycle, the necessity to make decisions by considering the Life Cycle Cost has been highlighted in the report.

The objectives of Value Management has been highlighted as;

a) Raising Productivity
b) Improving Management
c) Improving Life Cycle Cost
d) Improving Quality
e) Simplifying Work
f) Conserving Energy
g) Reducing Paper Work
h) Reducing Cost

In other words, the objective of value management is to meet economic and environmental sustainability through a quantities engineering approach of a project. Planning and Design stages are the most feasible stages to incorporate sustainable elements in a construction project.

Challenges to implement value engineering were: a) Lack of support from Clients b) Designers do not like to change their initial design concept, c) There is no standard procedure available for value engineering process in Sri Lanka, and d) No active encouragement by the construction industry regulatory body in Sri Lanka.

Benefits of value engineering were; a) Proof that the design was indeed the best, b) The owner was receiving best value for money, c) Introduction of higher quality products, d) Best up-to-date technology at lowest cost, and e) A clear focus on project objectives.

In conclusion, the literature of this study links to the sustainable approach of a project and this will be a good initiative to follow sustainable procurement for a construction project. The value engineering would develop the sustainable elements of the project and would be included as a requirement during the procurement.

(Jayasuriya & Rameezdeen) study on Construction Procurement Selection: Comparative Study of Routine Projects vs. Disaster Reconstruction Projects in reference to the Construction industry of Sri Lanka, categorises construction procurement into three categories;

1. Traditional method - Lump sum, Ad-measurement, Prime cost
2. Integrated method - Design and Build, Package Deal, Turnkey
3. Management method - Construction Management, Management Contracting

As a result of analysis, it was noted that the familiarity, accountability and cost are the most important factors governing procurement selection of routine projects. In addition, project duration was found to be approximately twice as important as risk management and four times as of flexibility for changes (Jayasuriya & Rameezdeen).

Researcher has revealed the factors affecting the project procurement selection as;

a) Familiarity of the method to the local industry;
b) Accountability and transparency;
c) Project cost;
d) Risk management;
e) Project duration;
f) Flexibility for changes;
g) Quality of output; and
h) Project complexity.

(Sumanarathna & Perera, 2015) study on the sustainability of government bid evaluation procedures for building projects in Sri Lanka. Highlights that the evaluation procedure is a key element of success, especially concerning incorporation of sustainability criteria in evaluation.

The Government bid evaluation procedure has four stages namely, a) preliminary bid evaluation, b) detailed bid evaluation and comparison of bids, c) post qualification verification and, d) writing the bid evaluation report. Improvement to minimum qualification criteria, making clarifications in an accepted manner, checking the validity of details submitted by bidders, identifying the lowest evaluated optimum bid, using standard formats wherever possible, justifications provided by the Technical Evaluation Committee for each and every evaluation decision, making necessary calculations and submitting necessary evidence, are the critical expert suggestions given in the research. In addition to critical suggestions, additional comments as conducting bid evaluation in a transparent manner, having a majority of technically qualified members, maintaining consistency of evaluation and authority among Provincial Councils are also highly recommended.

2.4 Summary of Literature review

A comprehensive literature review was carried out to study and understand the current practices, available publications, research methodologies and to assess the findings and outcomes of studies. The construction industry is an emerging industry in most of the countries and nearly 50 percent of the economy will account for infrastructure facilities. The construction industry represents about 6 percent of GDP globally and 5~8 percent of the GDP in Sri Lanka.

Sustainable procurement in the construction industry is an unpopular topic in the body of literature examined for the purpose of this study. In fact, an empirical study on this particular topic in the Sri Lankan context is almost non-existent. However, the lack of published literature may be because the concept of sustainable procurement has been an emerging concept during the recent past.

Several studies have been carried out in the world related to sustainable procurement practices in the construction industry. The Literature Review shows that the United Nations, World Bank, United Kingdom and Canada has taken more action towards sustainable procurement practices. A majority of the literature has been carried out in UK and Canada interestingly. Limited studies related to construction procurement have been undertaken in Sri Lanka, however, there has been no study to-date related to sustainable procurement. Therefore, this focused study is necessary as a first step and launch pad to understand the challenges and barriers to incorporate sustainable procurement practices in the Sri Lankan construction industry.

A majority of prior scholarly publications related to sustainable construction procurement have been centered on environmental criteria. This can be improved by incorporating social, and economic consequences of design; manufacturing and production methods; non-renewable material use; logistics; recycling options; operations; maintenance; reuse; suppliers' capabilities; and service delivery and disposal.

CHAPTER 3

3 RESEARCH METHODOLOGY, ANALYSIS AND DISCUSSION

3.1 General

The methodology employed to carry out this research, the framework of the research, collection of data and data analysis have been discussed in the section. A comprehensive literature survey was undertaken to study the challenges and benefits in the area of sustainable procurement in the construction industry. Whilst internationally published data were readily available, no study reports could be found that directly focused on incorporating sustainable procurement to the construction field in Sri Lanka.

3.2 Research Approach

The research was a quantitative study and results were produced by analysing the feedback received to the questionnaire survey. The study included a desk review of procurement manuals of the National Procurement Agency of Sri Lanka (NPA), procurement manual of World Bank (WB), procurement manual of the United Nations Office for Project Services (UNOPS) and standard bidding documents published by the Construction Industry Development Board (CIDA). Randomly picked solicitation documents for the procurement of infrastructure works of the institutions mentioned above were also studied to understand the current practices. One-to-one informal discussions were conducted with the selected procurement officials in public, private and international organizations and also GBCSL-AP (Green building Council of Sri Lanka Associated Professional) certified civil engineers to understand the background and current practices of the Sri Lankan construction industry.

Following the desk study, a comprehensive literature review was conducted. University of Moratuwa (UOM) library resources, science direct, International Civil Engineers (ICE) journals, websites and some other online publications were also used to collect research papers, journal articles and other discussions. The literature survey was also used as a way to identify and formulate questions related to sustainable factors, challenges and benefits.

3.3 Data collection and Sampling

An online questionnaire survey was designed through Google Forms and was used to collect the research data. Questionnaires are a relatively inexpensive tool to administer which can reach a wide range of respondents. However, response rates for questionnaires are often very low (Trochim & Donnelly, 2008). The central limit theorem in statistics indicated that at least a sample size of 30 is required to treat as a normal distribution (Levine, Krehbiel, Brenson, & Vishwanathan, 2011). Hence, more than 50 responses were targeted to reach good sample size. Invitation to respond to the questionnaire was sent to more than 250 people who are in the construction industry of Sri Lanka mainly working in the public sector, the private sector and international organizations.

Private companies were selected from the published list of construction companies registered under CIDA , prioritizing companies that have a grade C3 and above. Leading public institutions such as Road Development Authority (RDA), The Urban Development Authority (UDA), National Water Supply and Drainage Board (NWSDB), Sri Lanka Navy (SLN), State Engineering Corporation (SEC), Colombo Municipal Council (CMC) and semi-government institutions like Central Engineering and Central Engineering Consultancy Bureau (CECB) were also invited. International organisations and Non-governmental organizations such as World Bank (WB), Asian Development Bank (ADB), United Nations Office for Project Services (UNOPS), Japan International Cooperation Agency (JICA) were selected for sending invitations to gather information.

The questionnaire was inclusive of five sections;

1) Introduction and company name (optional)
   Brief introduction and purpose of the study was explained in this section along with a disclaimer regarding the use of data. Name of the institution was an optional question.

2) Procurement personnel information
   This section was designed with ten questions consisting of age of the person, education background, experience in procurement, international experience and trainings related to procurement. The section incorporated to conduct cross analysis based on the factors such as age, level of experience and training/ education related to procurement.

3) Background information of the institution

This section had six questions consisting of sector of representation, level of experience, the role of the institution, level of CIDA registration, engineering speciality and the years of operation of the company. The section also incorporated to study the procurement officials thinking pattern vis-à-vis institutional background.

4) Procurement procedures of the institution

This section was designed to include three questions which included documented procurement procedure, bid evaluation procedure and the procedure of obtaining projects.

5) Sustainability initiatives

This section was designed with eleven questions. A descriptive paragraph at the beginning of the section explained the meaning of sustainability and the definitions of environmental, social and economic sustainability. Informal discussion held with procurement practitioners shows the lack of clear understanding about sustainability and sustainable procurement. The description was included to obtain truthful answers by providing a clear understanding of sustainability and the triple bottom line of sustainability.

Institution commitment, sustainability, inclusions in the procurement manual, a methodology for financial evaluation (economic factors) , environmental and social factors and drivers, benefits and challenges of sustainability were included in the questions. 10 number of environmental sustainability factors, 10 numbers of social factors, 4 numbers of drivers, 10 numbers of benefits and 10 numbers of challenges were listed and requested respondents to rank in a Likert-type scale of five.

Optional questions with open space were provided to gather additional comments at the end of the questionnaire. This was provided in order to collect the concerns of the participants, which were not included in the questions.

The Questionnaire is attached as Annex A.

3.4 Respondents to the Survey

Responses to the questionnaire were collected between 23 September 2017 and 15 August 2017. The response rate was however poor (approx. 25%) and only 52 responses were received during the data collection period. All 52 responses were used for the analysis.

48 percent of the respondents who took part in the survey were from the private sector, while 29 percent were from the public/ semi-government sector and 23 percent were from international organizations/ NGOs.

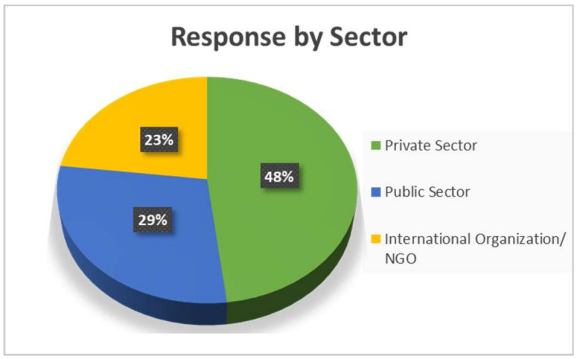

Figure 3-1: Responses by sector representing

Out of the respondents, 40 percent of them were in between 40~49 years of age while 33 percent of the respondents were in the 30~39 age group. Out of those who had responded, 50 percent held postgraduate qualifications. Due to the variety of the respondents who took part, a good combination of data was received on the areas of the construction sector they work in.

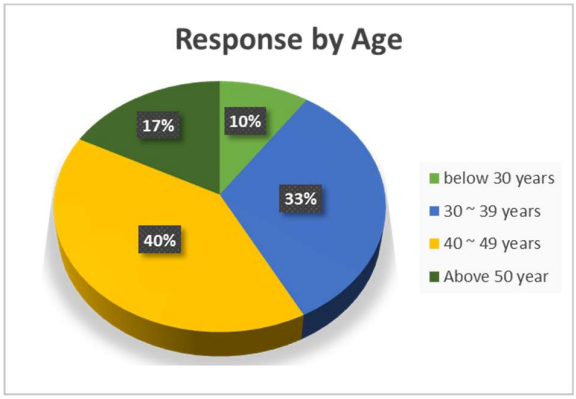

Figure 3-2: Response by age

As shown in Figure 3-3, more than 92 percent have been involved in building construction activities, while 61.5 percent of respondents have been involved in the water supply and sanitation sector and 59.6 percent involved in highway construction.

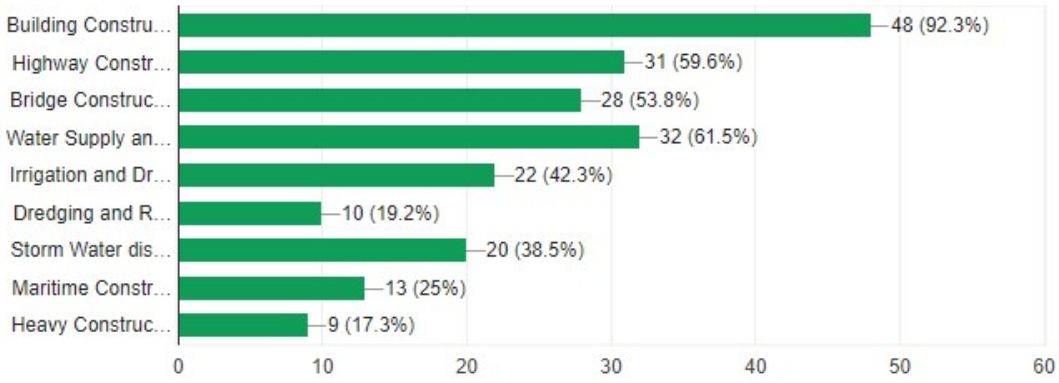

Figure 3-3 : Response by engineering speciality of the institution

As the respondent demographics were widely representative of the procurement community in the industry, this provided a good sample to assess the industry practice and understanding.

3.5 Analysis

Data analysis was conducted by using SPSS software, Microsoft Excel and the facility available through Google Forms. Considerations were given to assess the sample representation by considering many other aspects, which include cross analysis by different parameters as listed below. Summary of analysis is attached as Annex C.

1) Using all data
2) Age group (below 30 , 30 ~39, 40~49, 50 and above)
3) Educational level (certificate, diploma, undergraduate & postgraduate)
4) Sector representing (public, private and international organization/NGO)
5) Procurement experience (0 ~5 , 6~10, 11~15, 16~20 & over 20 years)
6) International experience (0 ~5 , 6~10, 11~15, 16~20 & no international experience)

3.5.1 Drivers for Sustainable Procurement

As a result of the quantitative analysis, following factors were identified as the main drivers for sustainable procurement: legislation (Government and regulations); company willingness to change; client procurement policy; and, the competitive edge of the market.

Table 3-1 : Analysis of main drivers for sustainable procurement

Main drives	No of Responses	Mean	Std. Deviation	Rank
Legislation (Government and regulations)	52	4.212	0.605	1
Company willingness to change	52	4.096	0.634	2
Client Procurement Policy	52	4.077	0.652	3
Competitive edge of the market	52	4.019	0.610	4

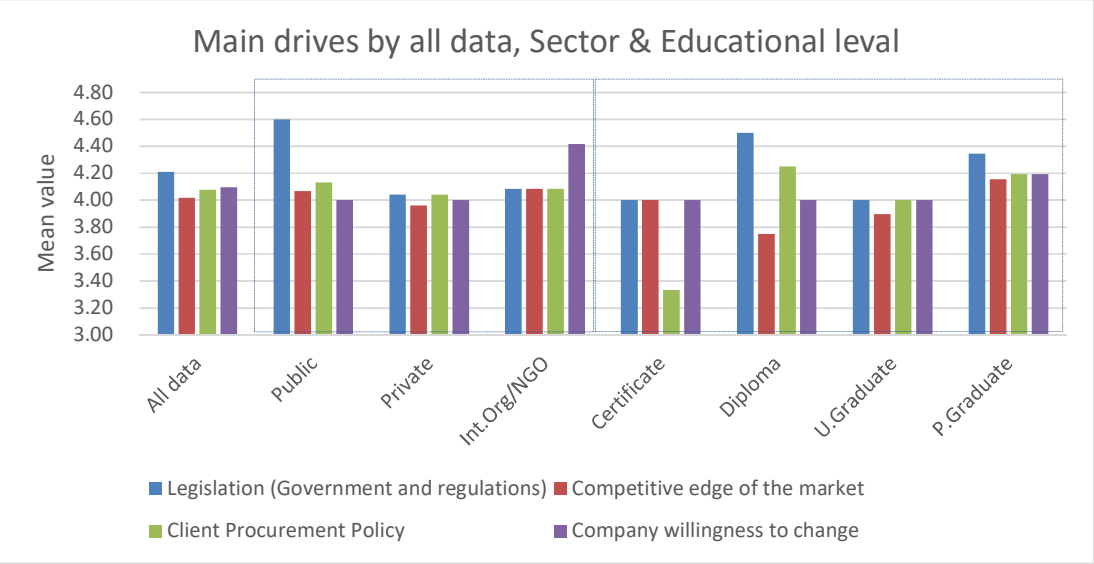

Figure 3-4 : Responses to main drivers by all data, by sector and education level

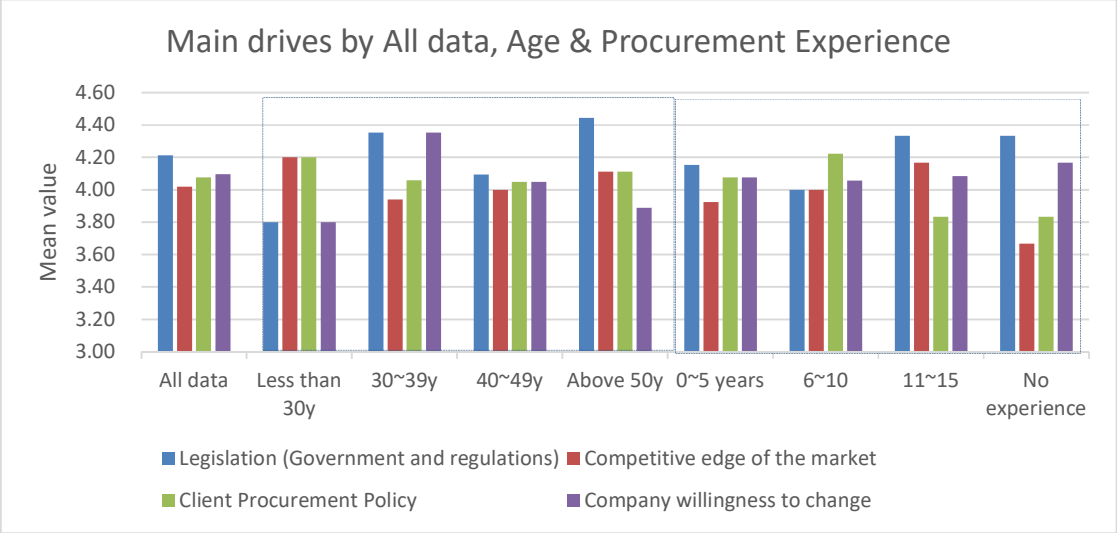

Figure 3-5 : Responses to main drivers by all data, by age and by procurement experience

Whilst this order is similar across different factors such as education and level of experience, clear differences can be seen based on the sector the respondents work in. Those in the public sector have rated "Legislation" as the main driver for sustainable procurement while the international organization/ NGO has ranked "Company willingness" to change as the main driver; private sector has rated all the factors in similar weightage. The results show a clear difference in the thinking pattern of those working in the respective sectors and how their line of work and exposure as well the perspective they have, change their interpretation and understanding of how sustainable procurement needs to be implemented. Public sector employees see it as needing to be enforced through regulation while private sector sees it being tied into their business requirements. International organization/ NGO employees see it as a change process that on the outset needs to be adopted from within the organization, with all other factors also contributing to help ensure its implementation. Procurement officials in international organizations/NGO had also shared a wide range of ideas on how sustainable procurement can be implemented.

As seen in figure 3.5, there is a considerable deviation of results with the age group. All age ranges excluding the age below 30 years has voted the "Legislation" as the main driver while "competitive edge of the market & client procurement policy" has top-ranked with the age below 30 years. Voting pattern with procurement experience is somewhat similar.

Variation of ranking by secondary factors such as education level, age, sector, procurement experience and international experience is tabulated below in table 3-2.

Table 3-2 : Ranking of benefits by secondary factors

#	Cross Analysis Category	All Data	Analysis by Education level				Analysis by Age				Analysis by Sector			Analysis by Procurement Experience					Analysis by International Proc Experience			
	Factor / Sub Criteria		Certificate	Diploma	Graduate	P.Graduate	Below 30	30~39	40~49	above 50	Public	Private	Int/NGO	0~5	6~10	11~15	16~20	over 20	0~5	6~10	11~15	No Exp
1	Legislation (Government and regulations)	1	1	1	1	1	3	2	1	1	1	2	2	1	3	1	1	1	2	1	2	1
2	Company willingness to change	2	1	3	2	2	3	1	2	4	4	3	1	2	2	3	2	4	3	3	2	2
3	Client Procurement Policy	3	4	2	2	3	1	3	2	2	2	1	2	2	1	4	3	2	4	1	1	3
4	Competitive edge of the market	4	1	4	4	4	1	4	4	2	3	4	2	4	3	2	4	2	1	3	2	4

3.5.2 Challenges for sustainable procurement

As listed in table 3-3, the analysis showed that respondents identified 1) lack of funding and un-willingness to incur higher capital cost; 2) insufficient policies, regulations, incentives and lack of leadership; and 3) lack of awareness, understanding, information, commitment and demand as the three main challenges for sustainable procurement.

Table 3-3 : Analysis of challenges

Challenges	No of Response	Mean	Std. Deviation	Rank
Lack of funding and un-willingness to incur the higher capital cost	52	4.096	0.823	1
Insufficient policies, regulations, incentives and lack of leadership	52	4.019	0.828	2
Lack of awareness, understanding, information, commitment and demand	52	4.000	0.767	3
Resistance to change	52	3.981	0.779	4
Separation between capital budget and operational budget	52	3.769	0.731	5
Complicated procedures	52	3.712	0.957	6
Insufficient skilled staff for execution	52	3.654	0.988	7
Insufficient/confusing guidance, tools, demonstrations and best practice	52	3.635	0.929	8
Lack of sufficient time to address sustainability issues	52	3.558	0.998	9
Vagueness of definitions and diversity of interpretations	52	3.500	0.828	10

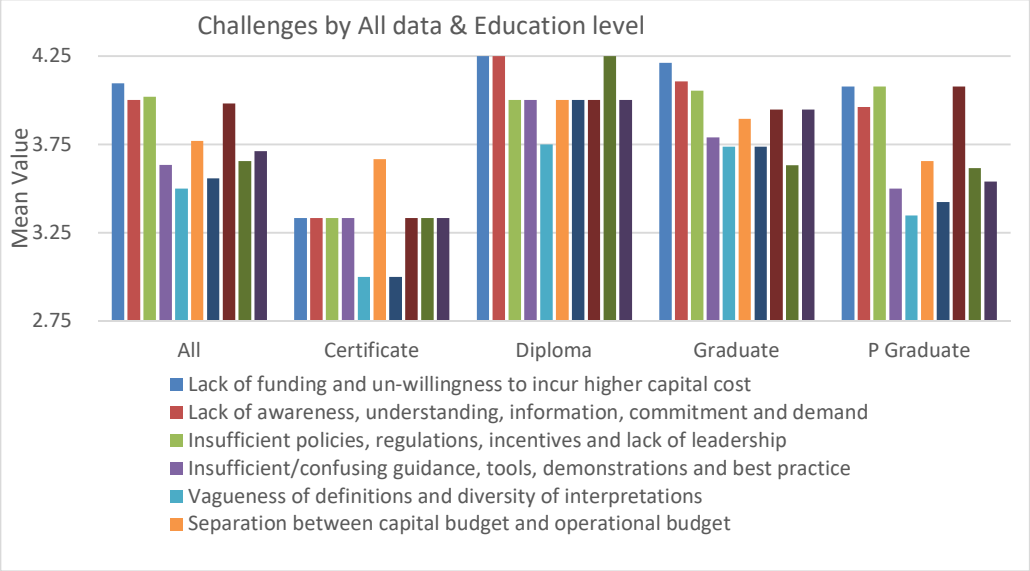

Figure 3-6 : Analysis of data on challenges by all data & by education level

The results through cross analysis is also similar in most of the areas. However, the respondents with post-graduate education and respondents with more procurement experience (over 15 years) have given broader answers and it highlights that the thinking pattern and ability to grasp the concept of implementing sustainable procurements is higher among respondents who have postgraduate qualifications and having more than 15 years of procurement experience. This would most likely be due to the exposure to international experiences, higher education or awareness of global best practices.

Variation of ranking by secondary factors such as education level, age, sector, procurement experience and international experience is tabulated below in table 3-4.

Table 3-4 : Ranking of challenges by secondary factors

Cross Analysis Category	All Data	Analysis by Education level				Analysis by Age				Analysis by Sector			Analysis by Procurement Experience					Analysis by International Proc Experience			
Factor / Sub Criteria		Certificate	Diploma	Graduate	P.Graduate	Below 30	30~39	40~49	above 50	Public	Private	Int/NGO	0 ~5	6~10	11~15	16~20	over 20	0~5	6~10	11~15	No Exp
Lack of funding and un-willingness to incur higher capital cost	1	2	1	1	1	1	2	2	1	1	1	4	4	1	7	1	1	1	1	3	2
Insufficient policies, regulations, incentives and lack of leadership	2	2	4	3	3	4	2	3	3	2	3	2	2	2	5	2	1	3	1	1	3
Lack of awareness, understanding, information, commitment and demand	3	2	1	2	4	1	4	1	5	4	4	1	1	6	2	3	1	6	5	3	1
Resistance to change	4	2	4	4	1	1	1	4	8	3	2	3	3	4	1	3	4	1	3	8	4
Separation between capital budget and operational budget	5	1	4	6	5	6	7	6	3	5	5	7	6	4	6	6	7	5	5	1	5
Complicated procedures	6	2	4	4	7	9	5	5	9	5	8	6	7	3	3	10	9	6	5	6	6
Insufficient skilled staff for execution	7	2	1	10	6	5	6	10	9	7	6	8	5	8	3	8	10	4	3	10	7
Insufficient/confusing guidance, tools, demonstrations and best practice	8	2	4	7	8	6	9	7	2	9	7	4	7	9	9	3	7	9	5	6	8
Lack of sufficient time to address sustainability issues	9	9	4	9	9	10	8	7	6	7	9	10	10	7	7	6	4	8	5	9	9
Vagueness of definitions and diversity of interpretations	10	9	10	8	10	8	10	9	6	10	10	9	9	10	10	8	4	10	10	3	10

3.5.3 Benefits of sustainable procurement

The analysis showed that respondents felt that reducing harmful emissions and waste generation; improving in working conditions - labour standards, health and safety; and reducing use of natural resources were the primary benefits of using sustainable procurement.

Table 3-5 : Analysis of benefits

Benefit	No. of Responses	Mean	Std. Deviation	Rank
Reducing in harmful emissions and waste generation	52	4.308	0.506	1
Improving in working conditions - labor standards, health and safety	52	4.269	0.598	2
Reducing use of natural resources	52	4.250	0.556	3
Saving the long term by considering the whole life cycle cost	52	4.192	0.561	4
Stimulate the market for green technologies	52	4.135	0.595	5
Improving the efficiency and transparency of procurement procedures	52	4.096	0.664	6
Up skilling your workforce to meet the future needs of your organization	52	4.000	0.594	7
Meet international obligations (Kyoto protocol/Climate Change-UNFCCC)	52	3.885	0.758	8
Assisting disadvantaged groups in society	52	3.712	0.723	9
Meeting the forthcoming legislation around the “Thirasara Sanwardana” agenda	52	3.712	0.572	10

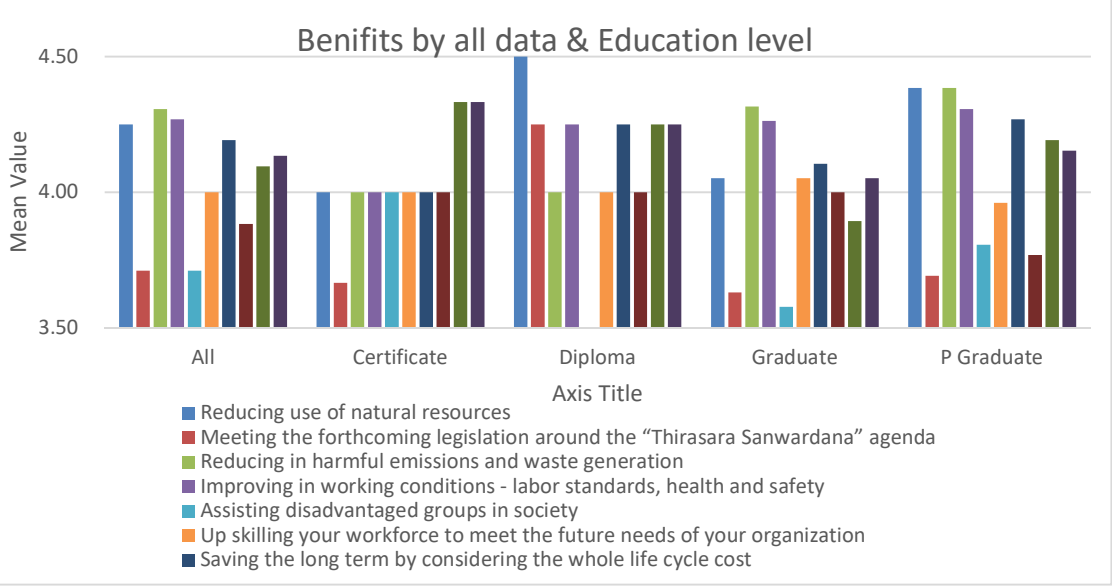

Figure 3-7 : Analysis by all data & by education level

The results of cross analysis revealed diverse results by different category. The perceptions of staff who have graduate/ postgraduate qualifications are quite similar with those aged above 40 years, as well as those with more than 15 years of procurement experience and those having international experience. There is also a clear difference in the benefits that people working in the international organizations/ NGOs see than those in the public and private sectors, who have somewhat of a similar viewpoint.

Variation of ranking by secondary factors such as education level, age, sector, procurement experience and international experience is tabulated below in table 3-6.

Table 3-6: Ranking of benefits by secondary factors

	Cross Analysis Category		Analysis by Education level				Analysis by Age				Analysis by Sector			Analysis by Procurement Experience					Analysis by International Proc Experience			
#	Factor / Sub Criteria	All Data	Certificate	Diploma	Graduate	P.Graduate	Below 30	30~39	40~49	above 50	Public	Private	Int/NGO	0~5	6~10	11~15	16~20	over 20	0~5	6~10	11~15	No Exp
1	Reducing in harmful emissions and waste generation	1	3	7	1	1	4	1	2	2	1	2	6	1	3	3	1	1	4	1	2	1
2	Improving in working conditions - labor standards, health and safety	2	3	2	2	3	1	2	4	6	2	3	2	2	2	4	1	4	1	3	2	2
3	Reducing use of natural resources	3	3	1	4	1	8	3	1	8	3	1	5	7	1	2	5	1	2	1	2	3
4	Saving the long term by considering the whole life cycle cost	4	3	2	3	4	1	4	3	6	3	4	2	4	6	1	5	4	2	3	2	4
5	Stimulate the market for green technologies	5	1	2	4	6	4	6	5	2	6	4	4	5	4	5	1	8	4	3	8	5
6	Improving the efficiency and transparency of procurement procedures	6	1	2	8	5	3	9	6	1	8	6	1	6	7	5	1	4	6	3	1	6
7	Up skilling your workforce to meet the future needs of your organization	7	3	7	4	7	4	6	7	2	5	7	8	8	4	7	7	8	7	3	2	8
8	Meet international obligations (Kyoto protocol/Climate Change-UNFCCC)	8	3	7	7	9	4	4	9	5	7	8	8	2	9	9	10	8	8	10	8	6
9	Assisting disadvantaged groups in society	9	3	10	10	8	10	6	10	8	10	10	7	10	8	8	7	1	8	9	2	10
10	Meeting the forthcoming legislation around the "Thirasara Sanwardana" a	10	10	2	9	10	9	10	8	10	9	9	10	9	10	10	9	4	10	3	10	9

3.5.4 Social factors

The top three social factors that can be considered during procuring construction contracts were identified as: health and safety to workforce; welfare facilities to workforce and fair and reasonable wage to the workers.

Table 3-7 : Analysis of social factors

Social factors	No. of Responses	Mean	Std. Deviation	Rank
Health and Safety to woke force	52	4.62	.491	1
Welfare facilities to work force	52	4.38	.530	2
Fair and reasonable wage to the workers	52	4.35	.556	3
Capacity building of work force /knowledge transfer	52	4.33	.585	4
Reduce impact on surrounding environment	52	4.29	.605	5
Use of local labour	52	4.08	.813	6
Use of Department of Labour/ILO as minimum guidelines	52	4.04	.559	7
Social awareness and community consultation	52	4.02	.577	8
Past performance of the contractor related to social factors	52	4.00	.686	9
Gender equality	52	3.44	1.037	10

Feedback among most of the cross analysis has a similar range of priorities and there was a consensus among all the respondent categories that health and safety of the workforce as being the main social factor for sustainable procurement. Interestingly, almost all the categories also put gender equality as the bottom-most factor for sustainable procurement. Gender equality is the main consideration in developed countries and international organizations.

Variation of ranking by secondary factors such as education level, age, sector, procurement experience and international experience is tabulated below in table 3-8.

Table 3-8: Ranking of social factors by secondary factors

#	Cross Analysis Category		Analysis by Education level				Analysis by Age				Analysis by Sector			Analysis by Procurement Experience					Analysis by International Proc Experience			
	Factor / Sub Criteria	All Data	Certificate	Diploma	Graduate	P.Graduate	Below 30	30~39	40~49	above 50	Public	Private	Int/NGO	0 ~5	6 ~10	11~15	16 ~20	over 20	0 ~5	6 ~10	11~15	No Exp
1	Health and Safety to woke force	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Welfare facilities to work force	2	1	3	2	2	4	4	2	2	2	2	3	3	4	2	2	1	2	6	4	2
3	Fair and reasonable wage to the workers	3	1	3	2	4	3	5	3	2	4	4	2	2	5	2	7	4	3	6	2	3
4	Capacity building of work force /knowledge transfer	4	7	3	2	3	1	3	6	4	5	3	5	4	2	5	2	1	4	1	2	5
5	Reduce impact on surrounding environment	5	1	3	5	5	7	2	4	4	2	6	5	6	3	4	2	4	5	3	6	4
6	Use of local labour	6	1	1	6	7	4	7	6	10	8	5	8	5	5	9	7	10	6	9	9	7
7	Use of Department of Labour/ILO as minimum guidelines	7	7	3	9	6	7	8	5	9	9	7	8	8	7	7	2	8	8	3	6	8
8	Social awareness and community consultation	8	7	3	7	9	9	6	8	8	6	9	5	9	8	6	2	8	7	3	6	9
9	Past performance of the contractor related to social factors	9	1	9	8	8	6	9	9	4	7	8	4	7	9	7	7	4	9	6	4	6
10	Gender equality	10	7	9	10	10	10	10	10	7	10	10	10	10	10	10	10	4	10	10	9	10

3.5.5 Environmental factors

The top three environmental factors to be considered during procuring construction contracts as identified by the respondents were: increase of water efficiency; increase of energy efficiency and use of renewable energy.

Table 3-9 : Analysis of environmental factors

Environmental factors	No of Responses	Mean	Std. Deviation	Rank
Increase of water efficiency	52	4.538	0.503	1
Increase of Energy efficiency	52	4.385	0.599	2
Use of renewable energy	52	4.365	0.687	3
Reduction of air pollution	52	4.346	0.653	4
Reduction of greenhouse gas emission	52	4.173	0.648	5
Rain water harvesting	52	3.904	0.975	6
Use of Biodegradable or Compostable materials	52	3.865	0.841	7
Comply with LEED	52	3.635	0.817	8
Comply with GBCSL	52	3.635	0.768	9
Implement buy back option	52	3.423	0.936	10

Feedback among most of the cross analysis has a similar range of priorities. However, it was interesting to note that staff who have more than 6 years of international experience showed a broader understanding and viewpoints about environmental sustainable factors related to procurement.

Important environmental factors such as buyback option and use of biodegradable or compostable materials has taken lower rank in the survey. This is assumed that it is due to current market practice of non-availability or un-affordable price of materials. The factor like buy back option in the last rank shows the unawareness of environment impact during disposal of items. Items like batteries, air conditioners, refrigerators, asbestos roofing sheets, etc. need proper disposal. Buyback option through vendors can be a good solution for proper disposal of the goods with minimal impact to the environment.

Variation of ranking by secondary factors such as education level, age, sector, procurement experience and international experience is tabulated below in table 3-10.

Table 3-10 : Ranking of social factors by secondary factors

#	Cross Analysis Category	All Data	Analysis by Education level				Analysis by Age				Analysis by Sector			Analysis by Procurement Experience					Analysis by International Proc Experience			
	Factor / Sub Categary		Certificate	Diploma	Graduate	P.Graduate	Below 30	30~39	40~49	above 50	Public	Private	Int/NGO	0~5	6~10	11~15	16~20	over 20	0~5	6~10	11~15	No Exp
1	Increase of water efficiency	1	4	2	1	1	1	1	1	2	1	1	3	2	1	1	2	1	1	1	1	1
2	Increase of Energy efficiency	2	4	1	2	4	2	4	2	2	3	2	3	5	2	2	2	3	3	1	1	3
3	Use of renewable energy	3	1	2	3	3	5	2	4	1	2	4	2	3	4	3	2	1	2	1	1	4
4	Reduction of air pollution	4	1	4	4	2	2	3	3	6	4	3	5	1	3	5	1	6	6	4	6	2
5	Reduction of greenhouse gas emission	5	4	5	5	5	2	5	5	8	5	5	1	4	5	4	5	3	4	4	4	5
6	Rain water harvesting	6	1	5	6	7	8	6	6	5	7	6	6	7	6	5	6	10	4	8	8	6
7	Use of Biodegradable or Compostable materials	7	4	9	7	6	6	7	7	2	5	9	7	6	9	7	8	6	7	8	6	7
8	Comply with LEED	8	8	7	8	9	10	9	9	7	9	7	8	9	8	8	8	3	10	6	4	9
9	Comply with GBCSL	9	8	7	9	8	8	8	8	10	8	8	10	8	7	9	8	6	8	6	8	8
10	Implement buy back option	10	8	9	10	10	7	10	10	9	10	10	8	9	10	10	6	9	9	8	8	10

3.5.6 Additional comments/suggestions on sustainable procurement

Below listed additional comments and/or suggestions were provided by the respondents

1. Sustainable procurement criteria to be made mandatory during tenders are launched.
2. Government policy makers to play a main role in practising sustainable development
3. Evaluation criteria and marking scheme should be very clear.
4. Most South Asian countries suffer from corruption and fraud practices for Procurement works. Therefore, it is difficult to implement sustainable criteria for bid evaluation.

5. Sustainable procurement concepts are not widely known. Hence, it would be better if there are more opportunities for public awareness on their terms and criteria.
6. Discussion to be initiated to prepare common sustainable procurement guidelines, which can be used for both private and public sector.
7. The main challenge for sustainable purchasing practices is the restricted budgets for purchasing goods/services as the projects are awarded to us on the 'lowest bid' basis most of the times
8. This research outcome must be more valuable to the present context of construction industry.

The additional comments shows the interest and willingness to use sustainable procurement. However, the comments have indicated the need for legislation and awareness/ training as an initiative.

CHAPTER 4

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The study was conducted to evaluate the current sustainable procurement practices whilst identifying the challenges and benefits of implementing sustainable procurement practices in the Sri Lankan construction industry. The following outlines the main conclusions of this study:

- The literature review established the unavailability of sufficient information to support the subject matter and thus underscores the importance of conducting a study of this nature. The construction industry is a fast-growing sector in most of the countries and nearly 50 percent of the economy is allocated for infrastructure facilities. In Sri Lanka, the construction industry represents up to 8 percent of the GDP compared to about 6 percent globally.
- Sustainable procurement in the construction industry appears to be in the starting blocks in terms of research and available material, especially in the Sri Lankan context. However, the importance of sustainability is understated although the fact remains that construction related themes are embedded in almost all 17 SDGs and as such the construction sector can be the leading sector to achieve the 2030 Agenda. A majority of prior scholarly publications related to sustainable construction procurement have focused on environmental criteria. This can be improved by incorporating social, and economic consequences of design; manufacturing and production methods; non-renewable material use; logistics; recycling options; operations; maintenance; reuse; suppliers' capabilities; and service delivery and disposal.
- In order to achieve sustainability in infrastructure or the built environment of society, a good collaboration between designers/engineers and procurement practitioners are necessary. This can be executed through proper planning and the establishment of an effective coordinating mechanism between these functions.
- The study was conducted through the use of an online questionnaire survey followed by a literature review. A questionnaire was prepared by using findings through literature, which consisted of 30 questions under five sections. Due to the unpopular

nature of the subject, the questions were designed with Likert scale rankings. Personal details like education, experience, training, international exposure and company details such as CIDA registration, Area of work, number of projects were asked to conduct the cross analysis. 10 number of environmental sustainability factors, 10 numbers of social factors, 4 numbers of drivers, 10 numbers of benefits and 10 numbers of challenges were listed and requested respondents to rank in a likert-type scale of five.

- The questionnaire has been circulated with over 250 procurement officials in the infrastructure field representing public, private and international intuitions. 52 responses were received by the end of the survey period, which has a good distribution among age, education, sector and experience and considered as a good sample.
- Data analysis was conducted through SPSS software, Excel and functionality available in Google forms. Cross-analysis was conducted by age group, educational level, sector representing, procurement experience and international experience. 43 percent of respondents from the private sector, 29 percent respondents from public/semi-government and 23 percent respondents from international organizations were contributed to the data. 40 percent represent 40~49 years group and 33 percent represent 30~39 years age group. Out of those who had responded, 50 percent held postgraduate qualifications.
- Legislation has been noted as the main driver for sustainable procurement whilst company willingness to change is in second place. This order is similar across different factors such as education level and experience. A clear difference can be seen based on sector representation. Those who represent public sector has ranked legislation as number one and those who represent international organizations has ranked company willingness as the main driver for sustainable procurement. The government of Sri Lanka, NPA, CIDA and IESL can be attributed to develop and implement the standards and regulations.
- Lack of funding and un-willingness to incur higher capital cost, insufficient policies, regulations, incentives and lack of leadership and lack of awareness, understanding, information, commitment and demand have been listed as top three challenges for sustainable procurement. Respondents with postgraduate education qualifications and with more procurement experience (over 15 years) have given broader answers.

- Reducing harmful emissions and waste generation, improving working conditions - labour standards, health and safety and reducing use of natural resources were identified as top three benefits of using sustainable procurement. There is a clear difference in the ranking of benefits of that people working in the international organizations/ NGOs than those are in the public and private sectors, who have somewhat of a similar view point.
- Health and safety to work force, welfare facilities to work force and fair and reasonable wage to the workers have been listed as top three social factors. Feedback among most of the cross analysis has a similar range of priorities and there was a consensus among all the respondent
- Increase of water efficiency, increase of energy efficiency and use of renewable energy has been listed as top three environmental factors. Respondents who have more than 6 years of international experience showed a broader understanding and viewpoints about social factors.
- Procurement guidelines and manuals that are available locally lack proper sustainability elements related to infrastructure procurements. Some of the international organizations have separate chapters for sustainable procurement. There is a minimal or zero use of sustainable procurement elements in the reviewed solicitation documents. The study revealed that current procurement practices are being carried out with few major concerns such as, lack of knowledge, lack of resources and insufficient training opportunities related to sustainability. The lack of published sustainable procurement guidelines and government regulations also contribute to the current situation of the sustainability initiatives.

4.3 Recommendations

- Clients/ funding sources should take the lead in promoting sustainability initiatives for the construction industry whilst legislation to introduce mandatory minimum sustainable criteria to encourage the industry to implement sustainable criteria should be established. There should be a necessity to enhance the knowledge and awareness of sustainable procurement practices by the project authorities such as project directors and project managers. Designers and project consultants are key stakeholders to initiate sustainable elements to the construction projects.
- Procurement processes are involved in all the stages of construction. Hence, procurement officials can highly contribute to implement sustainable procurement practices within the industry. Employing suitable staff such as people with at least 5 years of international procurement experience, more than 15 years of procurement experience, education above undergraduate level (preferably those who have completed postgraduate degrees) will be able to enhance the sustainable procurement practices. People with above qualifications and experience whom have worked in cross sectors such as public, private and international organizations will be able to produce better results.
- A guidance document to specify the importance of procurement alongside design professionals in the planning and design phases is needed. This is to bring infrastructure and procurement groups together to plan opportunities in advance in order to incorporate sustainable aspects in to infrastructure projects.
- Legislative bodies should encourage the construction industry to obtain certification of environmental management system, such as ISO14001, health and safety management system, such as OHSAS18001, code of conduct, or equivalent, through regular monitoring and communication, for example through social accountability 8000 (SA8000).
- Recommend to promote construction industry to achieve sustainability factors through,
    - development of local community outreach programmes
    - policies and processes in place to uphold the freedom of association and the effective recognition of the right to collective bargaining in its operations

    - policies and processes in place to eliminate discrimination and promote equal opportunities for men and women at all levels such as through employment and outreach activities to target qualified females and minority community members
    - actively promote the inclusion of local small, medium or minority businesses such as those owned by women, youths, ethnic and social minority groups
- Further research is recommended to study the impact of sustainable procurement on the cost, quality and duration of construction projects.

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APPENDIXES

Appendix - A	Sample Questionnaire
Appendix – B	Responses summary of the Questionnaire
Appendix – C	Data analysis summary/ Cross analysis

Appendix – A- Sample Questionnaire

Appendix – B - Responses summary of the Questionnaire

Appendix – C - Data analysis summary/ Cross analysis