

**A FRAMEWORK TO INTEGRATE
SUSTAINABILITY INTO THE PUBLIC
PROCUREMENT PROCESS IN THE SRI LANKAN
CONSTRUCTION INDUSTRY**

K. A. P. Gunawardhana

138014M

Doctor of Philosophy

Department of Building Economics

Faculty of Architecture

University of Moratuwa
Sri Lanka

August 2023

**A FRAMEWORK TO INTEGRATE
SUSTAINABILITY INTO THE PUBLIC
PROCUREMENT PROCESS IN THE SRI LANKAN
CONSTRUCTION INDUSTRY**

K. A. P. Gunawardhana

138014M

Thesis submitted in partial fulfilment of requirements for the degree
Doctor of Philosophy

Department of Building Economics

Faculty of Architecture

University of Moratuwa
Sri Lanka

August 2023

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

K. A. P. Gunawardhana

Signature: *UOM Verified Signature*

Date: 25 August 2023

The above candidate has carried out research for the PhD thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Prof. Y. G. Sandanayake

Signature of the supervisor:

Date: 25 August 2023

Dr. G. I. Karunasena

Signature of the supervisor:

Date: 25 August 2023

Dr. T. S. Jayawickrama

Signature of the supervisor:

Date: 25 August 2023

DEDICATION

To my family ...

ACKNOWLEDGEMENTS

I wish to express my appreciation to the people who helped me in numerous ways towards the successful compilation of this thesis, without whom the completion of this thesis would not have been possible.

Firstly, I express my sincere gratitude to my supervisors, Prof. Y. G. Sandanayake, Dr. Gayani Karunasena, and Dr. Thilini Jayawickrama, for their continuous guidance and encouragement, and constructive feedback on my PhD study and related research publications. I would also like to thank Prof. Srinath Perera, my Progress Review Specialist, for his insightful comments and encouragement.

My sincere thanks are also due to the Dean of the Faculty of Architecture, the Head of the Department of Building Economics, the Director of the Postgraduate Studies Division, the Research Coordinator of the Department of Building Economics, the staff of the Postgraduate Studies Division and Faculty of Graduate Studies, and the respective academic and non-academic staff of the University of Moratuwa, for providing me with institutional guidance and support, research facilities, and encouragement. Without their precious support, conducting this research would not be possible. In addition, I thank my research colleagues for the stimulating discussions and encouragement we shared in the University of Moratuwa research room.

I thank all staff officers and project directors of the foreign-funded projects of the Ministry of Public Administration, Home Affairs, Provincial Councils, and Local Government and other professionals/experts who cooperated professionally in providing data on the identified areas. Their support immensely helped me in successful data collection. My gratitude is extended to Mr. M. M. Nayeemudeen, the Secretary of the Ministry of Investment Promotion, for introducing to me the gravity of the procurement process in foreign-funded projects and for providing me with continued opportunities for knowledge sharing.

Last but not least, I thank my family for supporting me spiritually in writing this thesis and tolerating all the hard times created by my demanding schedules throughout the time.

ABSTRACT

A well-designed, effective, and transparent Public Procurement Process (PP Process) in the construction industry is an integral part of achieving sustainability in developing countries, where the contribution of the PP Process to the construction industry accounts for 30% of the GDP. As per the Department of Census and Statistics, the value of the civil works contracts in Sri Lanka in 2019 was USD 4.9 billion. Hence, a 1% efficiency in the construction industry saves more than USD 49 million per year. However, the current PP Processes in the construction industry in developing countries have lagging features in achieving sustainable development objectives due to many problems. Developing countries lack continued national strategies and sustainability focus in their PP Process in the construction industry compared to developed countries. This is identified as a main problem, in addition to the outdated knowledge and technology used by the contract parties and officers in the procuring entity. The development partners requested the borrowers to strengthen the PP Process with approaches to integrate sustainability into the PP Process to overcome the deficiencies of the process. Hence, the study formulated the key research question, “How to integrate sustainability into the Public Procurement Process in the Sri Lankan construction industry?” The aim of addressing this research problem was to develop a framework to integrate sustainability into the PP Process in the Sri Lankan construction industry, with five objectives. A comprehensive literature review, a desk study consisting of four internationally accepted guidelines and review reports, a preliminary study through interviews with 14 experts, a main investigation via interviews with 35 respondents, and an expert validation forum with five industry experts were conducted to develop, evaluate, and validate the proposed framework to integrate sustainability into the PP Process. This research selected a pragmatic stance. Accordingly, qualitative data were analysed using manual content analysis, and quantitative data were analysed using the arithmetic mean and presented in the X-Matrix Diagram using a colour code. The research focused only on integrating sustainability into the public procurement process but not the sustainability of the end product in the construction industry.

The desk study and the preliminary study verified the applicability of five key stages: (a) preparation, (b) design, (c) pre-construction, (d) construction, and (e) use, and related 39 activities, ten key problems and 22 key root causes, and 15 sustainability factors to the PP Process in the Sri Lankan construction industry. The findings confirmed the high impact of the 22 key root causes on the ten key problems and the high impact of the identified problems on the 39 activities of the PP Process. The root cause, ‘Negligence, errors, and technical deficiencies’ has the highest arithmetic mean value for eight problems out of ten. All ten problems highly impacted the activities in the latter part of the Preparation Stage and almost all activities in the Design and Pre-Construction Stages. The 22 root causes were highly impacted by 80% of the key sustainability factors, and 20% of the sustainability factors have a ‘medium impact’ on the root causes. Finally, the research developed a framework by integrating sustainability factors into the PP Process in the construction industry in Sri Lanka. The study contributed to the theory by identifying the sustainability factors needed to upgrade the existing PP Process in the construction industry for developing countries with similar contexts to Sri Lanka. The developed framework will support the construction industry in addressing problems at each PP Process stage by incorporating sustainability factors into the process. The Sri Lankan government could effectively use these research findings to develop a national policy, improve and update procurement guidelines and standard bidding documents, and establish indicators to monitor and evaluate the PP Process activities in the construction industry to achieve sustainable development. The findings will ultimately facilitate the development of a Sustainable Public Procurement Process (SPPP) in the construction industry.

Keywords: Construction Industry; PP Process; Problems; Root Causes; Sustainability Factors

TABLE OF CONTENT

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	v
TABLE OF CONTENT	vi
LIST OF FIGURES.....	x
LIST OF TABLES	xi
LIST OF ABBREVIATIONS	xii
PUBLICATIONS	xiv
CHAPTER 1.....	1
INTRODUCTION TO THE RESEARCH.....	1
1.1 Research Background.....	1
1.2 Research Problem	3
1.3 Aim and Objectives	5
1.4 Research Methodology.....	6
1.5 Scope and Limitations of the Research	7
1.6 Contribution of the Research.....	7
1.7 Structure of the Thesis.....	8
1.8 Chapter Summary.....	9
CHAPTER 2.....	10
LITERATURE REVIEW	10
2.1 Introduction to the Chapter	10
2.2 Defining Procurement.....	10
2.3 Public Procurement Process (the PP Process).....	12
2.4 Public Procurement in the Construction Industry	14
2.4.1 Significance of public procurement in the global construction industry	14
2.4.2 Significance of public procurement in the Sri Lankan construction industry	15
2.4.3 Stages and activities of the PP Process in the construction industry	17

2.4.3.1	PP Process activities in the preparation stage	22
2.4.3.2	PP Process activities in the design stage	23
2.4.3.3	PP Process activities in the pre-construction stage	23
2.4.3.4	PP Process activities in the construction stage.....	24
2.4.3.5	PP Process activities in the use stage	25
2.4.4	Problems of the PP Process in the construction industry	26
2.4.5	Root causes behind the problems of the Public Procurement Process in the construction industry	29
2.5	Sustainability of Public Procurement Process in the Construction Industry	34
2.5.1	Define sustainability	34
2.5.2	Sustainable procurement.....	35
2.5.3	The Sustainable Public Procurement Process (SPPP)	36
2.5.4	Importance of the SPPP to the construction industry	37
2.5.5	Sustainability-integrated frameworks for the PP Process in a global context	39
2.6	A Desk Study on the Sustainability Factors to be Integrated into the PP Process in Construction Industry	43
2.6.1	Procurement regulations for sustainable procurement of the World Bank ..	43
2.6.2	Post-completion sustainability evaluation report of the Asian Development Bank.....	44
2.6.3	Sustainability reporting in Singapore developed by the National University of Singapore.....	44
2.6.4	The framework of the Office of Government Commerce (OGC), United Kingdom	44
2.7	The Conceptual Model.....	56
2.8	Chapter Summary.....	58
CHAPTER 03.....		60
RESEARCH METHODOLOGY		60
3.1	Chapter Introduction.....	60
3.2	Research Philosophy	60
3.3	Research Approach.....	63
3.4	Research Techniques	64
3.5	Research Process	64
3.5.1	Background study	67

3.5.2	Comprehensive literature review.....	67
3.5.3	Desk Study.....	68
3.5.4	Conceptual model development	68
3.5.5	Preliminary study.....	68
3.5.6	Main study	72
3.5.7	Development of the Framework	76
3.5.8	Expert validation and final framework development	78
3.6	Chapter Summary.....	80
CHAPTER 04.....		81
RESEARCH FINDINGS AND DISCUSSION		81
4.1	Chapter Introduction.....	81
4.2	Preliminary Study Findings	81
4.2.1	Stages and activities of the PP Process in the construction industry	81
4.2.2	Verified key problems and root causes in the Sri Lankan construction industry	90
4.2.3	Verify sustainability factors relevant to the PP Process applicable to the Sri Lankan construction industry	94
4.3	Main Study.....	102
4.3.1	Background of the main study.....	102
4.3.2	Impact of root causes for the problems of the PP Process in the construction industry	102
4.3.3	Impact of the problems for the activities of the PP Process in each stage in the Sri Lankan construction industry	116
4.3.4	Impact of implementation of sustainability factors at the level of activities in each stage of the PP Process in the Sri Lankan construction industry	122
4.3.5	Integrate the sustainability factors to minimise the effect of the root causes on the problems in the PP Process in the construction industry	134
4.4	Development of a Framework to Integrate Sustainability into the Public Procurement Process in the Sri Lankan Construction Industry	147
4.4.1	Process of validation of the framework.....	149
4.4.2	Outcomes of the framework validation process	149
4.5	Chapter Summary.....	150
CHAPTER 05.....		151
CONCLUSIONS AND RECOMMENDATIONS		151
5.1	Chapter Introduction.....	151

5.2	Summary of the Research	151
5.3	Conclusions of the research.....	151
5.3.1	Stages & activities of the PP Process, problems & root causes of the PP Process, and (c) sustainability factors to be integrated into the PP Process	151
5.3.2	Applicability of stages & activities of the PP Process, problems & root causes of the PP Process, and sustainability factors to be integrated into the PP Process.....	153
5.3.3	Impact of root causes for the problems in each stage of the PP Process....	154
5.3.4	Integrate sustainability factors to mitigate problems by addressing root causes in each stage of the PP Process	155
5.3.5	Framework developed to integrate sustainability into the PP Process in the Sri Lankan construction industry.....	156
5.4	Contribution of the Research.....	156
5.4.1	Contribution to the knowledge	157
5.4.2	Contribution to industry.....	157
5.5	Implementation of the Sustainability Integrated PP Process Framework	157
5.6	Limitations of the Study	158
5.7	Further Research	158
5.8	Concluding Remarks	159
6	LIST OF REFERENCES	160
	Annexure I.....	183
	INTERVIEW GUIDELINES FOR PRELIMINARY STUDY	183
	INTERVIEW GUIDELINES FOR EXPERT OPINION - PART I.....	184
	Annexure II	192
	INTERVIEW GUIDELINES FOR THE MAIN STUDY	192
	INTERVIEW GUIDELINES FOR EXPERT OPINION - PART II	193
	Annexure III.....	199
	DETAILS OF THE ANALYSIS IN FOUR AREAS WITH VALUES	199

LIST OF FIGURES

Figure 2.1: Conceptual Model for Sustainable Public Procurement Process in Construction Industry.....	57
Figure 3.1: Nested Approach	61
Figure 3.2: Research Process	66
Figure 3.3: Experience of the Experts in the Main Study	75
Figure 3.4: Involvement of the Experts in the PP Process in the Main Study	75
Figure 3.5: X-Matrix Diagram with the Verified Areas	78
Figure 4.1: X-Matrix Diagram of the Verified Areas in the Preliminary Study	101
Figure 4.2: Element Points and Impact of Root Causes for the Problems	103
Figure 4.3: Impact of the Problems on the Activities in Each Stage	117
Figure 4.4: Impact of Implementation of Sustainability Factors at the Level of Activity in Each Stage.....	123
Figure 4.5: Impact of Sustainability Factors on the Root Causes	135
Figure 4.6: Framework Developed to Integrate Sustainability into the PP Process in Sri Lankan Construction Industry.....	148

LIST OF TABLES

Table 2.1: Categories of Procurement.....	11
Table 2.2: Key Principles of the PP Process.....	13
Table 2.3: Activities of the PP Process throughout Project Procurement Lifecycle.....	19
Table 2.4: Problems of the PP Process in the Construction Industry.....	27
Table 2.5: Root Causes behind the Problems of the PP Process in the Construction Industry	30
Table 2.6: Special Features and Considerations of Sustainability Integrated the PP Process Frameworks.....	40
Table 2.7: Summary of the Sustainability Factors Identified from the Desk Study	46
Table 3.1: Comparison of Research Philosophies.....	62
Table 3.2: Structure of Interview Guidelines.....	69
Table 3.3: Profiles of the Experts in the Preliminary Study	70
Table 3.4: Categorisation of Research Questions Against Objectives.....	72
Table 3.5: Profiles of the Experts in the Main Study	73
Table 3.6: Colour Coding Used to Present the Impact of Each Factor in X-Matrix.....	76
Table 3.7: Profiles of the Experts Involved in Framework Validation	79
Table 4.1: Verified Activities in the PP Process in the Sri Lankan Construction Industry	82
Table 4.2: Verified and Refined Stages and Activities of the PP Process in the Construction Industry.....	89
Table 4.3: Verified Problems of the PP Process in the Construction Industry	90
Table 4.4: Verified Root Causes of the PP Process in the Construction Industry	91
Table 4.5: Verified Sustainability Factors relevant to the PP Process.....	95

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BSc	Bachelor of Science
CIDA	Construction Industry Development Authority
CIPS	Chartered Institute of Procurement and Supply
GDP	Gross Domestic Products
GOSL	Government of Sri Lanka
EIA	Environmental Impact Assessment
FIDIC	International Federation of Consulting Engineers
FR	Financial Regulations
IBRD	International Bank for Rehabilitation and Development
ICTAD	Institute of Construction Training and Development
JICA	Japan International Cooperation Agency
LKR	Sri Lankan Rupees
MOF	Ministry of Finance
NPA	National Procurement Agency
NPC	National Procurement Commission
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
OGC	Office of Government Commerce
PE	Procuring Entity
PGLs	Procurement Guidelines
the PP Process	Public Procurement Process
QFD	Quality Function Deployment
RAP	Resettlement Action Plan
RIBA	Royal Institute of British Architects
SBDs	Standard Bidding Documents
SDGs	Sustainable Development Goals
SIA	Social Impact Assessment
SLGAP	Sri Lankan Government Action Plan
SLIDA	Sri Lanka Institute of Development Administration
SPPP	Sustainable Public Procurement Process

TEC	Technical Evaluation Committee
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US\$	United State Dollars
VFM	Value for Money
WB	World Bank
WSSD	World Summit on Sustainable Development

PUBLICATIONS

- Gunawardana K.A.P. Sandanayake Y.G. Karunasena G. and Jayawickrama T., (2021) Integrate Sustainability into the Public Procurement Process in Construction Industry, *In Proceedings of the 1st IEOM India Conference*, 16-18 August 2021, India [Online], ID 042, Retrieved from <https://www.ieomsociety.org/proceedings/2021india/42.pdf>. (Scopus Indexed).
- Gunawardana, K.A.P., Sandanayake, Y.G., Karunasena, G.I. and Jayawickrama, T.S. (2021). Problems and related causes of public procurement process to achieve sustainability in developing countries. *In Proceedings of the 9th World Construction Symposium*, 9-10 July 2021, Sri Lanka. [Online]. pp. 458-470. DOI: <https://doi.org/10.31705/WCS.2021.40>. Available from: <https://ciobwecs.com/papers/>. (Scopus Indexed).
- Gunawardhana K.A.P. and Gayani Karunasena (2016), Gaps in Public Procurement Process in Sri Lankan Construction Industry, *In Proceedings of the 5th World Construction Symposium 2016*, on 29-31 July 2016 in Colombo, Sri Lanka, pp. 231-240.
- Gunawardhana K.A.P. and Gayani Karunasena (2015), Conceptual Framework for Sustainable Public Procurement Process in Construction Industry, *In Proceedings of the 4th World Construction Symposium*, on 12-14 June 2015 in Colombo, Sri Lanka, pp. 192-202.
- Gunawardhana, K.A.P. and Karunasena, G. (2015). Sustainable Public Procurement Process for Developing Countries: Research Methodological Perceptive. *In Proceedings of the 19th Pacific Association of Quantity Surveyors World Congress (PAQS)*, 28 May-01 June 2015, Yokohama, Japan.
- Gunawardhana K.A.P. and Gayani Karunasena (2014). Sustainability Concerns to the Public Procurement Process in Construction: Literature Review. *In Proceedings of the 3rd World Construction Symposium*, 20-22 June 2014 in Colombo, Sri Lanka, pp. 525-533.
- Gunawardhana, K.A.P. and Karunasena, G. (2014). Sustainable Public Procurement Process in Construction Industry: Literature Review. *In Proceedings of the 8th FARU International Research Symposium – 2014* in Colombo, Sri Lanka, pp. 47-55.