



Ministry of Environment , Climate
Change and Technology

USER GUIDE FOR IMAGING EQUIPMENT

Life Cycle Costing Assessment (LCCA)



Version 1.0

Promoting Energy Efficient Buildings through
Strengthening Low Carbon Energy
Island Strategies (LCEI) Project





**Ministry of Environment,
Climate Change and Technology**

Strengthening Low Carbon Energy Island
Strategies (LCEI) Project



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Abbreviations

CO₂ -eq	Carbon Di-oxide equivalent
DISCOM	Electricity Distribution Company
EE	Energy Efficiency
kWh	Kilo watt hour
LCC	Life cycle cost
LCCA	Life cycle cost assessment

1. Introduction

This guide has been developed for the implementation of life cycle costing-based procurement as per the notification from the Ministry of Finance under the clause 10.77 of the 3rd Amendment (2020/R-51) to PFR 2017/R-20. The notification directs all the public procurers to undertake life cycle costing assessment to determine least lifecycle cost option during procurement of the prioritised appliances and equipment as per the procedure mentioned therein.

This user guide is developed for the multifunctional imaging equipment which includes printers, copiers, devices and scanners marketed for office or domestic use, or both.

The tool guide for Imaging equipment facilitate the user on the following aspects:

1. Introduction to LCCA;
2. Objective, applicability and when to use the tool;
3. Preparation of the bid documents including the list of parameters and evaluation criteria to be included in the bid;
4. Definitions and formula for the bid evaluation;
5. Software requirement and compatibility to use the LCCA tool; and
6. Steps to use the LCCA Tool.

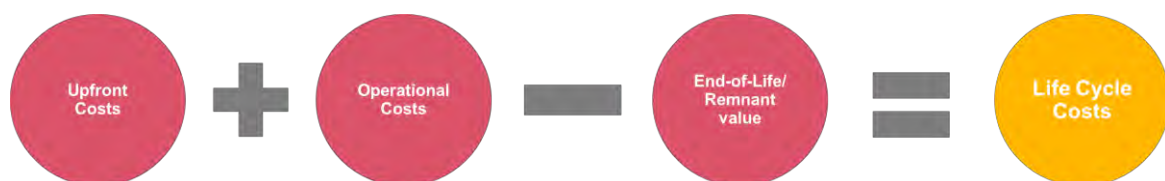
1.1. Life cycle cost assessment (LCCA)

The lowest upfront cost (acquisition & installation) bid may not be the most economical bid over the life cycle of an equipment or appliance

Life cycle costing-based procurement considers upfront costs (acquisition & installation), operational costs and end-of-life/remnant costs over the lifetime of a product with the objective to holistically assess the total cost of ownership of the product throughout its usable life.

Life-cycle cost assessment (LCCA) provides organisations the ability to determine their procurement expenses by holistically incorporating all lifecycle cost factors. LCCA enables organisations to determine the most cost-effective option among different competing alternatives to purchase, own, operate, maintain, and finally, dispose of a product.

Figure 1: An overview of LCCA cost interactions



The LCCA becomes critical in the scenario of energy efficiency, wherein organisations focus on procuring the highest efficiency products. Such products can often have higher upfront costs (acquisition & installation) which in turn can increase economic stress on the organisations' financial budget with moderate energy savings in the long run. The LCCA methodology analyses all the relevant costs including the upfront costs (acquisition + installations), operation costs (energy, service and maintenance costs) and end-of-life/remnant costs, to present the best economic procurement option with adequate emphasis on energy efficiency. In summary, the LCCA can help organisations move towards achieving a balance between economic and energy efficient options.

1.1.1. Upfront Cost (Acquisition and Installation)

Upfront costs include acquisition and installation costs related to a product. Cost for the acquisition of the product includes the price at which the product is bought incorporating all commissioning, freight, transport and taxes. Installation costs include other one-time costs such as the labour or technician costs to install the product.

1.1.2. Operational Costs

The operating cost is often the most critical cost component of the LCCA. The operational costs include costs towards operating the equipment, largely electricity costs in case of electrical equipment and Service/maintenance costs during the operational/useful life of a product. The electricity costs are the costs of electricity supply, all taxes and fees included (MVR/kWh) and serves to calculate operational costs linked to the energy consumption of the product. The operational costs also include Service/maintenance costs, which covers labour costs and the cost of any spare parts or replacements required during the operational/useful life of a product.

1.1.3. End-of-Life Costs

End-of life costs or remnant value is the depreciated value of the product at the end of its useful life. This value reduces the total life cycle cost as it assumes that the product could be sold at the end of the evaluation period. In case of some equipment (especially electronic equipment) and under certain regulations requiring regulated disposal of equipment, the end-of-life cost may increase the total life cycle cost.

1.2. What is the objective of the tool?

Enable an economical and energy efficient procurement

The objective of this tool is to assist the procurement officers and bid evaluators involved in public procurement activities in the Maldives, to determine the least cost products based on energy efficiency-based life cycle costing. The tool enables a balance between cost economics and energy efficiency, providing subsequent energy and cost savings for the organisations in the long run.

1.3. Who is this tool intended for?

The tool has been designed for the procurement officers and bid evaluators associated with the public sector organisations in the Maldives. The tool is designed with a user centric approach to promote anyone with basic spreadsheet experience of Microsoft Excel™ to be able to use it. The tool provides enough information as notes and definitions of various parameters for the user understanding and

ease of access. Further, there are no calculations at the user end barring basic data entry parameters. These data entry parameters will be included in the procurement documents and can be easily entered in the model with the reference of the bidder responses/proposals.

1.4. When to use the tool?

This tool can be used for the products following procurement methodology as per the LCCA. The tool can be used at different stages during the procurement process, as listed below:

1.4.1. Before bidding/Bid preparation

Before tendering and during bid preparation the tool can help the procuring entity in market assessment activity for various product options. The procuring entity through the tool can assess any preliminary product proposals for identifying different cost elements and define general performance requirements for the new products to be procured.

1.4.2. During bidding/Bid evaluation

During bidding and evaluation, the tool can be used to compare the offers received from bidders. The evaluator can compare the life cycle cost (LCC), energy utilisation and the estimated carbon footprint (CO₂ emissions) of different offers, during the evaluation phase.

1.4.3. After bidding/After bid award and finalisation

After the bidding process the procuring entity can use the tool to verify and evaluate the performance of the awarded solution. Comparative analysis can be conducted of the operations of the previous procurements to the current procurement. Further, post bidding the tool could be used to monitor the results and help set benchmarks for the future bids.

2. Preparation of the bid document

This user guide is developed for the multifunctional imaging equipment which includes printers, copiers, devices and scanners marketed for office or domestic use, or both. In the bid document, under the “Statement of Requirement”, the procuring entity will provide specifications for type of imaging equipment, colour printing capability, minimum printing duty cycle of the equipment (i.e. number of pages/month/printer) and other parameters as listed in this section. The bid document will mention that the criteria for evaluation of the bids would be based on Life cycle cost assessment (LCCA).

2.1. Parameters to be provided in the bid document by procuring entity

The Table 1 lists the general LCCA parameters which will be provided by the procuring entity in the bid documents. These parameters have been fixed in the tool by default but can be changed by the procuring entity as per the process requirements.

Table 1: Parameters to be provided by procuring entity in the bid document

Parameters fixed by Procuring entity for life cycle costing assessment				
Sr. No.	Parameter	Definition	Source of Data	Fixed value
1.	Life of the Equipment	Number of years over which to calculate and compare life cycle costs of different solutions.	Procuring entity	10 ^[1]
2.	Discount rate	The discount rate is used to calculate the present value of future costs.	Procuring entity	10% ^[1]
3.	Electricity annual price increase (optional)	Average price increase of electricity in the Maldives. It should include all non-recoverable taxes and fees and be adjusted to eliminate the effect of inflation.	Procuring entity/ Electricity utility	2% ^[1]
4.	Salvage value Percentage	Remaining value of the Imaging equipment at the end of life.	Procuring entity	5% ^[1]
5.	Operational office days per year	Total number of working days for the office.	Procuring entity	250 ^[1]

¹ The value is considered as a conservative assumption for the particular LCCA based procurement.

Parameters fixed by Procuring entity for life cycle costing assessment				
Sr. No.	Parameter	Definition	Source of Data	Fixed value
6.	Daily office hours	Total number of working hours for the office.	Procuring entity	8 ^[1]
7.	Assumed active utilisation time of the imaging equipment in a day (%)	Estimated duration in a day when the imaging equipment will be in active output mode i.e. when the imaging equipment is being utilised.	Procuring entity	20% ^[1]
8.	Assumed ready/on-time of the imaging equipment in a day (%)	Estimated duration in a day in which the equipment is not producing output, has reached operating conditions, has not yet entered into any lower-power modes, and can enter Active State with minimal delay.	Procuring entity	60% ^[1]
9.	CO ₂ -eq emissions of the national electricity mix	Grid emission factor.	Procuring entity	0.72 ^[2]

The Table 2 lists the bid specific parameters to be provided in the bid documents.

Table 2: Bid specific parameters to be provided by the procuring entity

Bid Specific Parameters to be provided by the Procuring Entity			
Sr. No.	Parameter	Definition	Source of Data
1.	Number of Imaging equipment to be procured	Number of Imaging equipment of the same type required by the procuring entity.	The procuring entity should provide this value in the bid documents as per the requirement.
2.	Colour printing capability	Either black/white or coloured.	The procuring entity should clarify this in the tender documents.
3.	Minimum printing duty cycle of the equipment	Printer duty cycle, also called the monthly duty cycle, is the absolute number of pages that can be printed per month	The procuring entity should provide this value in the tender documents as per their estimated monthly printing requirements per printer.

² UNFCCC:

https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/29357641_Maldives-BUR1-1-First%20BUR%20of%20Maldives.pdf

Bid Specific Parameters to be provided by the Procuring Entity			
Sr. No.	Parameter	Definition	Source of Data
		<p>at the rated print quality of a machine.</p> <p>The duty cycle is intended to show how much a given printer can produce over a one-month period without any errors or jams.</p>	
4.	% of Prints in black & white and colour	The estimated percentage of prints in black & white and/or in colour that are expected in a year for each machine (unit).	The procuring entity should provide this value in the tender documents as per their estimated annual printing requirements.
5.	Annual maintenance costs	Annual Service/maintenance costs per Imaging equipment could include both labour costs and cost of any equipment and parts required excluding the cartridge costs which are accounted separately.	Procuring entity should provide this value based on previous service experience or existing service contracts. Please note that this value should be kept constant for all the bids that are to be evaluated under a procurement and should be provided in the bid documents.
6.	Electricity price	Cost of electricity supply, all taxes and fees included (MVR/kWh). It serves to calculate operation costs linked to the energy consumption of the Imaging equipment.	<p>The procuring entity should use the highest electricity consumption band for Government/Institutions set by the Utility Regulatory Authority (URA).</p> <p>If the procuring entity is based in the Greater Male' Region, then the applicable tariff will be from the Greater Male' Region and if the procuring entity is based in the outer islands, then the tariff applicable for that particular region should be used. For example: If the procuring entity is based in the Greater Male' Region, then the electricity tariff of the highest defined electricity consumption band (electricity consumption >600 kWh) under the 'Government & Institutes' consumer category will be applicable and currently it is MVR 4.35/kWh.</p>

2.2. Bidder input parameters

The following set of parameters will be requested from the bidders in the bid document for the evaluation of bids. Please note the following parameters will be entered into the tool by the procuring entity with the data provided in the bidder's proposal:

Table 3: Parameters to be provided by the bidder and entered by the Procuring entity

Parameters to be provided by the bidder and entered by the Procuring entity			
Sr. No.	Parameter	Definition	Source of Data
1.	Bidder's Name	Name of the bidding entity.	Bidder
2.	Manufacturer details	Name of the Imaging equipment manufacturer.	Bidder
3.	Imaging equipment Name and Model Number	Name and model of the Imaging equipment based on the bid.	Bidder
4.	Acquisition costs	Cost per unit for the acquisition of the Imaging equipment by the procuring entity based on all requirements set in the bid documents.	Bidder
5.	Installation costs	Cost per unit for the delivery, installation and any other cost at the start of the contract based on all requirements set in the bid documents. Leave blank if they are included as part of the acquisition cost.	Bidder
6.	Printing duty cycle of the equipment	The bidders will provide duty cycle values of their products in compliance with the requirements set by the procurement authority.	Bidder
7.	Yield of cartridges: <ul style="list-style-type: none"> • Page yield of the black toner / ink cartridge • Page yield of the blue toner / ink cartridge • Page yield of the yellow toner / ink cartridge 	Yield, i.e. number of printed pages per cartridge that the toner/ink cartridge in the offer can produce. The yield should be measured and reported according to the standard or norm defined in the tender documents. This is needed to estimate printing costs of the equipment.	Bidder

Parameters to be provided by the bidder and entered by the Procuring entity			
Sr. No.	Parameter	Definition	Source of Data
	<ul style="list-style-type: none"> Page yield of the magenta toner / ink cartridge 		
8.	Cartridge costs: <ul style="list-style-type: none"> Cost of the black toner / ink cartridge Cost of the blue toner / ink cartridge Cost of the yellow toner / ink cartridge Cost of the magenta toner / ink cartridge 	Costs of the toner/ink cartridges needed for the operation of the equipment. This is needed to estimate the operation costs linked to the consumption of toner or ink.	Bidder
9.	Electricity Consumption in Active mode	Electricity consumption during active output mode when the imaging equipment is being utilized.	Energy consumption under the defined categories will be submitted by the bidders in reference with the IEC 62301:2011 - Household electrical appliances - Measurement of standby power or As specified by the tender documents.
10.	Electricity Consumption in Ready/Standby/on mode	The power state in which a product is not producing output, has reached operating conditions, has not yet entered into any lower-power modes, and can enter Active State with minimal delay.	
11.	Electricity Consumption in Sleep/Low power mode	The low power mode the product enters after receiving a signal from a connected device or an internal stimulus. The product may also enter this mode by virtue of a signal produced by user input. The product must wake on receiving a signal from a connected device, a network, a remote control, and/or an internal stimulus.	
12.	Electricity Consumption in Off mode	The power mode in which the product is disconnected from a power source, and is not providing any On Mode or Sleep Mode functions.	

2.3. Documents to be submitted by Bidder

The following documents shall be requested to be submitted by the bidder for verification of information provided for LCCA.

1. Declaration of conformance as provided in section 7.
2. Product catalogue including product model number.
3. Signed and sealed 'Form 4: Bidder technical details submission form' refer section 6.4.

2.4. Evaluation criteria

The following criteria shall be included in the bid document by the Procuring Entity. The bid evaluation criteria will be based on the least cost bid/offer identified by the life cycle costing formula, as provided below:

Life cycle costs = Upfront cost + (Electricity costs)_{NPV} + (Service/Maintenance Costs)_{NPV} – (Remnant value)_{NPV}

Where,

- *Upfront Costs = (Acquisition costs + Installation costs) X Number of Imaging equipment*
- *(Electricity Costs)_{NPV} = Annual electricity consumption of per unit of Imaging equipment X Electricity Price X Electricity Present Value Factor X Number of Imaging equipment*
- *(Service/Maintenance Costs)_{NPV} = (Annual Printing Costs + Annual Maintenance Costs) x General Present value Factor x Number of Imaging equipment*
- *(Remnant value)_{NPV} = Acquisition costs X Salvage Value Percentage X Present Value Factor (for the duration of the Life of the Equipment) X Number of Imaging equipment*
- *NPV refers to Net Present Value, calculated by the following formula:*
 - *Net Present Value Factor = 1 / (1+Discount rate) ^ (Life of the Equipment)*

Sample format to be used in the bid document is provided in section 6.

3. Bid Evaluation Parameters

The Procuring Entity should consider the following definitions and formula for the bid evaluation.

3.1. Data provided by the Bidder

The following set of metrics are provided by the bidder as a part of their response to the bid.

Metrics for the economic offer for the bid

The following metrics cover the economic costs of the product as defined in the bid and quoted by the bidders:

A. Acquisition cost of the Equipment

Cost for the acquisition based on all requirements set in the bid documents. This cost will include all commissioning, freight, transport and taxes.

B. Installation cost - including delivery and any other one-off costs

Installation costs include other one-time costs such as the labour or technician costs to install the product.

C. Yield of the toner/ink cartridges

Yield, i.e. number of printed pages per cartridge that the toner/ink cartridge in the offer can produce. This is needed to estimate printing costs of the equipment. The yield should be measured and reported according to the standard or norm defined in the tender documents.

D. Cartridge costs for the different colours (black, blue, yellow and magenta)

Costs of the toner/ink cartridges needed for the operation of the equipment. This is needed to estimate the operation costs linked to the consumption of toner or ink.

Metrics for the Electricity consumption of the Imaging equipment

The following metrics govern the parameters for electricity consumption:

A. Active mode

Electricity consumption during active output mode when the imaging equipment is being utilised.

B. Ready/Standby/on mode consumption

The power state in which a product is not producing output, has reached operating conditions, has not yet entered into any lower-power modes, and can enter Active State with minimal delay.

C. Sleep/Low power mode consumption

The low power mode the product enters after receiving a signal from a connected device or an internal stimulus. The product may also enter this mode by virtue of a signal produced by user input. The product must wake on receiving a signal from a connected device, a network, a remote control, and/or an internal stimulus.

D. Off mode consumption

The power mode in which the product is disconnected from a power source, and is not providing any On Mode or Sleep Mode functions.

3.2. Data provided by the Procuring entity

Identification of the Equipment

A. Reference of the machine type in the bid

Short identifier of the equipment that will be considered in each column of the tool based on the types included in the tender documents or lot to be evaluated with the tool.

B. Type of Imaging equipment

Dropdown menu to select the type of the equipment that will be evaluated in the tool in each column. For e.g., if the quotations have been invited for Colour equipment then please select Colour from the dropdown list.

C. Number of Imaging equipment to be provided

Number of Imaging equipment to be delivered/installed by bidders as defined in the bid documents.

Basic parameters for the calculations of LCCA

A. Life of the Equipment

Number of years over which to calculate the life cycle costs. It should be equivalent to the average lifetime of the equipment in your organisation.

B. Discount rate

Coefficient used to transform future cost into present value. This is called discounting and consists of applying a selected discount rate such that each future cost occurred during the evaluation period is adjusted and expressed in relation to the present time. The following present value factors are evaluated based on discount rate:

$$\text{Electricity Present value Factor} = 1 / (\text{discount rate} - \text{electricity price increase}) \times [1 - ((1 + \text{electricity price increase}) / (1 + \text{Discount rate})) ^ (\text{Life of the Equipment})]$$
$$\text{General Present value Factor} = 1 / \text{discount rate} \times [1 - (1 / (1 + \text{Discount rate})) ^ (\text{Life of the Equipment})]$$

C. Salvage rate

Rate at which the equipment reduces their value due to normal usage and market developments.

Basic parameters for the calculation of operation costs

A. Electricity price

Cost of electricity supply, all taxes and fees included (MVR/kWh). It serves to calculate operation costs linked to the electricity consumption of the equipment. The per unit electricity costs/tariffs can be obtained from the Electricity utility/Distribution Company (DISCOM).

B. Electricity annual price increase

Average price increase of electricity in the region of procuring entity.

C. Number of prints - black & white and colour

Estimated numbers of prints in black & white and/or in colour that the procuring entity expect to do each year in each machine (unit). This together with the toner/ink cartridges yield and cost allows to estimate the operational costs related to the use of toner/ink cartridges.

3.3. Tool Result metrics

The following metrics depict the results of the bid evaluation:

Standalone metrics

A. Upfront costs (acquisition & installation)

Acquisition and installation costs of each type of Imaging equipment assumed to occur at the beginning of the contract.

$$\text{Upfront Costs} = (\text{Acquisition costs} + \text{Installation costs}) \times \text{Number of Imaging equipment}$$

B. Electricity Costs

Cumulative annual cost due to the electricity use of each type of Imaging equipment during the evaluation period expressed in net present value.

$$\text{Electricity Costs} = \text{Annual electricity consumption of per unit Imaging equipment} \times \text{Electricity Price} \times \text{Electricity Present Value Factor} \times \text{Number of Imaging equipment}$$

C. Service/maintenance costs

Cumulative annual service and/or maintenance costs for each type of Imaging equipment during the evaluation period expressed in net present value.

$$\text{Service/Maintenance Costs} = (\text{Annual Printing Costs} + \text{Annual Maintenance Costs}) \times \text{General Present value Factor} \times \text{Number of Imaging equipment}$$

D. Annual Printing Costs

Printing costs arising from the number of annual prints, calculated corresponding to yield and costs of toner / ink cartridge.

$$\text{Annual Printing Costs} = (\text{No. of Annual prints in B/W} \times 1/\text{Yield of the B/W toner} \times \text{Costs of B/W toner}) + \text{No. of Prints in color} \times 1/4 \times \sum (1/\text{Yield of each colour cartridge} \times \text{Cost of each color cartridge})$$

E. Remnant value

Value of the Imaging equipment in terms of percentage of depreciation of its initial value at the end of the evaluation period. This value is negative and reduces the total life cycle cost as it assumes that Imaging equipment could be sold at the end of the evaluation period.

$$\text{Remnant value} = \text{Acquisition costs} \times \text{Salvage Value Percentage} \times \text{Present Value Factor (for the duration of the Life of the Equipment)} \times \text{Number of Imaging equipment}$$

$$\text{Present value Factor} = 1 / (1 + \text{Discount rate})^{\text{Life of the Equipment}}$$

F. Electricity use

Electricity use of each type of Imaging equipment during the evaluation period (kWh) calculated based on the annual Electricity consumption.

$$\text{Electricity use during product life} = \text{Annual Electricity Consumption} \times \text{Life of the Equipment} \times \text{Number of Imaging equipment}$$

G. CO₂-eq emissions

CO₂ Emissions associated with the operations or usage of the Imaging equipment.

$$CO_{2eq} \text{ emissions} = CO_{2eq} \text{ emissions of the national electricity mix} \times \text{Electricity use}$$

H. Life cycle cost

Total costs of each type of Imaging equipment during the evaluation period. Electricity, Service/Maintenance and Remnant Costs are calculated in net present value.

$$\text{Life cycle costs} = \text{Upfront Costs} + (\text{Electricity costs})_{NPV} + (\text{Service/Maintenance Costs})_{NPV} - (\text{Remnant value})_{NPV}$$

Comparative metrics depicting best option

A. Reference Electricity Saving in comparison to least Acquisition cost Imaging equipment

Highlights Electricity savings compared to the Imaging equipment with the lowest acquisition costs.

$$\text{Reference Electricity Saving} = \text{Electricity consumption of least acquisition cost product} - \text{Electricity consumption of least LCC product}$$

B. Reference Electricity Saving costs in comparison to least Acquisition cost Imaging equipment

Highlights Electricity savings costs compared to the imaging equipment with the lowest acquisition costs.

$$\text{Reference Electricity Saving Costs} = \text{Electricity consumption costs of least acquisition cost product} - \text{Electricity consumption costs of least LCC product}$$

C. Reference Carbon Emissions reduced in comparison to least Acquisition cost Imaging equipment

Highlights carbon emission reductions compared to the Imaging equipment with the lowest acquisition costs.

$$\text{Reference carbon emission reductions} = \text{Carbon emission reductions of least acquisition cost product} - \text{carbon emission reductions of least LCC product}$$

4. LCCA Evaluation Tool

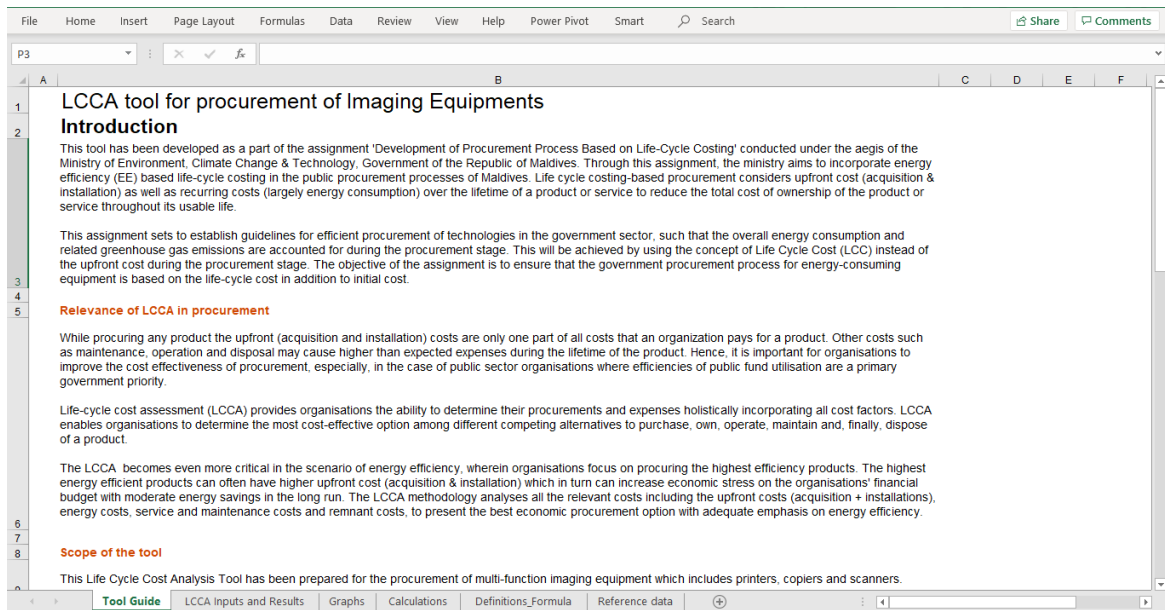
The following sections highlight points on the usage of the LCCA evaluation tool.

4.1. Software requirement and compatibility

The tool is originally developed on Microsoft Excel™ - a spreadsheet-based tool. Please use the following steps to access the tool:

1. Ensure that the Microsoft Excel™ is available on your Computer system.
2. Download the tool files (e.g., Imaging equipments_Tool.xlsx) from the authorised source.
3. Save a copy of the tool files to the desired location on your Computer.
4. Navigate to the saved location and double click to open the tool. The following window should appear -

Figure 2: A snapshot of the tool upon installation



4.2. Structure of the tool

The tool contains six tabs or sub-sheets:

1. **Tool Guide** briefly outlines the guidelines to operate the tool. The tool guide covers the introduction to the assignment, relevance of LCCA in procurement, scope of the tool, structure of the tool and how to use the tool.
2. **LCCA inputs & results**, where the LCCA parameters and information are compiled, and results are presented. The LCCA results are presented for each product offered. The

procurement agency will only interact with this sheet for any data inputs. There is provision to add up to 15 different products for LCCA.

3. **Graphs**, this sheet provides a graphical representation of the LCCA results in the form of bar charts. One analysis in this sheet shows the contribution of each cost category to the total LCC of each type of product included in the tool. Another analysis shows a comparison between the least LCC product and least upfront cost (Acquisition + Installation) product, analysing both the products in terms of costs, electricity use and CO₂ -eq. emissions.
4. **Calculations**, this sheet shows the calculations needed to transform all present and future costs to net present value. Separate calculations have been made for the Electricity costs, Service/Maintenance Costs and Remnant Value.
5. **Definitions & formulas**, this sheet provides definitions for each parameter and formula used in the tool. Procurement authorities will have to make sure to specify in the bid documents the standards and data format to ensure consistency between offers (especially in relation to energy use for the calculation of operation costs).
6. **Reference data**, blank sheet to store any temporary data.

NOTE: The tool needs to keep its precise structure for the formulas and calculations to work. Therefore, it is important to ensure that:

- i. Do not edit the worksheet structure.
- ii. Do not edit formula/delete cells/ rows/ columns. If you do not require data in certain fields, you can hide the unnecessary rows/columns. You can do it by using the [+/-] signs on the left and top margins or in the Format menu.
- iii. Do not add cells/ rows/ columns.
- iv. Input data only in the intended fields.

5. Steps to complete and use the LCCA Tool

Organizations using this tool for the procurement should follow the instructions given below while preparing their bid documents.

5.1. How to use the tool

1. The procuring entity must only interact with the "LCCA Inputs and Results" sheet for all the data inputs.
2. The Procuring entity, must only fill the **white cells** in **section A** and **Section B** of the "LCCA Inputs and Results" tab. The **Dark Grey** cells are calculated automatically based on information from other cells and tabs.
3. All the data entry is to be done by the Procuring entity. The data for **section A** will be provided by the bidder and should be asked in the bid documents. The **section B** data is to be determined by the Procuring entity.

Figure 3: Representation of the LCCA Inputs and Results Sheet

The screenshot shows the 'LCCA Inputs and Results' spreadsheet. It is divided into two main sections: Section A (Data provided by the Bidder) and Section B (Data provided by the Procuring entity).

Section A: Data provided by the Bidder (Rows 5 to 34)

- General Details:** Includes fields for Bidder's Name, Manufacturer, Equipment Name and Model Number, Type of Imaging equipment (B/W or Colour), and Monthly Printing duty cycle of the equipment.
- Economic offer for the contract broken down by:** Includes Acquisition cost (including delivery and any other one-off costs) and Installation cost (including delivery and any other one-off costs).
- Performance Information:** Includes Page yield of the black, blue, yellow, and magenta toner/ink cartridge, and Cartridge costs (including acquisition and installation).
- Electricity Parameters of the equipment:** Includes Active mode, Ready/standby mode, Sleep/Low power mode, and Off mode consumption.

Section B: Data provided by the Procuring entity (Rows 37 to 71)

- Equipment Description:** Includes Reference of the equipment type in tender, Type of Imaging equipment (B/W or Colour), Number of equipment to be provided, and Minimum monthly printing duty cycle of the equipment.
- Basic parameters for the calculations of LCC:** Includes Life of the Equipment, Discount rate, and Salvage value Percentage.

4. The cells have different colour codes for every interaction:

Colour Coding	Description
	The white cells are the input cells for data entry. Please enter relevant values in these cells. Comments are given on the left column in the sheets for guidance.
	The dark grey cells are automatically filled/calculated with data from previously filled cells or are formula based. Please do not edit/alter these cells.
	The light grey cells can be altered by the procuring entity but remain constant for a particular procurement. Certain standard values have been locked in these cells.
	The comment cells on the left column against input fields provide comments and notes for clarity. The procuring entity can refer the text in these cells to know more about the input parameter or result.

5. In the 'comment cell' next to input fields, explanations are provided for the inputs. Detailed information is provided in the "Definitions & Formulas" tab defining the formula and definitions.
6. The section 'C' and Section 'D' of the LCCA Inputs and results sheet, provide results and best procurement option respectively. The details on the output section are given in section 5.2. The following result parameters are available:
 - i. Life Cycle Cost (LCC) of the product
 - ii. Electricity consumption in kWh
 - iii. Cost of electricity consumption in MVR
 - iv. The best option on the basis of least LCC
 - v. CO₂-eq emissions during the product life
 - vi. Electricity Saving (kWh): Least upfront cost product vs Least LCC product
 - vii. Electricity Saving costs (MVR): Least upfront cost product vs Least LCC product
 - viii. Carbon Emissions reduced: Least upfront cost product vs Least LCC product
7. The 'Graph' sheet represents the results and comparative analysis in a bar graph format. The following analysis are covered:

- i. LCCA Results – Covers the representation of consolidated products in terms of costs, energy consumed and carbon emissions.
- ii. Least LCC product vs Least upfront cost (acquisition + installation) product - Presents a comparative analysis of the Lowest LCCA Bid and Lowest Upfront (acquisition + installation) cost bid in terms of costs, energy consumption and carbon emissions.

5.2. Results structure of the tool

The results are presented in the 'LCCA Inputs and Results' sheet with deep dive analysis on product cost trends in 'Graphs' sheet.

5.2.1. LCCA Inputs and Results

The section 'c' of the sheet summarises all the cost factors such as upfront costs, electricity costs, service costs and remnant costs post calculations during the evaluation period in present net value. The section presents LCCA costs of the procurement with respect to product/bidder with the lowest cost highlighted in **Yellow**. The section also highlights Electricity use during the product life and CO₂-eq emissions during the product life.

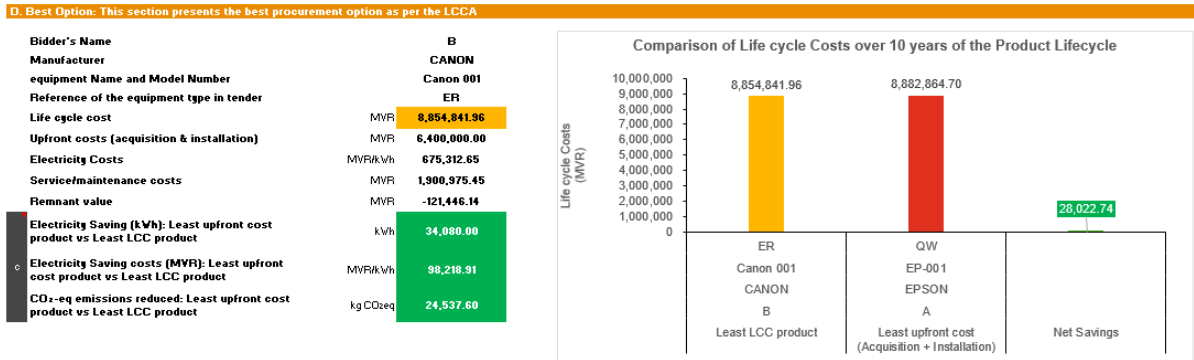
Figure 4: Representation of the section C: LCCA Results

C. LCCA Results (per type of Equipment and in total): This section presents the LCCA results across the products						
Upfront costs (acquisition & installation)	MVR	8,100,000.00	8,400,000.00	8,800,000.00	8,800,000.00	8,900,000.00
Electricity Costs	MVR	773,531.56	675,312.65	662,574.17	649,835.68	646,261.99
Service, printing and maintenance costs	MVR	2,124,396.12	1,900,975.45	1,826,301.89	1,826,301.89	1,826,301.89
Salvage value	MVR	(115,662.99)	(121,446.14)	(125,301.57)	(129,167.00)	(131,084.72)
Life cycle cost	MVR	8,882,864.70	8,854,841.96	8,963,574.49	9,146,900.57	9,241,479.16
Electricity use during the product life	kWh	268,400.00	234,320.00	229,900.00	225,480.00	224,240.00
CO ₂ -eq emissions during the product life	kg CO ₂ eq	193,248.00	168,710.40	165,528.00	162,345.60	161,452.80

The section 'D' of the sheet presents the best procurement option as per the LCCA methodology with three comparative factors:

- i. **Annual Electricity Saving (kWh):** Least upfront cost (acquisition & installation) product vs Least LCC product
- ii. **Annual Electricity Saving costs (MVR):** Least upfront cost (acquisition & installation) product vs Least LCC product
- iii. **Carbon Emissions reduced:** Least upfront cost (acquisition & installation) product vs Least LCC product

Figure 5: Representation of the section D: Best Option



5.2.2. Graphs

The graphs sheet represents the tool results in graphical format. The sheet is segregated into two sections, section A: LCCA Results and section B: Least LCC product vs Least upfront cost (Acquisition + Installation) product comparison.

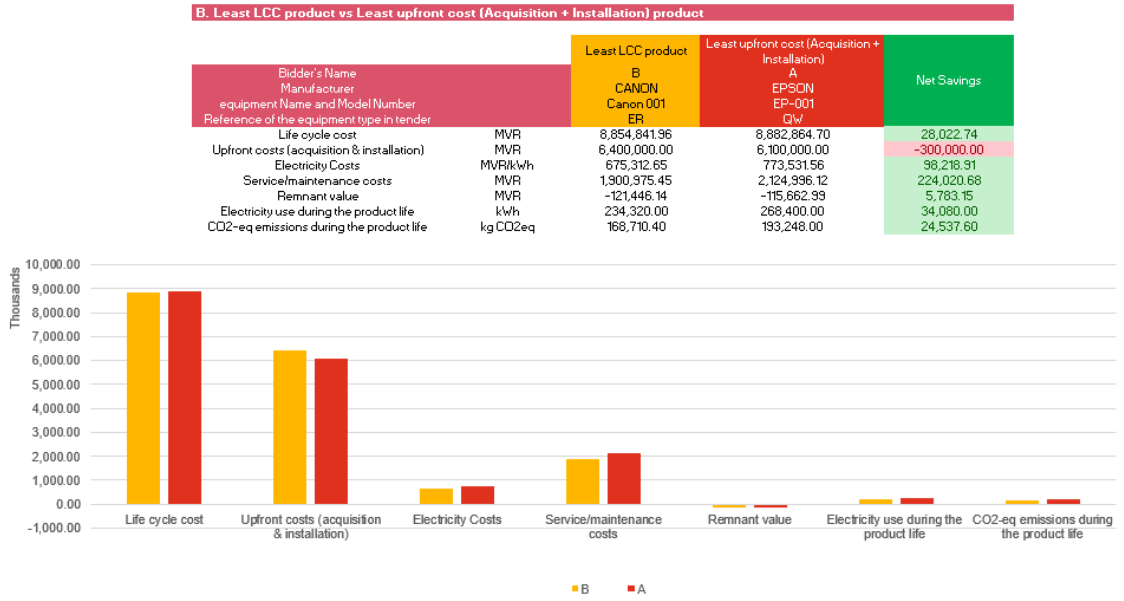
Section A summarises the costs parameters and plots all the results on a bar graph format. The left Y (Vertical) axis in the graph represents the costs in Thousand MVR and the right Y (Vertical) axis in the graph represents the Electricity use and CO₂-eq emissions during the product life as depicted in Figure 6: Representation of the section A: LCCA Results.

Figure 6: Representation of the section A: LCCA Results



Section B presents a comparative analysis between least LCC product vs least upfront cost (acquisition + installation) product, analysing both the bids in terms of costs, electricity use and CO₂-eq emissions. The section also presents net savings (see column) between both the bids marking **Green** for savings and **Red** for losses.

Figure 7: Representation of the section B: Least LCC product vs Least upfront cost (Acquisition + Installation) product



6. Annex 1 – Sample formats to be used in bid document

The procuring entity should include the sections 6.1, 6.2, 6.3 and 6.4 as part of the bid documents.

6.1. Statement of requirement

1.	Number of Imaging equipment to be procured	[provided by procurement entity]
2.	Type of Imaging equipment to be procured	[provided by procurement entity]
3.	Colour printing capability (Black and White or Coloured)	[provided by procurement entity]
4.	Minimum printing duty cycle of the equipment	[provided by procurement entity]

6.2. Evaluation Parameters

The following parameters are fixed for the life-cycle costing assessment

Sr. No.	Parameter	Definition	Value
1.	Life of the Equipment	Number of years over which to calculate and compare life cycle costs of different solutions.	10 ^[3]
2.	Discount rate	The discount rate is used to calculate the present value of future costs.	10% ^[1]
3.	Electricity annual price increase	Average price increase of electricity in the Maldives. It should include all non-recoverable taxes and fees and be adjusted to eliminate the effect of inflation.	2% ^[1]
4.	Salvage value Percentage	Remaining value of the Imaging equipment at the end of life i.e. 10 years.	5% ^[1]
5.	Operational office days per year	Total number of working days for the office.	250 ^[1]
6.	Daily office hours	Total number of working hours for the office.	8 ^[1]

³ The value is considered as a conservative assumption for the particular LCCA based procurement.

Sr. No.	Parameter	Definition	Value
7.	Assumed active utilisation time of the imaging equipment in a day (%)	Estimated duration in a day when the imaging equipment will be in active output mode i.e. when the imaging equipment is being utilised.	20% ^[1]
8.	Assumed ready/on-time of the imaging equipment in a day (%)	Estimated duration in a day in which the equipment is not producing output, has reached operating conditions, has not yet entered into any lower-power modes, and can enter Active State with minimal delay.	60% ^[1]
9.	CO ₂ -eq emissions of the national electricity mix	Grid emission factor.	0.72 ^[4]
10.	% of Annual Prints in black & white and colour	The estimated percentage of prints in black & white and/or in colour that are expected in a year for each machine (unit).	[provided by procurement entity]
11.	Annual maintenance costs	Annual Service/maintenance costs per Imaging equipment could include both labour costs and cost of any equipment and parts required excluding the cartridge costs which are accounted separately.	[provided by procurement entity]
12.	Electricity price	Cost of electricity supply, all taxes and fees included (MVR/kWh). It serves to calculate operation costs linked to the energy consumption of the Imaging equipment.	[provided by procurement entity]

6.3. Form 3: Evaluation Criteria

The bid evaluation criteria will be based on the least cost bid/offer identified by the life cycle costing formula, as provided below:

Life cycle costs = Upfront cost + (Electricity costs)_{NPV} + (Service/Maintenance Costs)_{NPV} – (Remnant value)_{NPV}

Where,

- *Upfront Costs = (Acquisition costs + Installation costs) X Number of Imaging equipment*

⁴ UNFCCC:

https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/29357641_Maldives-BUR1-1-First%20BUR%20of%20Maldives.pdf

- *(Electricity Costs) $_{NPV} = \text{Annual electricity consumption of per unit of Imaging equipment} \times \text{Electricity Price} \times \text{Electricity Present Value Factor} \times \text{Number of Imaging equipment}$*
- *(Service/Maintenance Costs) $_{NPV} = (\text{Annual Printing Costs} + \text{Annual Maintenance Costs}) \times \text{General Present value Factor} \times \text{Number of Imaging equipment}$*
- *(Remnant value) $_{NPV} = \text{Acquisition costs} \times \text{Salvage Value Percentage} \times \text{Present Value Factor (for the duration of the Life of the Equipment)} \times \text{Number of Imaging equipment}$*
- *NPV refers to Net Present Value, calculated by the following formula:*
 - *Net Present Value Factor = $1 / (1 + \text{Discount rate})^{\text{Life of the Equipment}}$*

6.4. Form 4: Bidder technical details submission form

This form should be filled and submitted by the bidder. No changes should be made to the format.

Sr. No.	Parameter	Value
1.	Bidder's Name	
2.	Name of the Imaging equipment manufacturer	
3.	Imaging equipment Name and Model Number	
4.	Type of Imaging equipment per the bid requirement	
5.	Acquisition costs Cost per unit for the acquisition of the Imaging equipment by the Procuring entity based on all requirements set in the bid documents.	
6.	Installation costs Cost per unit for the delivery, installation and any other cost at the start of the contract based on all requirements set in the bid documents. Leave blank if they are included as part of the acquisition cost.	
7.	Printing duty cycle of the equipment	
8.	Cost of the black toner / ink cartridge	
9.	Cost of the blue toner / ink cartridge	
10.	Cost of the yellow toner / ink cartridge	
11.	Cost of the magenta toner / ink cartridge	
12.	Page yield of the black toner / ink cartridge	

Sr. No.	Parameter	Value
13.	Page yield of the blue toner / ink cartridge	
14.	Page yield of the yellow toner / ink cartridge	
15.	Page yield of the magenta toner / ink cartridge	
16.	Electricity Consumption in Active mode	
17.	Electricity Consumption in Ready/Standby/on mode	
18.	Electricity Consumption in Sleep/Low power mode	
19.	Electricity Consumption in Off mode	

The following documents must be submitted by the bidder while submitting the bid response:

1. Declaration of conformance as provided in section 7.
2. Product catalogue including product model number.
3. Signed and sealed 'Form 4: Bidder technical details submission form' refer section 6.4.

7. Annex 2 – Declaration of conformance

(This declaration letter for conformance is to be submitted by the Bidder along with the Proposal.)

Date:

Place:

[Address of the procuring entity]

Dear Madam/Sir,

Sub: Invitation of Request for Proposal for providing _____

We hereby confirm the following:

1. The Proposal is being submitted by _____ (Name of the Bidder) who is the Bidder in accordance with the conditions stipulated in the RfP.
2. We have examined in detail and have understood and abide by; all the terms and conditions stipulated in the RfP document issued by _____ (Name of procuring entity) and in any subsequent communication sent by _____ (Name of procuring entity).
3. The product information provided against this procurement is as per the requirements of the RfP document and standards mentioned therein to the best of our knowledge and as per the original specification provided by the manufacturer.
4. We would be solely responsible for any errors or omissions in our Proposal.

For and on behalf of :

Signature :

(Authorised Signatory)

Name of the Person :

Designation :