Low Carbon Operating System Platform User Guide

Version 1.0- March 2023

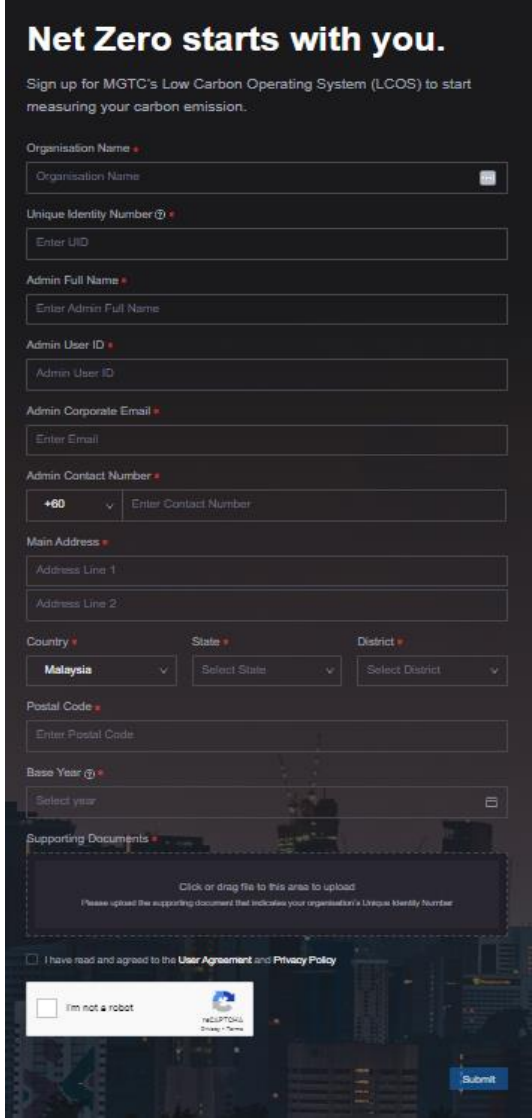
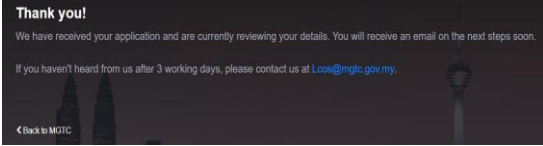# Table of Contents

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1.0 What is MGTC LCOS?

LCOS also known as the ***Low Carbon Operating System*** is an Artificial Intelligence of Things (AIoT) operating system designed by Envision Digital for the Malaysian Green Technology and Climate Change Corporation (MGTC) under the flagship of the Ministry of Natural Resources, Environment and Climate Change to enable enterprises and cities to accelerate their digital transformation agendas via green growth, climate change mitigations and green lifestyle. Built on open standards and cutting-edge technology, its design incorporates Envision Group's best practices and expertise based on vertical domains such as renewables comprising solar & wind, cities, buildings, smart grid, and more, ensuring extensive connectivity while operating in a secured and open ecosystem to benefit organizations efficiency and innovate thus develop their ecosystems in an agile manner.

The Low Carbon OS platform is responsible and committed to provide a state of the art Carbon Management platform for Malaysian corporations, Small-Medium Enterprises (SME) to encourage and embark them into the Net-Zero 2050 direction aligning with the 2015 Paris Agreement and global Sustainability Development Goals (SDGs) . The launch of the Low Carbon OS with Envision Digital will eventually democratize access to Carbon Management Capabilitites that includes Green House Gas (GHG) categorized under Scope 1, 2 and 3 emissions.
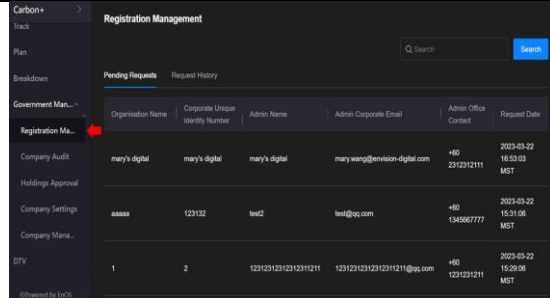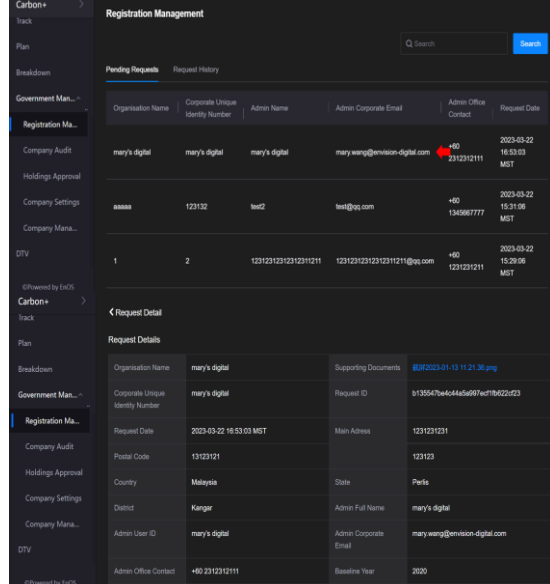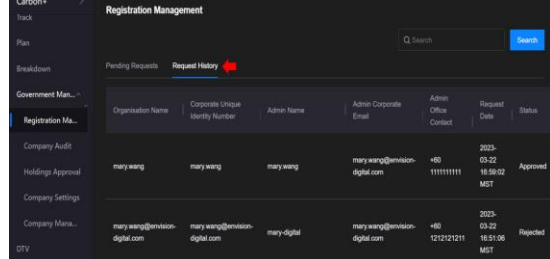

2.0 Registration

Screenshot	Steps

Registration page
 	
Net Zero starts with you.
Sign up for MGTC's Low Carbon Operating System (LCOS) to start measuring your carbon emission.
 	
Organisation Name *
[Organisation Name]
 	
Unique Identity Number ⓘ *
[Enter UID]
 	
Admin Full Name *
[Enter Admin Full Name]
 	
Admin User ID *
[Admin User ID]
 	
Admin Corporate Email *
[Enter Email]
 	
Admin Contact Number *
[+60 v] [Enter Contact Number]
 	
Main Address *
[Address Line 1]
[Address Line 2]
 	
Country * State * District *
[Malaysia v] [Select State v] [Select District v]
 	
Postal Code *
[Enter Postal Code]
 	
Base Year ⓘ *
[Select year]
 	
Supporting Documents *
Click or drag file to this area to upload
Please upload the supporting document that indicates your organisation's Unique Identity Number
 	
☐ I have read and agreed to the **User Agreement** and **Privacy Policy**
 	
☐ I'm not a robot reCAPTCHA
 	
[Submit]
	1. User goes to Registration page via URL: https://www.lcossignup.mgtc.gov.my
	2. Enter the following information fields (mandatory fields are indicated with *):
	   a. Organisation Name*
	   b. Unique Identity Number*
	   c. Admin Full Name*
	   d. Admin User ID*
	   e. Admin Corporate Email*
	   f. Admin Contact Number*
	   g. Main Address*
	   h. Country, State, District*
	   i. Postal Code*
	   j. Base Year*
	   k. Supporting Documents*
	   l. Agree to the MGTC User Agreement and Privacy Policy*
	   m. Complete the security captcha*
	3. Click Submit

Screenshot	Steps
Completed Registration **Thank you!** We have received your application and are currently reviewing your details. You will receive an email on the next steps soon. If you haven't heard from us after 3 working days, please contact us at Lcos@mgtc.gov.my. ‹ Back to MGTC	4. After successful registration, MGTC will review the application and inform the results to the user via email.

2.1 Registration Management

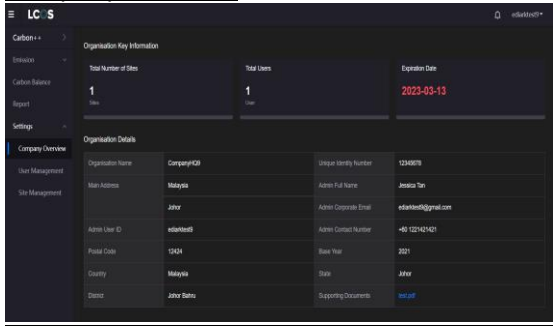| Screenshot	Steps
	1. To see the registration management, select "Registration Management" on left menu. 2. Search for the relevant organisational entity which are pending requests.
	3. Upon clicking on the organisational entity, more details will be displayed in a new page.
	4. To view the request history, select the "Request History" tab and the list of approved and rejected applications.

3.0 Login for First-Time User

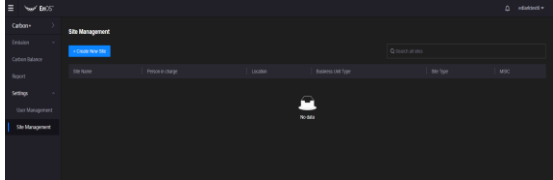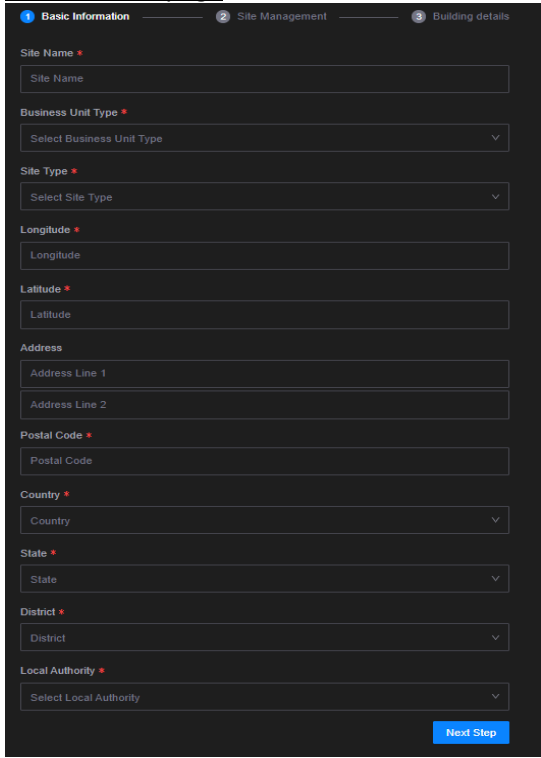| Screenshot	Steps
Email from MGTC Your LCOS application has been approved Inbox × Lcos@mgtc.gov.my to me ▾ You will receive another email from EnOS (operator@global.envisioniot.com) to create your account password. If you do not receive the email, please check your junk mail folder or contact your IT administrator. Once you have created your password, you can login to LCOS via https://lcos.mgtc.gov.my If you face any issues, please contact us at Lcos@mgtc.gov.my. **Email from EnOS** [EnOS] Welcome to EnOS! Inbox × EnOS <operator@global.envisioniot.com> to me ▾ Dear User, We are glad to inform you that your App Portal account has been created. Your account ediarktest9 Please click the link below to enter the system and set your password. To ensure your account security, please set your password within 24 hours. https://app-portal-eu2.envisioniot.com/init-user?token=FUy9tzwermNwLQNDsg4YpFGvwLwgE8K3 Thank you! EnOS, Envision Digital **Welcome!** User ediarktest6 Email ediarktest6@gmail.com * Set Password: [••••••••] * Confirm Password: [••••••••] [Submit] **Login page** https://lcos.mgtc.gov.my	1. After MGTC has approved the account creation, user will receive two emails. One from MGTC to inform the results of account creation. Another from EnOS with the account creation details to login the account for the first time to create password using the URL in the email within 24 hours. 2. After password has been set successfully, user can login with the account via the URL: https://lcos.mgtc.gov.my 3. The trial period is 14 days. During trial period, user account can only create up to 3 sites. After MGTC receives payment, the account will be extended for a year.

6

4.0 Company Overview

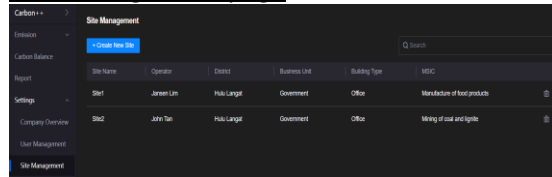| Screenshot	Steps

<u>Company Overview</u>
 	
	1. Under Company Overview page, users can see the company information that is used during registration:
	    a. Total Number of Sites
	    b. Total Users
	    c. Expiration Date
	        i. Newly created account has a trial period of 14 days. After making payment to MGTC, the account can be extended.
	    d. Organisation Name
	    e. Unique Identity Number
	    f. Main Address
	    g. Admin Full Name
	    h. Admin Corporate Email
	    i. Admin User ID
	    j. Admin Contact Number
	    k. Postal Code
	    l. Base Year
	    m. Country
	    n. State
	    o. District
	    p. Supporting Documents

4.1 Site Creation for Company

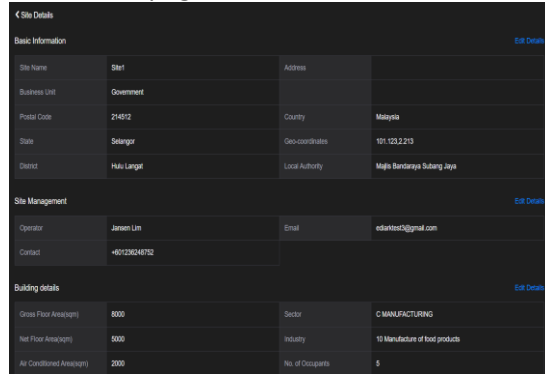| Screenshot	Steps

Site Management page
 	
Site Creation page
 	
	1. To add sites within the same organisation, click Site Management under the Settings menu.
	2. Click Create New Site button to create new site.
	3. Enter the following information fields (mandatory fields are indicated with *):
	   a. Site Name*
	   b. Business Unit*
	   c. Longitude*
	   d. Latitude*
	   e. Address*
	   f. Postal Code*
	   g. Country*
	   h. State*
	   i. District*
	   j. Local Authority*
	   k. Office Contact*
	   l. Operator*
	   m. Gross Floor Area (sqm)*
	   n. Net Floor Area (sqm)*
	   o. Air Conditioned Area (sqm)*
	   p. No. of Occupancy
	   q. HVAC System Type
	   r. Industry Sector
	   s. Site Establishment Year
	   t. Building Type
	   u. Electricity Tariff
	   v. Age of Building
	   w. Operating Hours
	   x. Certified Energy Manager
	   y. EMGS Certification Level
	   z. Click Create New Site button
	4. Note: During the trial period, user can create up to 3 sites only.
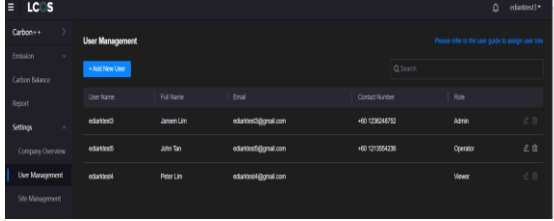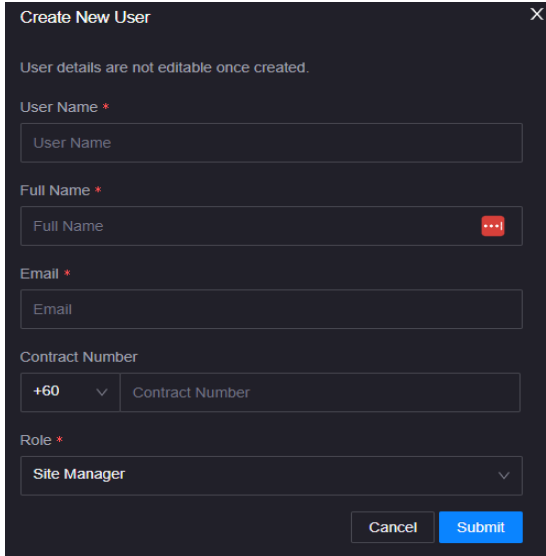
4.2 Edit Site Information

Screenshot	Steps

Site Management page

Site Details page

Site Details page – Edit site information

1. Under the site management page it list down the sites that the company has created.
2. Click the site name to see the site details.
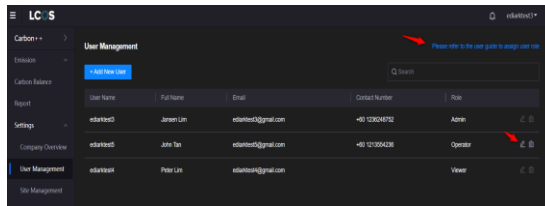3. Click Edit Details to edit the site information.

4.3 User Creation for Company

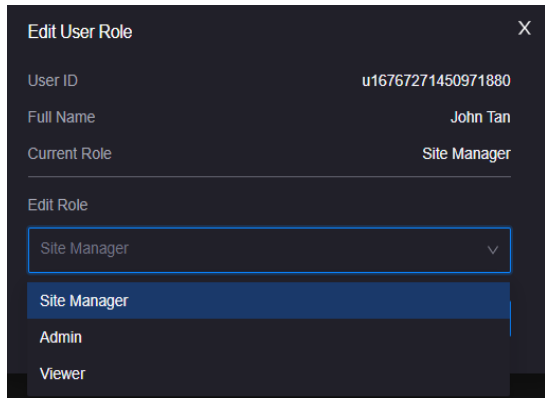| Screenshot	Steps

User Management page
 	
Create New User
 	
	1. Under Settings menu, click User Management.
	2. Click Add New User button to create new user.
	3. Enter the following information fields (mandatory fields are indicated with *):
	   a. User Name*
	   b. Full Name*
	   c. Email*
	   d. Contact Number
	   e. Role*
	     i. Admin (only 1 per company) Allows user to manage administrative matters.
	     ii. Operator (1 for each site created) Allows data entry, data removal and control.
	     iii. Viewer (only 1 viewer) Allows sharing the account for everyone to see the company dashboard and information but not able to make any changes.
	4. Click Submit and user will receive an email from EnOS to create his password.

4.4 Edit User Role

Screenshot	Steps

Edit User Role
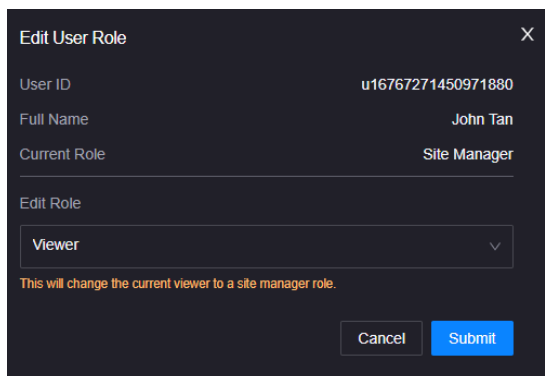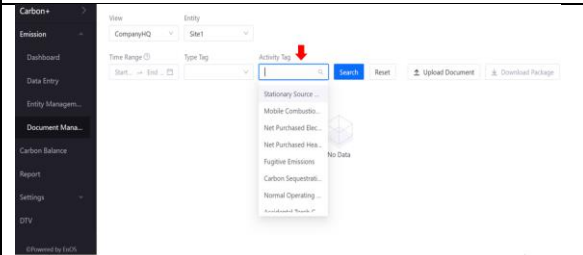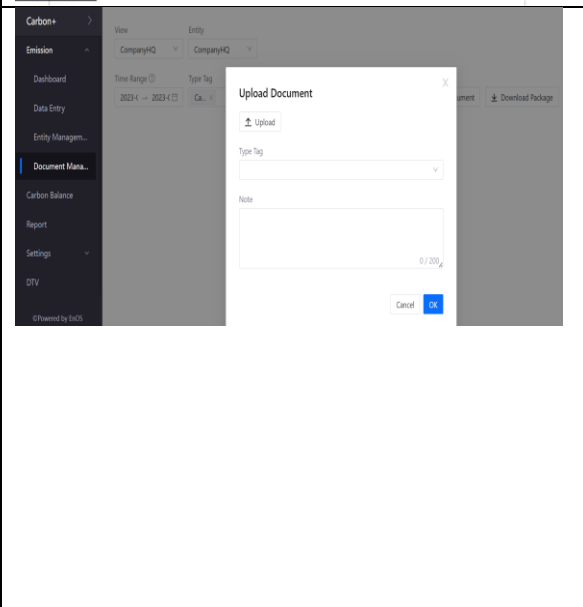
1. Under Settings menu, click User Management.
2. Click the Pencil icon on the user with Operator role. Only user with Operator role can be edited.
3. User can choose from three roles for the user: Operator, Admin, Viewer.
   a. There can only be 1 admin and 1 viewer role assigned. If a user changes the role to Viewer or Admin, the existing user that has the role Viewer or Admin will be automatically changed to Operator role.

Note: User can click on the "Please refer to the user guide to assign user role" link to download the user guide for changing role.
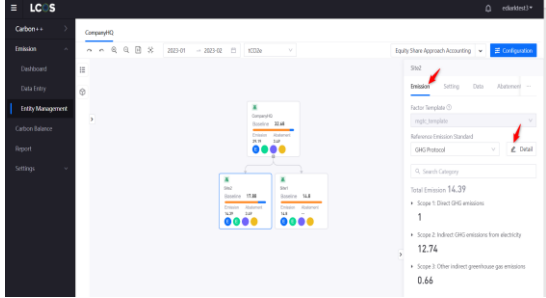
5.0 Document Management
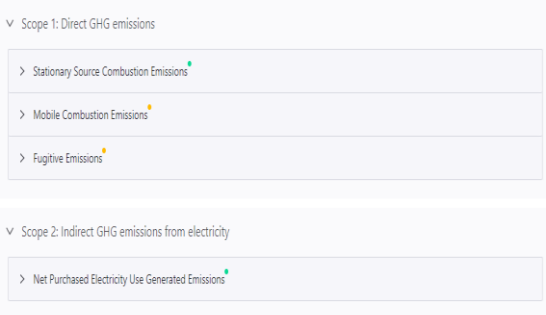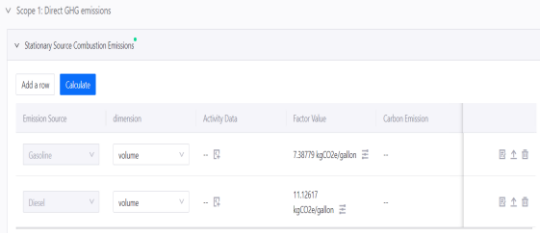
Screenshot	Steps
	1. To see the document management, select "Document Management" on left menu. 2. Select the relevant organisational entity. Note: This is the feature which the user can attach a reference document for the data entry column
	3. Select the time range which document belongs to – e.g., carbon inventory report for 2022 January to 2022 December.

	4. Select most relevant document type under the type tag. Multiple types can be selected if document falls into one or more of the following categories:
	   a. Carbon inventory report – Document to quantify in detail an organization's GHG emissions or carbon footprint, broken down by geographies, source and time period.
	   b. Carbon verification report – Document that provides independent verification of the organization's GHG emissions. Includes methodology used to calculate emissions and offsetting measures.
	   c. Carbon emissions certificate – Certificates to verify the quantity of emissions produced by the organization, validated by external verifiers.

	d. Carbon neutralization certificate – Certificates to verify whether the organization is carbon neutral, e.g., PAS2060. e. Enterprise information files - introduction of enterprise, the main industrial process of enterprise. f. User authorization files - includes the Data Confidentiality Agreement etc. g. Inventory data files - used to verify the emission data, e.g. emission factor sources and calculation methodology h. Abatement related files - for abatement data, such as the electricity bills.
	5. Select the tag most relevant to the activity information from the document. Please refer to annex A for more explanation on the respective activity types. 6. Select Search to filter out the document.
	7. To upload document, click on "Upload Document" and a pop up will appear. 8. Click on upload and select the file to upload. 9. After uploading the document, select the document type under the type of tag. 10. Depending on the type selected, different prompts will appear for the user to input information. (e.g., boundary of emissions – whether the emissions fall within the organisation's control, verification agency involved in verifying emissions) 11. Additional information can be included in the notes (200-word limit).
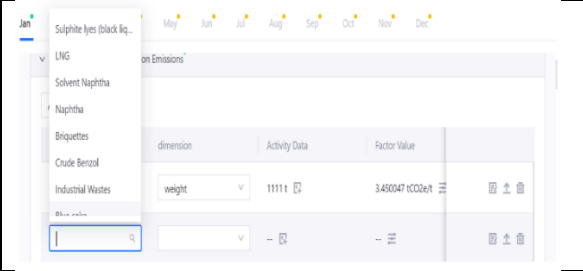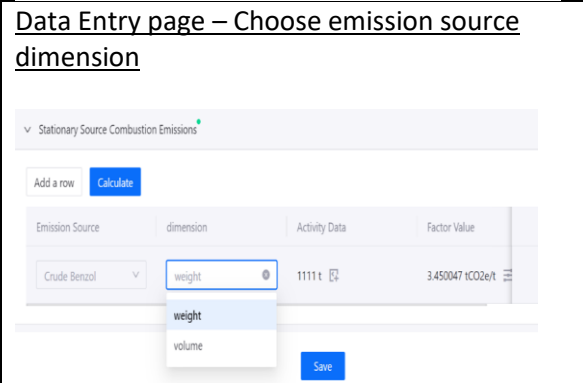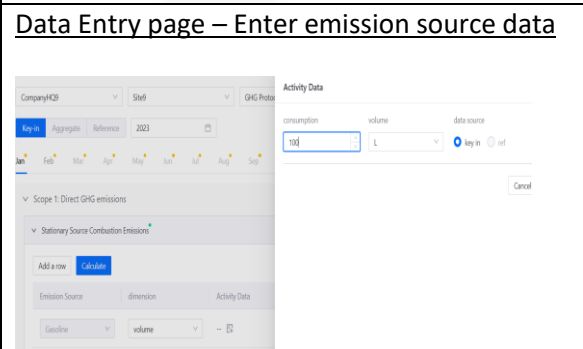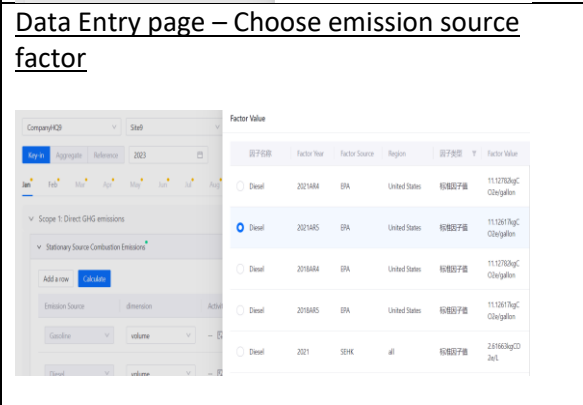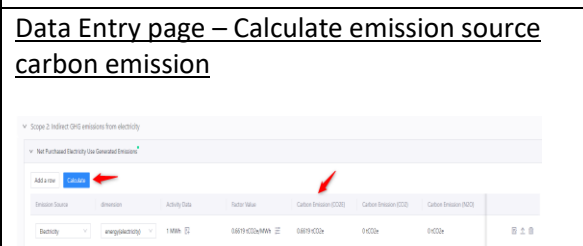
Upload

report1651041770749.xls

Type Tag

Carbon Inventory Report ∨

Boundary

Verification Agency

Note

0 / 200

Cancel   OK

Upload

report1651041770749.xls

Type Tag

Inventory Data Files ∨

Activity Tag

∨

Note

0 / 200

Cancel   OK

12. Select download package to download the documents

6.0 Recording Carbon Emission Data for Company and Sites

Screenshot	Steps
Entity Management page 	1. Click Entity Management menu to see the overall company hierarchy and sites. 2. Select the site and a menu will appear on the right side of the page. 3. Under "Emission" tab, click "Detail" button and a new browser tab for "Data Entry" page will appear for user to enter carbon emission data.

Data Entry page – Select site
 	
If company is selected:
 	
	4. User can select the following information
	   a. Select Company
	   b. Select Site
	   c. Note: If company is selected, the "Aggregate" value will be shown. This shows the total aggregated values from all sites on the company level. The values are not editable.
	   d. Carbon reporting framework (GHG Protocol)

Data Entry page – Select year and month
 	
	e. Under the key-in option,
	   a. Select year
	   b. Select month for data input
	
	Remarks: Green dots on the month represent there are existing data. Orange dots represent there are no existing data.

Data Entry page – Select emission scope 	5. Select scope of emissions based on emission type. Overview of scope definitions: **Scope 1** - covers direct emissions from owned or controlled sources (e.g., Fuel

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	combustion Company vehicles, Fugitive emissions). **Scope 2** - covers indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting company.
	Scope 3 - includes all other indirect emissions that occur in a company's value chain (e.g., Purchased goods and services, business travel, employee commute, products sold, leased assets and franchises).
Data Entry page – Select emission categories	6. Select emission categories based on scope. <u>Remarks</u>: Green dots on the emission categories represent there are existing data. Orange dots represent there are no existing data.

Data Entry page – Add emission source	7. Under the emission categories, predefined template has been added for the following Scope 1 and 2 emission sources:
	 a. Scope 1 – Stationary Source Combustion Emissions:
	    i. Emission Source: Gasoline
	    ii. Dimension: Volume
	    iii. Factor Value: EPA 2021AR5
	
	    iv. Emission Source: Diesel
	    v. Dimension: Volume
	    vi. Factor Value: EPA 2021AR5
	
	 b. Scope 1 – Mobile Combustion Emissions:
	    i. Emission Source: Gasoline Passenger Cars

	ii. Dimension: Volume
	   iii. Factor Value: EPA 2021AR5
	
	   iv. Emission Source: Diesel Passenger Cars
	    v. Dimension: Volume
	   vi. Factor Value: EPA 2021AR5
	
	c. Scope 2 – Net Purchased Electricity Use Generated Emissions:
	    i. Emission Source: Electricity
	   ii. Dimension: Energy(electricity)
	   iii. Factor Value: Malaysia Grid Emission Factor depending on your state (Peninsular/Sabah/Sarawak)
	
	d. Scope 2 – Net Purchased Heat Use Generated Emissions:
	    i. Emission Source: Heat
	   ii. Dimension: Energy(heat)
	   iii. Factor Value: EPA 2021 AR5
	
	   iv. Emission Source: Steam
	    v. Dimension: Energy(heat)
	Factor Value: EPA 2021AR5

<u>Data Entry page – Select emission source outside of predefined template</u>	8. If additional emission source needs to be added, user can click "Add a row" to add another emission source and select the dimension and factor value. 9. Click on the emission source and input the emission source relevant to your operations.

Data Entry page – Choose emission source dimension	10. Based on the emission source selected, the relevant dimensions and input selections will be displayed in the dropdown and icons (Refer to "Annex A - Data Input Guide" for more details on collecting the information for the various emission source).
Data Entry page – Enter emission source data	11. Please click on the icon under activity data to key in the inputs. Consumption refers to quantity/level of activity, with the respective metric presented based on your dimension selection. In this case, metrics for weight are displayed as the weight dimension was selected.
Data Entry page – Choose emission source factor	12. Under factor value, please select the IPCC emission factors that best fits your organisation. Refer to "Annex A - Data Input Guide" for more details on selecting the relevant emission factors for your company operations.
Data Entry page – Calculate emission source carbon emission	13. After completing the data entry for the emission source, user has to click the Calculate button for the system to calculate the total carbon emission for the emission source. The results can be seen in the column Carbon Emission.

Screenshot	Steps
Data Entry page – Save the records 	14. Click Save button to save the inputs. Note: After clicking Save, the system will only save the data. User has to trigger a carbon accounting run (refer to next step) for the system to calculate and update the carbon emission for the company and site.
Entity Management page – Run carbon accounting 	15. After saving the inputs, user can close the browser tab and go back to the Entity Management page to trigger a run with the selected carbon accounting approach to calculate the sites carbon emissions. Each site carbon emission records will aggregate up to the company total carbon emission records. Note: The definition for equity share or other control can be located in the GHG protocol publication (Link). For LCOS, we only support equity share at this stage. We will enhance LCOS with other calculation methods in the future release.
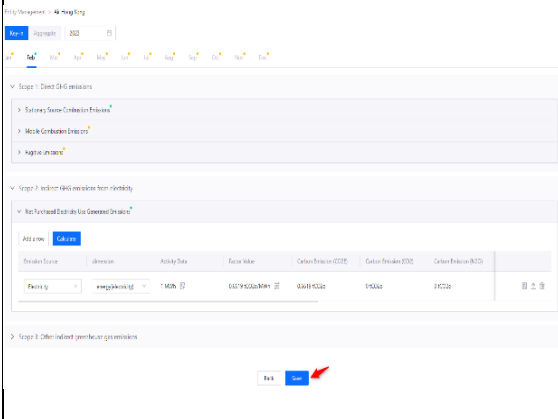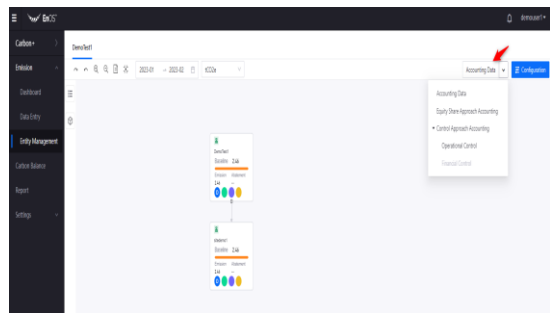
6.1 Recording Carbon Emission Data via excel upload
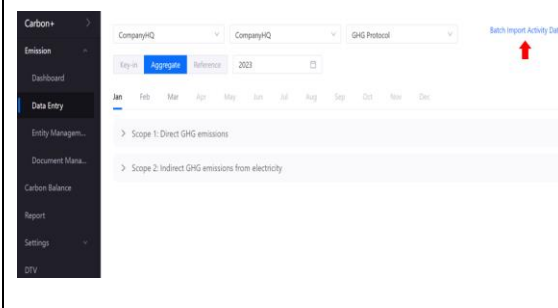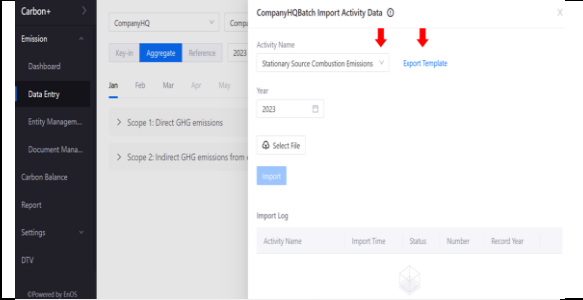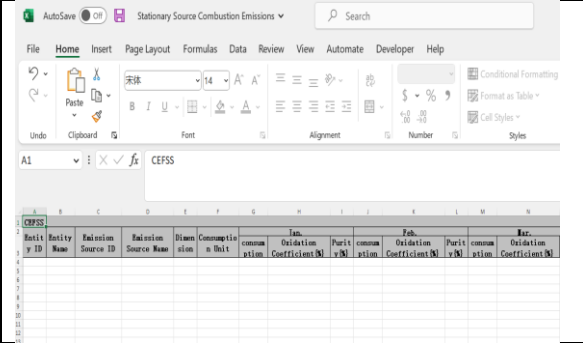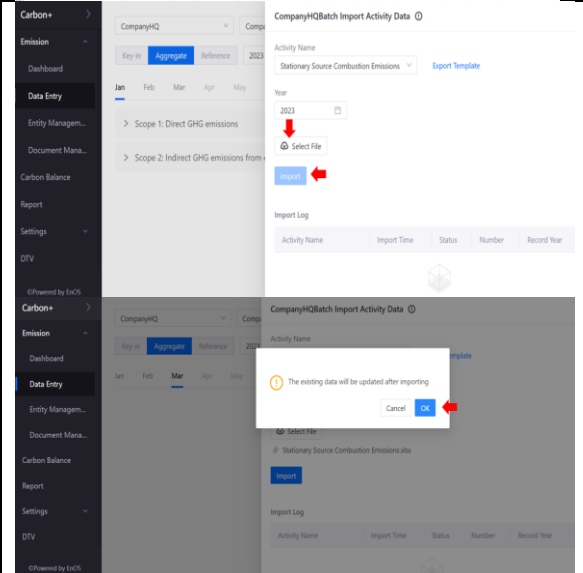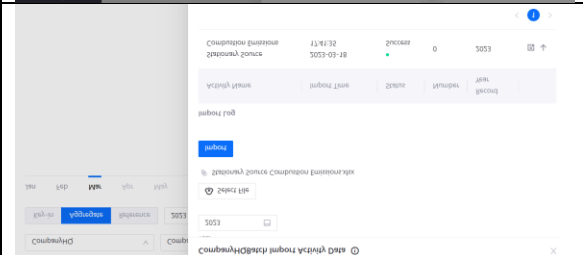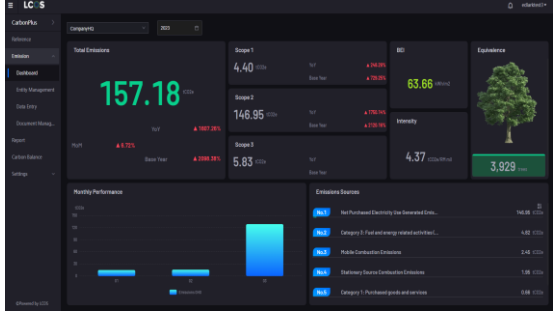
Screenshot	Steps
Data Entry page 	1. Select data entry menu to view data input options 2. Click on "Batch Import Activity Data" to download data input template

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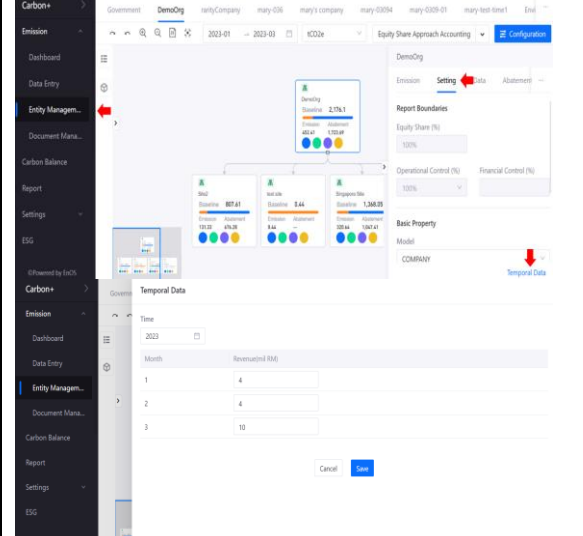
	3. Select the relevant activity type 4. Select relevant year for activity year (refer to annex A for more explanation on various activities) 5. Click on "Export Template" to download the excel template
	6. After downloading the file, populate the tabs using the activity data collected. 7. The tabs to be populated include the activity data from January to December - Column G onwards. Columns A to F would be pre-defined upon download.
	8. To upload the excel, click on select file and locate the completed template in the file directory. 9. After selecting the file, click on import to upload the file onto the web portal. 10. Click on "OK".
	11. Upon uploading, the import status will be displayed under the import log. A green icon will be displayed if the file is successfully uploaded.

7.0 Dashboard
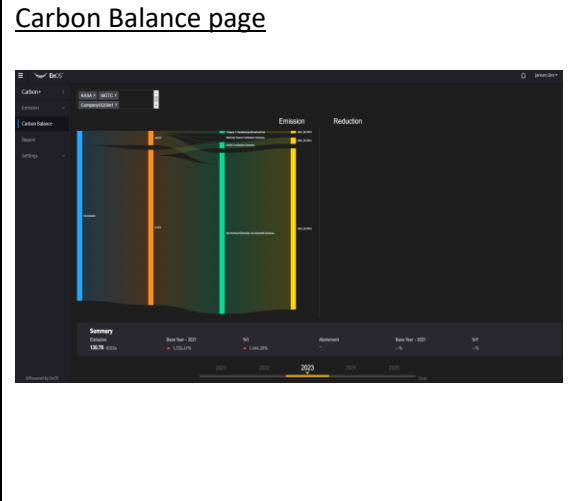
Screenshot	Steps

Dashboard page
 	
	1. To see the overall company key performance metrics, user can click the Dashboard menu.
	2. Select the Company or Site and year to see these Key Performance Metrics on the dashboard:
	    a. Total Emissions (Scope 1, 2 and 3)
	       i. Month-on-Month (MoM) % comparison
	          1. Comparison between the previous month and month before previous month. For example, this month is April, this MoM will compare between March and February.
	      ii. Year-on-Year (YoY) % comparison
	      iii. Base year % comparison
	    b. Scope 1,2 and 3 individual emissions
	      i. Year-on-Year (YoY) % comparison
	      ii. Base year % comparison
	    c. Equivalence (Total emissions equivalent to number of trees: 1 tree = 0.04 tCO2e)
	    d. Emissions Sources Ranking
	    e. Abatement Initiatives Ranking
	    f. Intensity
	      i. Total Carbon Emissions (tCO2e)/ Revenue (RM mil)
	    g. Building Energy Intensity (BEI)

<table>
<tr><td></td><td>i. Purchased Electricity (kWh) / Gross Floor Area (m2)

h. Total Carbon Emission Monthly Performance</td></tr>
</table>

22

8.0 Revenue entry

Screenshot	Steps
	1. To key in revenue, select the "Entity Management" tab on the left menu. 2. Select the company to key in revenue. 3. Under "Setting", click on "Temporal Data". 4. Under the Temporal Data page, select the time period and key in the revenue for the respective months (in million RM)

9.0 Carbon Balance

Screenshot	Steps
Carbon Balance page 	1. The Carbon Balance page allows user to have an overview of the breakdown in carbon emission and reduction across its sites and emission scopes.

Carbon Balance page - Selection of sites **Carbon Balance page - Selection year** 	2. User can select one or multiple sites that belong to its company. 3. User can select the time period (year) data.
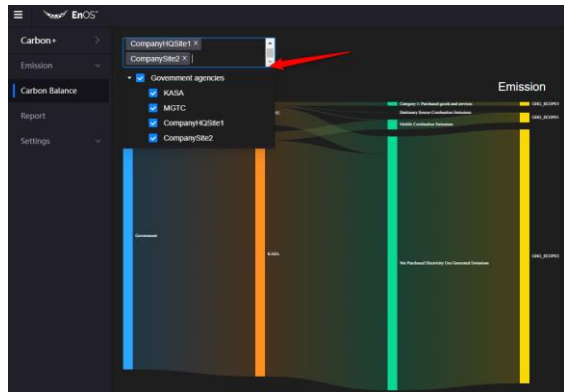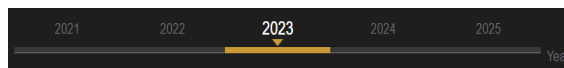
Carbon Balance page – Breakdown of sites emissions
 	
	4. The breakdown of the carbon emission information from left to right is as follows:
	
	   a. Business Unit, site, total emissions of that site
	   b. Site, emission category and total emissions of that category
	   c. Emission category, emission scope and total emissions across sites for that emission scope
	   d. Emission scope and total emissions across sites for that emission scope

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Screenshot	Steps

Carbon Balance page – Summary
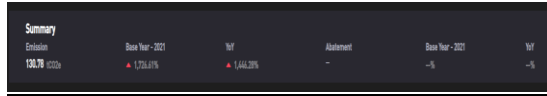 	
Summary
Emission Base Year – 2021 YoY Abatement Base Year – 2021 YoY
130.78 tCO2e ▲ 1,726.61% ▲ 1,444.28% – –% –%
	5. Summary section provides the following summary information across the sites selected:
	   a. Emission: Total carbon emission
	   b. Base Year: Comparison % of selected year against company base year
	   c. YoY: Year-on-year % comparison of selected year against previous year

10.0 Report Generation
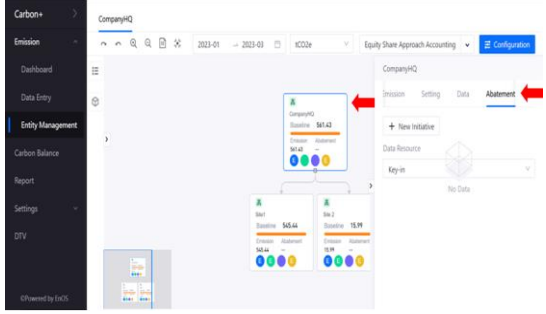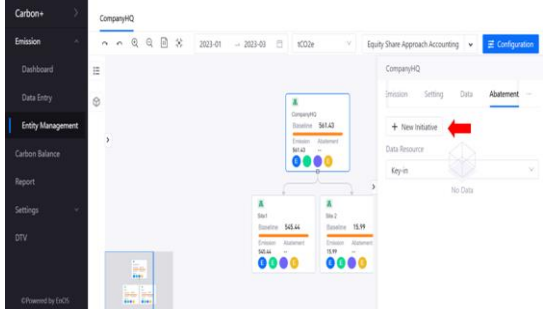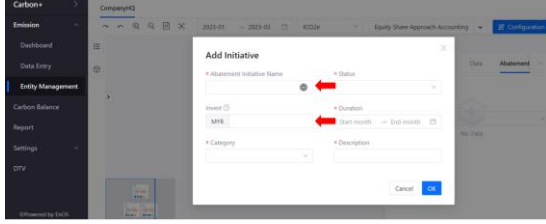
Screenshot	Steps
Report Download page LCOS CarbonPlus Reference 2020 Emission Template Name Operation Report Company GHG Inventory Report ⬇ Download Carbon Balance Settings	1. The Report page allows user to generate a report for its company based on the GHG inventory report template. 2. Click on Report. 3. Select the year. 4. Click Download button. 5. The report will be downloaded in Microsoft Word Document format and some sections of the report will be filled up with data that are already entered in the system.
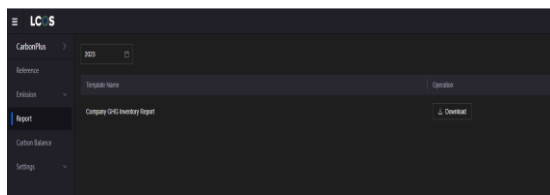
11.0 Abatement

Screenshot	Steps
<u>Entity Management page</u> 	1. Click Entity Management menu to see the overall company hierarchy and sites. 2. Select the site and a menu will appear on the right side of the page. 3. Click on the abatement tab.
	4. Under abatement tab, click on "New initiative" to add in abatement measures
	5. A pop-up will appear for the initiative, with the required inputs listed. 6. Key in the name of the initiative and invested amount in MYR (if the sum available)
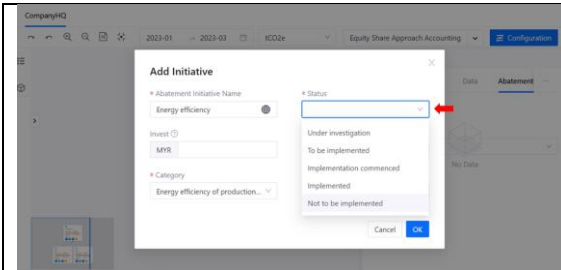
7. Under status, please select the option most relevant to the abatement initiative:

   a. Under investigation: A potential initiative to reduce emissions that is being evaluated but not yet approved by your company during the reporting year.

   b. To be implemented: An initiative to reduce emissions that has been approved for implementation by your company but its implementation has not yet commenced during the reporting year.

   c. Implementation commenced: An initiative to reduce emissions was started/activated in the reporting year, but by the end of the reporting period it was not yet fully active/functional in realizing emissions reductions.

   d. Implemented: An initiative that has fully come into effect in the reporting year e.g., it has become fully operational/functional in realizing CO2e savings.

   e. Not to be implemented: A potential initiative to reduce emissions that was evaluated but not pursued by your company during the reporting year
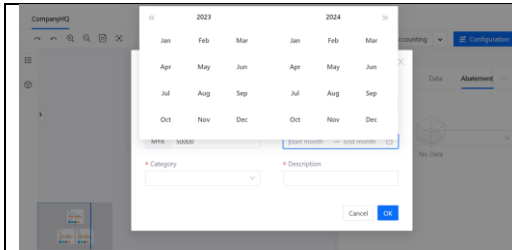
8. Select abatement duration from the starting month/year to ending month/year
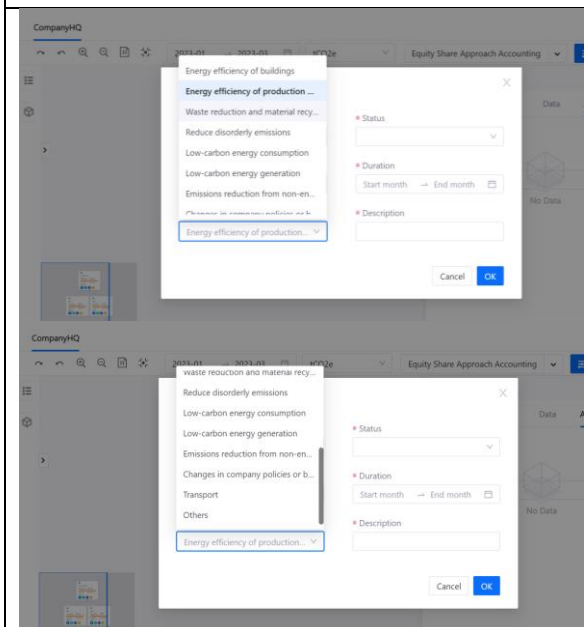
9. Under category, select the category most relevant to abatement initiative:
    a. Energy efficiency in buildings – Select this option for all energy efficiency initiatives relating to buildings, including those relating to the building fabric (e.g. insulation, draught-proofing, etc.) and those relating to building services (e.g. HVAC, BEMS etc.)
    b. Energy efficiency in production processes – Select this option for all energy efficiency initiatives relating to processes (e.g. waste heat recovery, process optimization, compressed air, combined heat and power, automation, smart control systems, product/service design to improve energy efficiency etc.)
    c. Waste reduction and material circularity – Select this option for circular economy and waste reduction initiatives (e.g. reuse, recycling,

	remanufacturing, product/service design to reduce waste etc.). d. Fugitive emissions reductions – Select this option for initiatives to reduce fugitive emissions (e.g. methane capture, agricultural nitrous oxide reductions, refrigerant leakage reduction etc.) e. Low-carbon energy consumption – Select this option for emissions reduction initiatives relating to increasing low-carbon energy consumption i.e. energy from renewable sources, nuclear plants and fossil-fuel plants fitted with carbon capture and storage. f. Low-carbon energy generation – Select this option for initiatives relating to the installation of low-carbon energy generating facilities (renewable, nuclear or fossil-fuel plants fitted with carbon capture and storage) at your own site or at others on behalf of your clients. g. Non-energy industrial process emissions reductions – Select this option only for initiatives to reduce emissions from industrial production processes which chemically or physically transform materials (e.g. CO_2 from the calcinations step in cement manufacturing, CO_2 from catalytic cracking in petrochemical

<table>
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h. processing, PFC emissions from aluminum smelting etc.)

i. Company policy or behavioral change – Select this option for initiatives relating to a change in company policy (e.g. value chain engagement, a new procurement policy) or an organizational behavioral change (e.g. resource efficiency improvements such as reducing paper use, waste management improvements such as reducing food waste etc.). Note that changes in company transportation policies should not be reported here but under the initiative category "Transportation"

j. Transportation – Select this option for initiatives relating to employee travel and commuting and the company fleet.

k. Other, please specify – If none of the listed categories are applicable to your initiative, select this option and specify the initiative.
</td>
</tr>
</table>

	10. After selecting abatement category, add in description (if relevant) and click "OK".
	11. After clicking OK, link to respective category of emissions being abated by clicking on the link icon.
	12. Select relevant emission category based on the site emission scope and type.
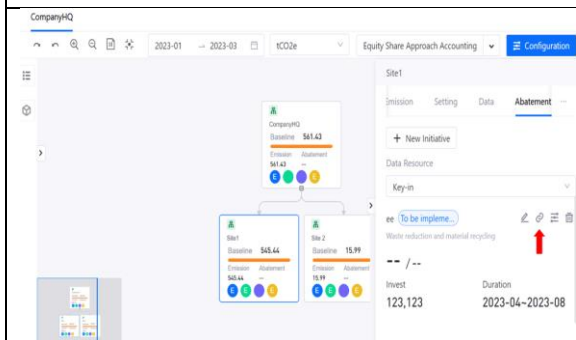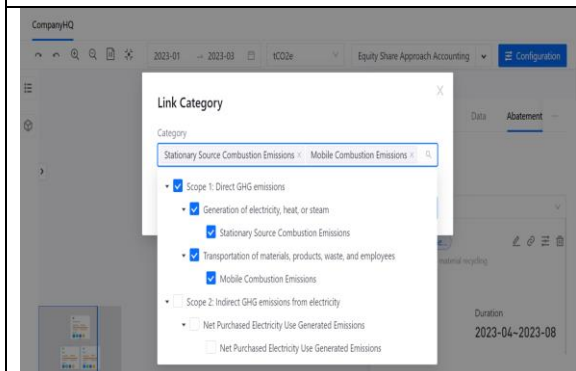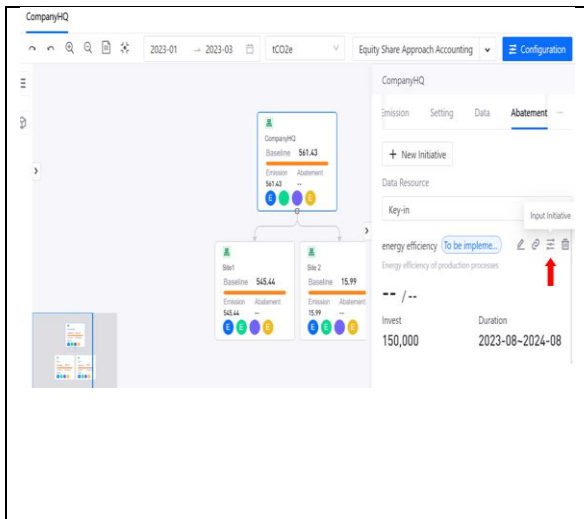
	13. Proceed to keying in estimated and actual abatement by clicking on the initiative input.
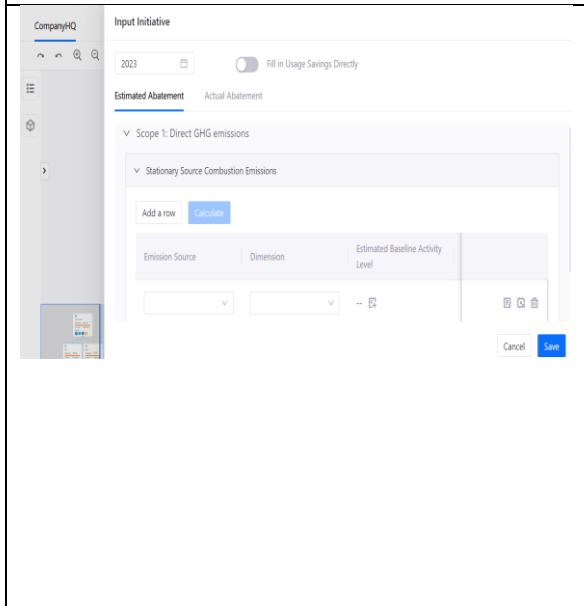
	14. Under the input initiative prompt,
	
	    l. Proceed to estimated abatement (to calculate estimate emissions abated before abatement initiative is implemented)
	
	    m. Select the relevant emission source based on your operations, please refer to section under "**Recording Carbon Emission Data for Company and Sites**" for the respective inputs.
	
	    n. After keying in the inputs, proceed to click "Calculate" to calculate emissions abated, followed by "Save".
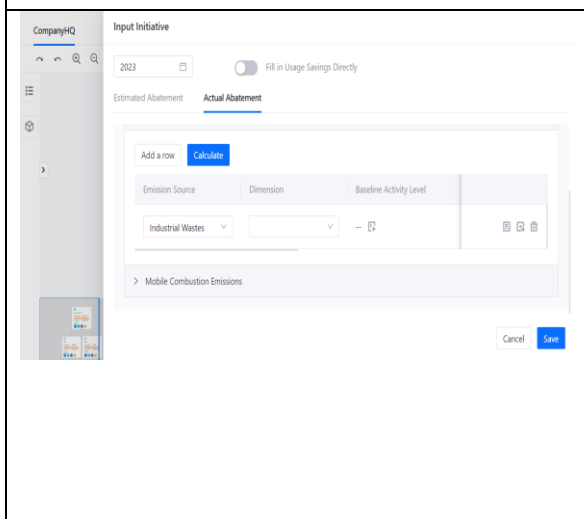
	15. After the implementation of abatement initiative and the actual abatement quantity is gathered, the data will then be keyed in under the 2nd tab - "actual abatement". For the data input, the same process applies as step 14.

Annex A - Data Input Guide

Scope 1 emission types

Scope 1 Emission types (choose based on relevance)	Emission source (choose based on relevance)	Dimension (choose relevant metric)	Activity Data
Stationary Source Combustion Emissions	Stationary fuel combustion sources are devices that combust fuel, generally for the purposes of producing electricity, steam, or heat. Please select the emission source based on your operations (e.g., LNG, Gas, Natural gas, Diesel)	Please select relevant metric to measure emission source (e.g., weight in kg, volume in gallons, or energy (heat) produced from combustion	Key in consumption quantity of respective stationary source
Carbon sequestration products implicit emissions	Sequestration-related processes including products such as Crude steel carbon or Methanol	Weight of product consumed	Metric grams
Normal operating conditions torch combustion co2 emissions	Emissions produced from torch combustion under normal circumstances	NA (leave as empty)	Flare gas flow Carbon content Oxidation rate % CO2 concentration %
Accidental Torch combustion co2 emissions	Emissions produced from torch combustion under accidental circumstances	NA (leave as empty)	Flare gas flow Carbon content Oxidation rate % CO2 concentration %
Raw material decomposition co2 emissions	Emissions produced from decomposition of raw materials	Weight of raw materials decomposed	Metric tonnes or % clinker content

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Non-fuel-based raw material carbon calcination emissions	Emissions produced from carbon calcination of non-fuel-based raw material	Weight of raw materials decomposed	Metric tonnes or %
Smelter consumption co2 emissions	Emissions produced from materials consumed for smelting process - Dolomite or Limestone	Weight of material consumed	Metric grams
Electrode consumption co2 emissions	Emissions produced from electrode consumed	Weight of material consumed	Metric grams
External purchased raw iron and other carbon materials generated co2	Alloys and irons consumed in operations	Weight of material consumed	Metric grams and % purity of materials
Raw material generated co2 emissions	Raw material consumed e.g., carbon, naphtha, coke, CH4, propane, natural gas, petroleum coke, methanol	Weight of material consumed	Material type, metric grams and % purity of materials
Carbonate use process co2 emissions	Please input the relevant carbonate consumed – e.g., sodium carbonate, calcium carbonate, lithium carbonate etc.	Weight of carbonate consumed	Metric grams and % purity of materials
Nitric Acid production process n2o emissions	Please input the pressurization method for nitric acid production	Weight of nitric acid produced	Metric tonnes, % of removal efficiency and % usage rate
Adipic Acid Production process n2o emissions	Oxidation of nitric acid or other processes for production	Weight of adipic acid produced	Metric tonnes, % of removal efficiency and % usage rate
Continuous scorch co2 emissions	Emission produced from continuous scorch equipment	Weight of equipment	Metric tonnes of scorch, carbon content and % oxidation rate

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Interstitial scorch co2 emissions	Emission produced from interstitial scorch equipment	Weight of equipment	Metric tonnes of catalyst consumed carbon content and % carbon oxidation rate
Hydrogen production equipment	Emission produced from hydrogen production equipment	Weight of equipment	Type of raw material/ syngas/ residue, metric tonnes of material, and carbon content
Petroleum coke calcining equipment	Emission produced from petroleum coke calcining equipment	Weight of equipment	Type of coke/ metric tonnes of coke, and carbon content
Bitumen Oxide equipment	Emission produced from bitumen oxide equipment	Weight of equipment	Metric tonne output of asphalt oxide, and emission factor for oxide
Ethylene cracking equipment	Emission produced from ethylene cracking equipment	Weight of equipment	Average flow rate, scorch time, % CO2 concentration
Ethylene Glycol/ Ethylene oxide production equipment	Emission produced from ethylene glycol/ ethylene oxide production equipment	Weight of equipment	Ethylene raw material consumed, metric tonne consumption, carbon content
CH4 recycling for own use	Recycled methane for own consumption	Weight of CH4	Oxidation coefficient, CH4 volume and volume concentration
CH4 recycling for external supply	Recycled methane for own external supply	Weight of CH4	Volume of CH4 and volume concentration
CH4 torch destruction	Methane destroyed through torch	Weight of CH4	% in destruction efficiency, hours of equipment operated, methane gas flow, volume concentration
Industrial wastewater anaerobic treatment ch4 emissions	Processes include methane recovery, biological oxygen demand, and chemical oxygen demand	Weight of CH4	Amount of wastewater, oxygen demand, organics removed, and MCF (thousand cubic feet)

Industrial wastewater treatment n2o emissions	Emissions produced from nitrogen use	Weight	Nitrogen content and emission factor
Alternative fuels or waste non-biomass carbon combustion emissions	Waste includes solvents, oil, leather, tires, plastics and scrap floor-reinforced-plastic	Weight	Consumption in metric grams
Amount of co2 recycled	Carbon dioxide recycled	Volume	Gallon of CO2 recycled, recovered, and % purity
Outsourced co2 loss emissions	Carbon dioxide outsourced	Weight	Weight of CO2 purchased, proportion of lost emissions, and % purity
Mobile combustion emissions	Fuel for combustion include – gasoline, kerosene, diesel, aviation, biodiesels etc.	Please select relevant metric to measure emission source (e.g., weight in kg, volume in gallons, or energy (heat) produced from combustion	Key in consumption quantity of respective mobile source
Fugitive emissions	Emissions produced from refrigerant usage, please key in the most relevant product	Weight	Consumption in metric grams and % dissipation rate

Scope 2 emission types

Scope 2 Emission types (choose based on relevance)	Emission source (choose based on relevance)	Dimension (choose relevant metric)	Activity Data
Net purchased electricity use generated emissions	Green Power (renewable energy)	Energy (electricity)	Key in net electricity purchased and select units (kWh/MWh)

Net purchased electricity use generated emissions	Electricity purchased	Energy (electricity)	Key in net electricity purchased and select units (kWh/MWh)
Net purchased electricity use generated emissions	Direct Power Supply	Energy (electricity)	Key in net electricity purchased and select units (kWh/MWh)
Net purchased heat use generated emissions	Heat	Weight – if weight (g) of heat is given Energy(heat) - Amount of Joules in heat energy purchased Energy (electricity) - Amount of kWh or MWh in electricity energy produced	Using metrics selected from the dimension, please key in purchased/ sales amount
Net purchased heat use generated emissions	Steam	Weight – if weight (g) of steam is given Energy(heat) - Amount of Joules in steam energy purchased Energy (electricity) - Amount of Watt hours in electricity energy produced	Using metrics selected from the dimension, please key in purchased/ sales amount

Scope 3 emission types

Scope 3 Emission types (choose based on relevance)	Emission source (choose based on relevance)	Dimension (choose relevant metric)	Activity Data

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Category 1: Purchased goods and services	Accounting and industrial purchases including foods, farms, laboratories, parks, agriculture, ambulances etc.	Financial spend	Price of consumption in USD
Category 2: Capital goods	Accounting and industrial goods including foods, farms, aircrafts, laboratories, parks, agriculture, ambulances etc.	Financial spend	Price of consumption in USD
Category 3: Fuel and energy related activities (not included in scope 1 or 2)	Fuel source – input country electricity provider/ other fuel source e.g., biodiesel	Energy (electricity) for providers or weight for alternate fuel sources	kWh/MWh for electricity providers or metric grams for alternate fuel sources
Category 4: Upstream transportation and distribution	Transportation of materials to your organization - includes air, passenger, water, truck, rail, and pipeline	Financial spend	Price of consumption in USD
Category 5: Waste generated in operations	Drinking water and wastewater treatment, waste management and remediation	Financial spend	Price of consumption in USD
Category 6: Business travel	Transportation types- includes air, passenger, water, truck, rail, and pipeline	Financial spend	Price of consumption in USD
Category 7: Employee commuting	Please input country which employees are commuting in	Employees/ staff	Number of persons
Category 8: Upstream leased assets	Assets which are leased – e.g., buildings, vehicles, commercial equipment to extract raw materials	Financial spend	Price of consumption in USD
Category 9: Downstream transportation and distribution	Transportation types (distribution to customers) - includes air, passenger, water, truck, rail, and pipeline	Financial spend	Price of consumption in USD

Category 10: Processing of sold products	Fuel source for processing goods – input country electricity provider/ other fuel source e.g., natural gas, LPG etc.	Energy (electricity) for providers or weight for alternate fuel sources	kWh/MWh for electricity providers or metric grams for alternate fuel sources
Category 11: Use of sold products	Fuel source to support product use – input country electricity provider/ other fuel source e.g., natural gas, LPG etc.	Energy (electricity) for providers or weight for alternate fuel sources	kWh/MWh for electricity providers or metric grams for alternate fuel sources
Category 12: End-of-life treatment of sold products	Disposal method for products – ranges from landfill, closed-loop, open-loop disposal	Weight of product disposed	Metric grams
Category 13: Downstream leased assets	Assets which are leased – e.g., buildings, vehicles, commercial equipment to distribute finished goods	Financial spend	Price of consumption in USD
Category 14: Franchises	Building type for franchise – office, mall, hostel	Square feet (to be updated)	Square feet of building (to be updated)
Category 15: Investments	Accounting and industrial purchases including foods, farms, laboratories, parks, agriculture, ambulances etc.	Financial spend	Cost of investment in USD

Annex B - Frequently Asked Questions

What is LCOS?
LCOS, Low Carbon Operating System is a cloud based carbon management platform designed specifically to help Corporates and SMEs easily measure, manage, and mitigate their greenhouse gas (GHG) emissions.

Why do I need to measure my GHG emissions?
Climate change affects all of us and we are all contributing towards it. Every organisation needs to know exactly how much GHG emissions that they are responsible for and take meaningful climate action to reduce it.

How can LCOS help my company?
You can't manage what you do not measure. The first step in your journey towards sustainability is to know and understand your GHG emissions baseline. LCOS makes it easy for you to start just by entering basic data such as your monthly electricity bill and your monthly vehicle fuel consumption.

Again, why do I need to measure my GHG emissions?
Governments, businesses, financial institutions, employees and most importantly consumers are choosing companies that take responsibility for their impact on the environment. Companies that do not share and disclose their sustainability efforts risk losing out and running out of business.

What else can LCOS do?
Once you have measured your baseline, LCOS allows you to set targets and keep track of your emissions on a monthly basis. You can also plan and manage your emissions reduction efforts, analyse your Year-On-Year performance and benchmark against industry standards and peers.

Is LCOS aligned with local & international standards?
Yes. LCOS is aligned with ISO14064 and GHG Protocol, the 2 most widely used standards for corporate GHG emissions measurement and reporting. LCOS is also preconfigured with locally approved emissions factors, IPCC2006, EFDB, DEFRA, EPA, and other emissions factor sources.

How does LCOS benefit my business?
LCOS can help you reduce your cost by guiding you to improve efficiency, increase productivity and reduce wastage in your business operations. LCOS also gives you a head start in preparing your business for the potential introduction of a carbon tax that the Malaysian Government will be studying in 2023.

Is my data secure?
LCOS runs on Microsoft Azure and is built on software that has been certified by leading cyber security and privacy standards such as MS/IEC ISO27001, GDPR and SG IM8. This is in line with the recommendations by CyberSecurity Malaysia.

Who is MGTC?
MGTC, Malaysian Green Technology and Climate Change Corporation is an agency under the Ministry of Natural Resources, Environment and Climate Change (NRECC) mandated to accelerate the green economy, advance climate action and advocate a green lifestyle.

Who is Envision Digital?
Envision Digital is the world's leading net-zero technology partner for enterprise, governments, and cities, with the goal of accelerating progress towards carbon-free energy and improving quality of life for all of humanity.

EnOS™