HS2

eTool – Step-by-Step

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HS2

Development & Guidance

Process

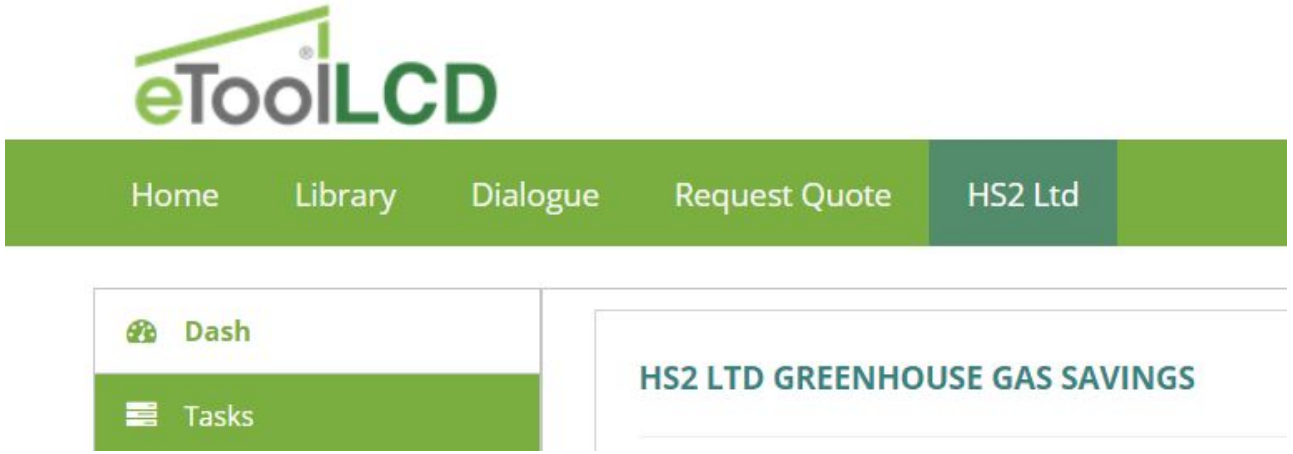
- Getting Set Up
  - Login in details & HS2 domain
  - Project Setup and Access
- Design Versions
- Assurance Activities
- Linking model to Asset Numbers
- Adding & Editing Templates
- Adding & Editing EPDs
- Recommendations – recording design changes
- Bulk Upload
- Reports – deliverable outputs

Getting Started

https://etoollcd.com/

- HS2 LCA Leads – Lisa Ithurralde & Mark Fenton – contacted by etool@hs2.org.uk

- Click on the above link, go to login and create your account, select the free read only option.
- Then inform HS2 LCA Lead and email ITetoolenquiries@hs2.org.uk which will raise a work order to create your access.



Access Project

Go to the HS2 space – top of the page

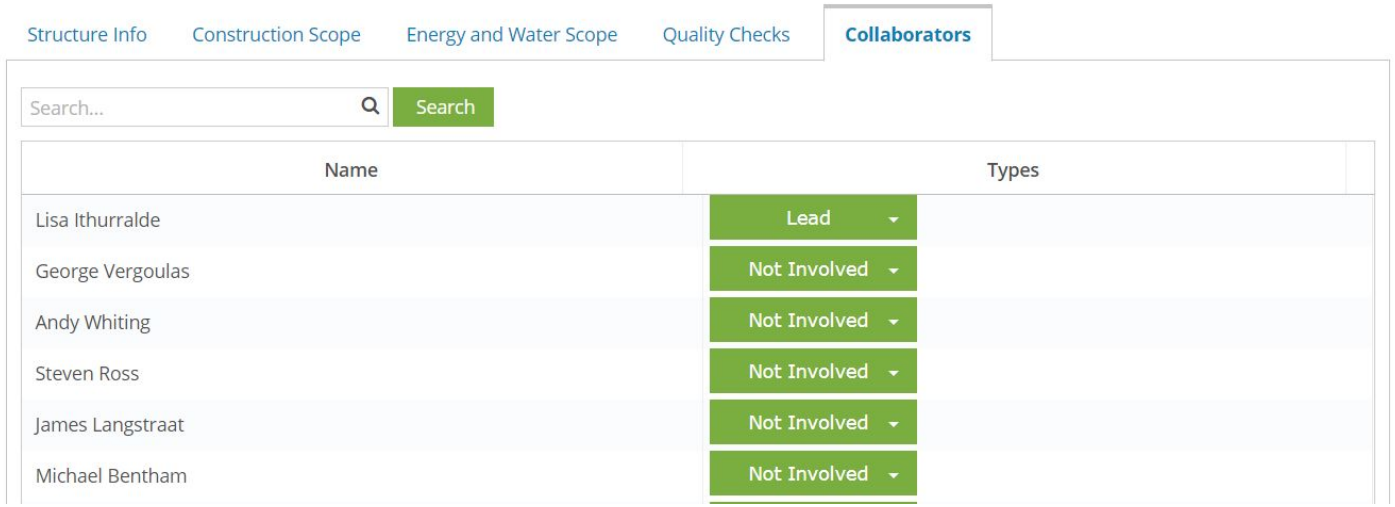
To the right is the phase specific space

Your projects will be in the relevant phase areas.

If you cannot access or see the design, contact your phase LCA lead to arrange access or set up.

Collaborators

- Each contract space has a list of registered users
- Collaborator access – LCA practitioners who will be updating the data
- Read-Only – viewing rights but no data access



Access Rights

There are three levels of licenced access to the HS2 domain – Read-Only, Enterprise and Specialist.

Read-Only – view the project and carrying out high level assurance activities – you cannot change the data.

Enterprise – full access and the ability to carryout 20 actions a month – for updates and minor changes to assessments.

Specialist – full access and unlimited activity.

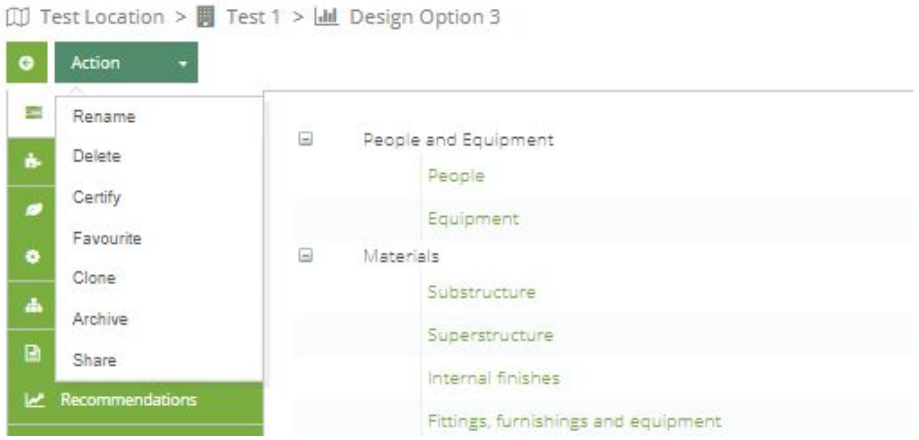
Your licence level will change depending on your access needs at any given time – please inform the ID team when you plan to undertake updates and we will ensure you have the appropriate licence assigned for the duration.

Project Space

Within the phase space is the project areas and the versions of designs displayed as below

Creating New Design Level

- Baseline Designs will be created by HS2 during project set up
- To create the next version of the design, select the latest design, within the design space select the action tab on the left hand, select Clone.
- Enter name – Design Option 1, 2, 3-etc. or As-built if this is the final design.
- Leave ‘current structure’ selected
- Purpose – Select for relevant design level.
  - LCA Baseline – LCA Proposed
  - Design Options - LCA Improved (multiple versions are expected)
  - As-Built – LCA As Built



New Design Level Details – do not change

Design Name – add **LCA Baseline, Design Option 1->, As-built** depending on design phase

Purpose – Select for relevant design level. **LCA Baseline – LCA Proposed**, **Design Options - LCA Improved** (multiple versions are expected), **As-Built – LCA As Built**

Benchmark – blank, there is no industry average for high speed rail currently.

Stories or levels – retain **1** story for all design features unless feature is for a station or assert that is greater than 1 story. – this has no effect on the infrastructure elements

Commissioning Date (Start of Life) – Align with current program date

Decommissioning Date (End of Life – 120y after start of life date

Energy Monitoring Adjustment Factor – **100%**, leave as 100 unless modelling a LCA Improved alternative that has a recognised % improvement in energy consumption, then reduce – e.g. 10% saving reduce due to changes the number should be 90. This allows for quick comparison of design alternatives.

Design Quality – select **very high** – this sets the standard service life of the design

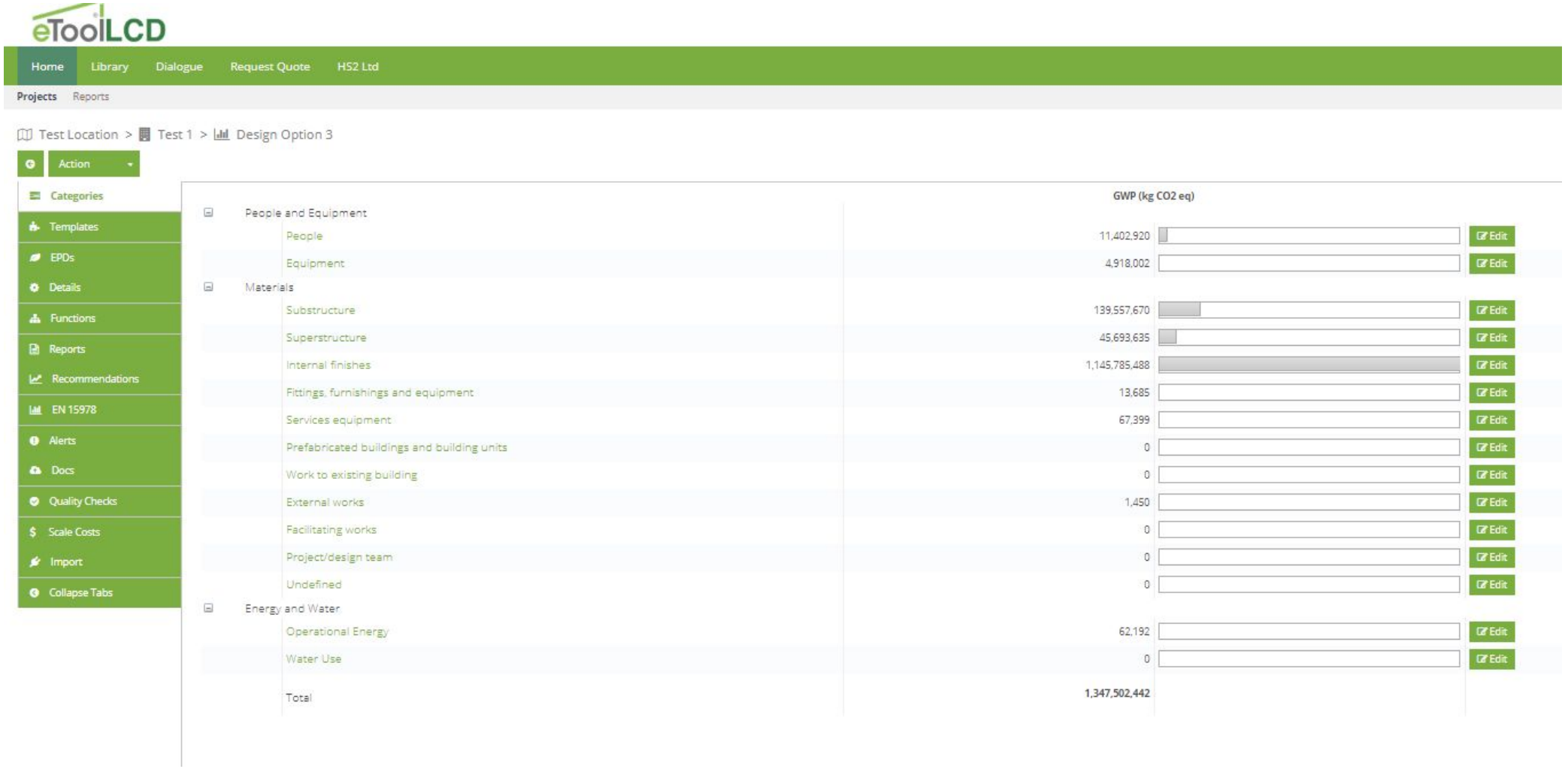
Ownership – select **one owner** – HS2

Structural Service Life Limit – in years – **120y**

Suburb Redevelopment Potential – select **Very Low**

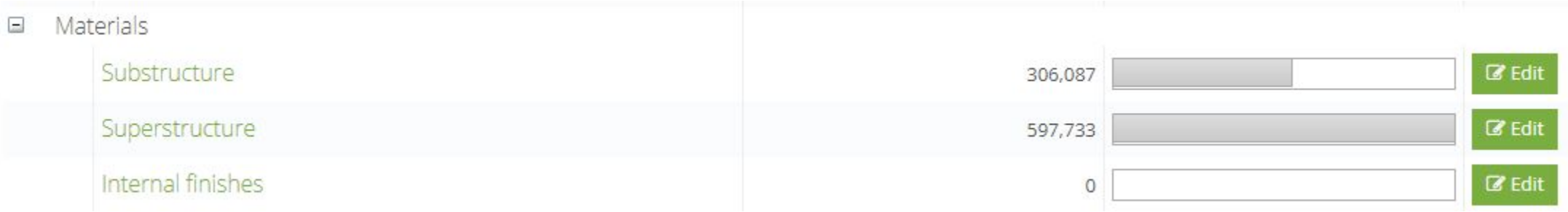
Predicted Service Life – **120y** study period of the LCA assessment

Categories Tab



Categories Tab

Select Edit for the section of the design to be updated.



Then select Edit for the template to be updated and make required change.

Category Selection Breakdown

When entering data to the model select the recommended category.

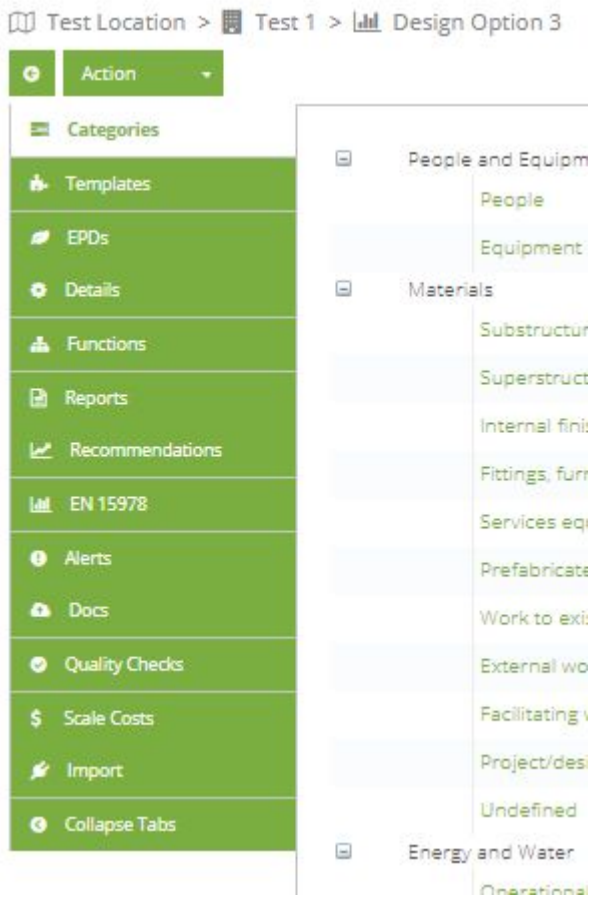
Categories	Applicable Assets
Substructure	Below ground structures and foundations. MWCCs assets. Culvert/Underpass, underbridge, cutting, embankment, drainage, highway features, underground structures, depot, workshops, station structures.
Superstructure	Above ground structures and infrastructure. MWCCs assets. Footbridge, over bridge, viaduct, retaining wall, platforms, track, signalling, telecommunication, traction power, fences and walls, depot, workshops, station structures.
Internal Finishes	Depot, workshops, station structures. Building Specific
Fittings, Furnishing and Equipment	Depot, workshops, station structures. Building Specific
Service Equipment	Depot, workshops, station structures. Rolling Stock.

Categories	Applicable Assets
Prefabrication building and building units	Depot, workshops, station structures. Building Specific
Work to existing building	Depot, workshops, station structures. Building Specific
External Works	Depot, workshops, station structures. Building Specific
Facilitating Works	Enabling works. Temporary earthworks, mitigating earthworks, remediation earthworks
Project/Design Team	Modelling energy and time used by the design elements of the project.
Undefined	If unclear about appropriate category, select undefined and bring the issue to the peer working group.

Navigation Tabs

Each tab takes you to a different function of the tool.

Templates and EPDs list all library items that are currently applied to the tool – making up the model



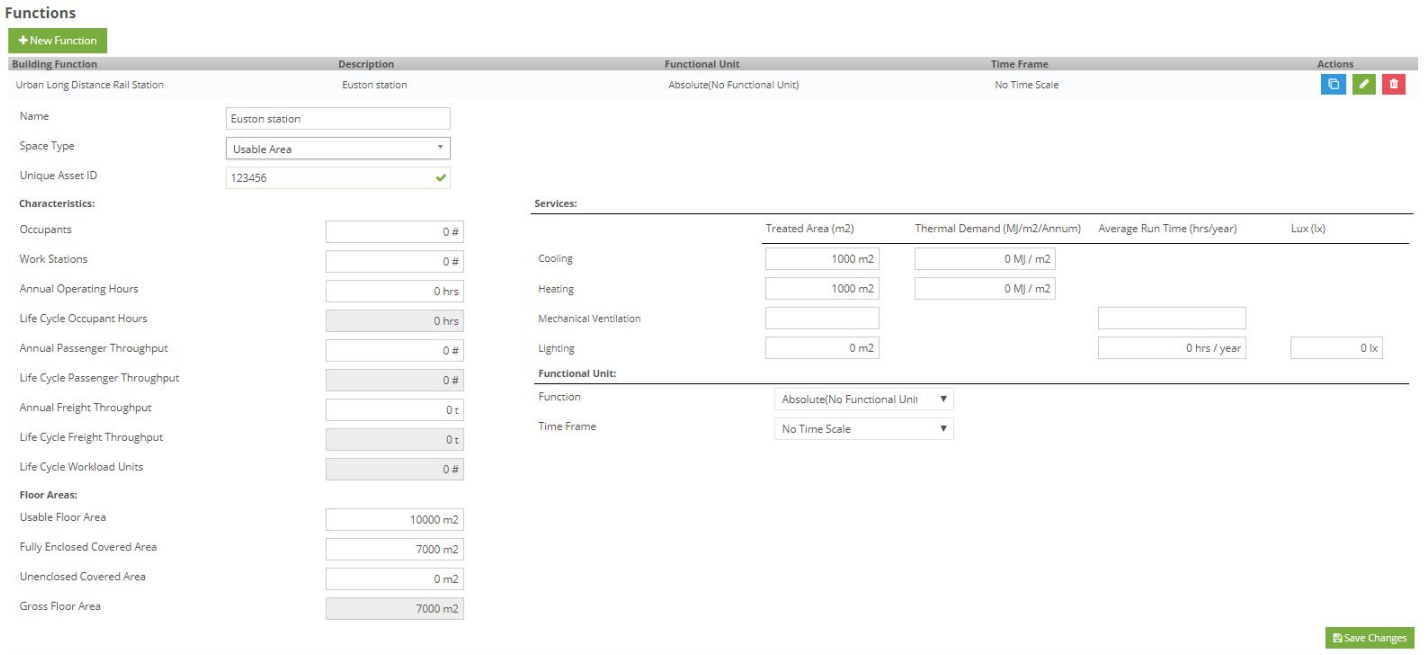
Functions = HS2 Asset Number

Main asset numbers should be provided by HS2 at function level at or soon after project set up.

Assets currently in the project can be reviewed by selecting the Function tab to the left of the screen.

Users can add assets to the functions are to the main structure a needed in line with guidance note.

Edit the function by clicking on the green pen.

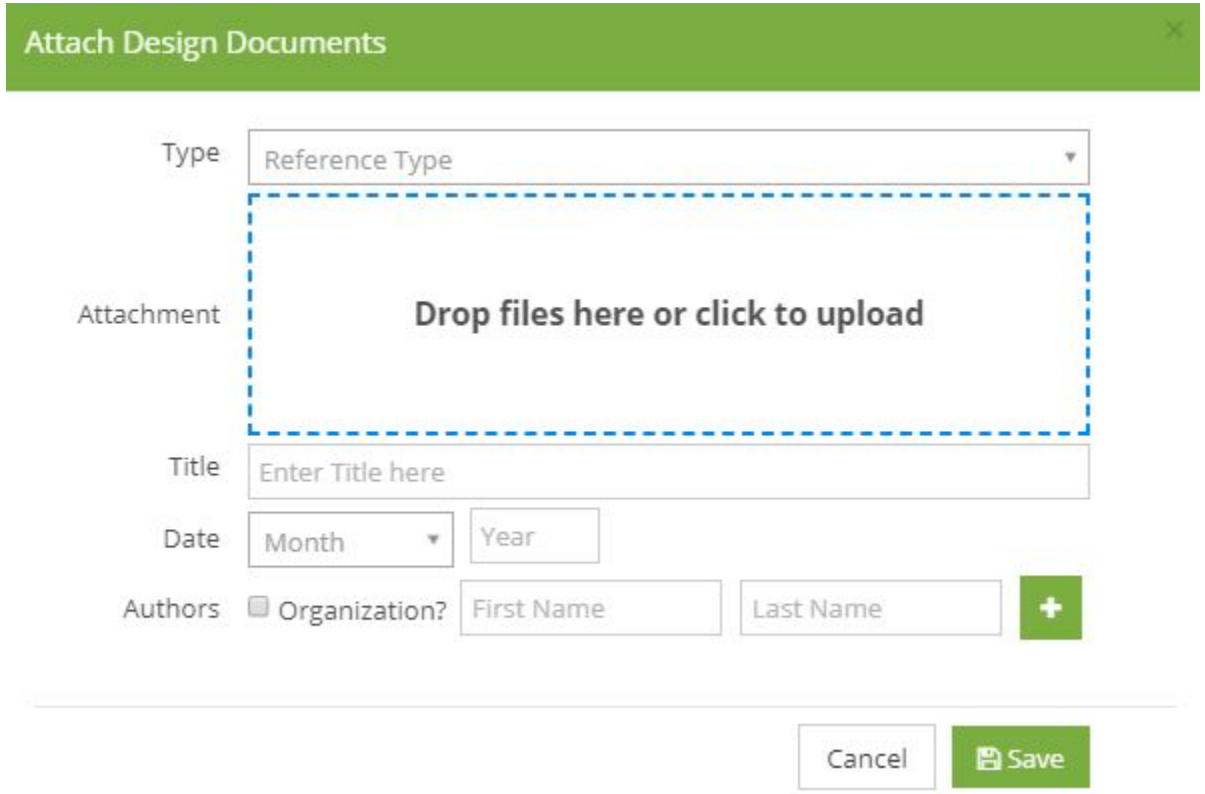


Docs

Into this space any documentation relating to the design can be stored and used to evidence the model for verification purposes

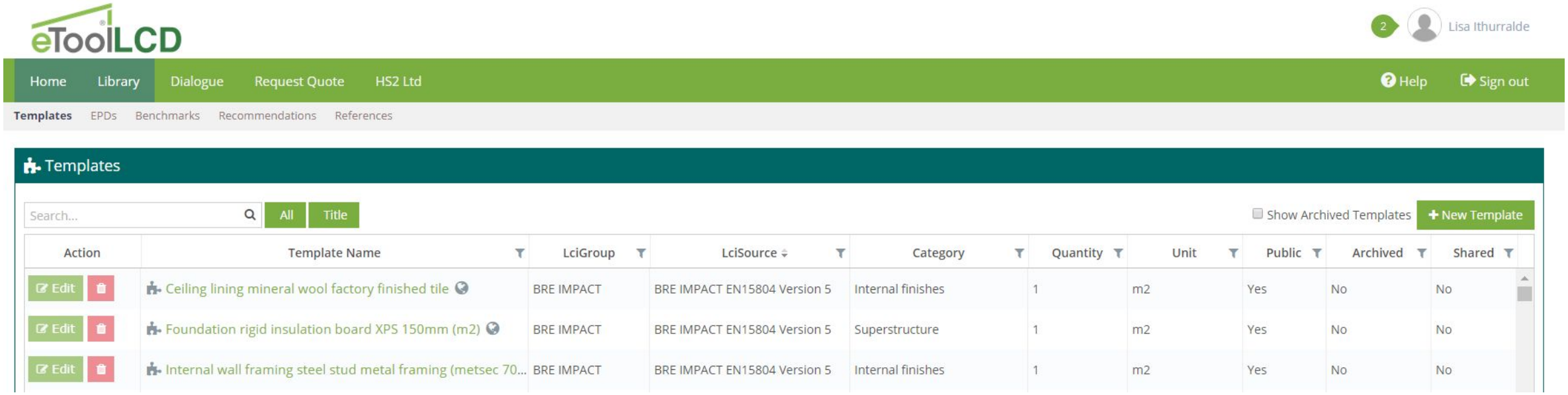
- Designs
- EPDs
- Reports
- Scope documents
- Etc.

Upon submittal the date of upload or creation and the organisation or author should be included.



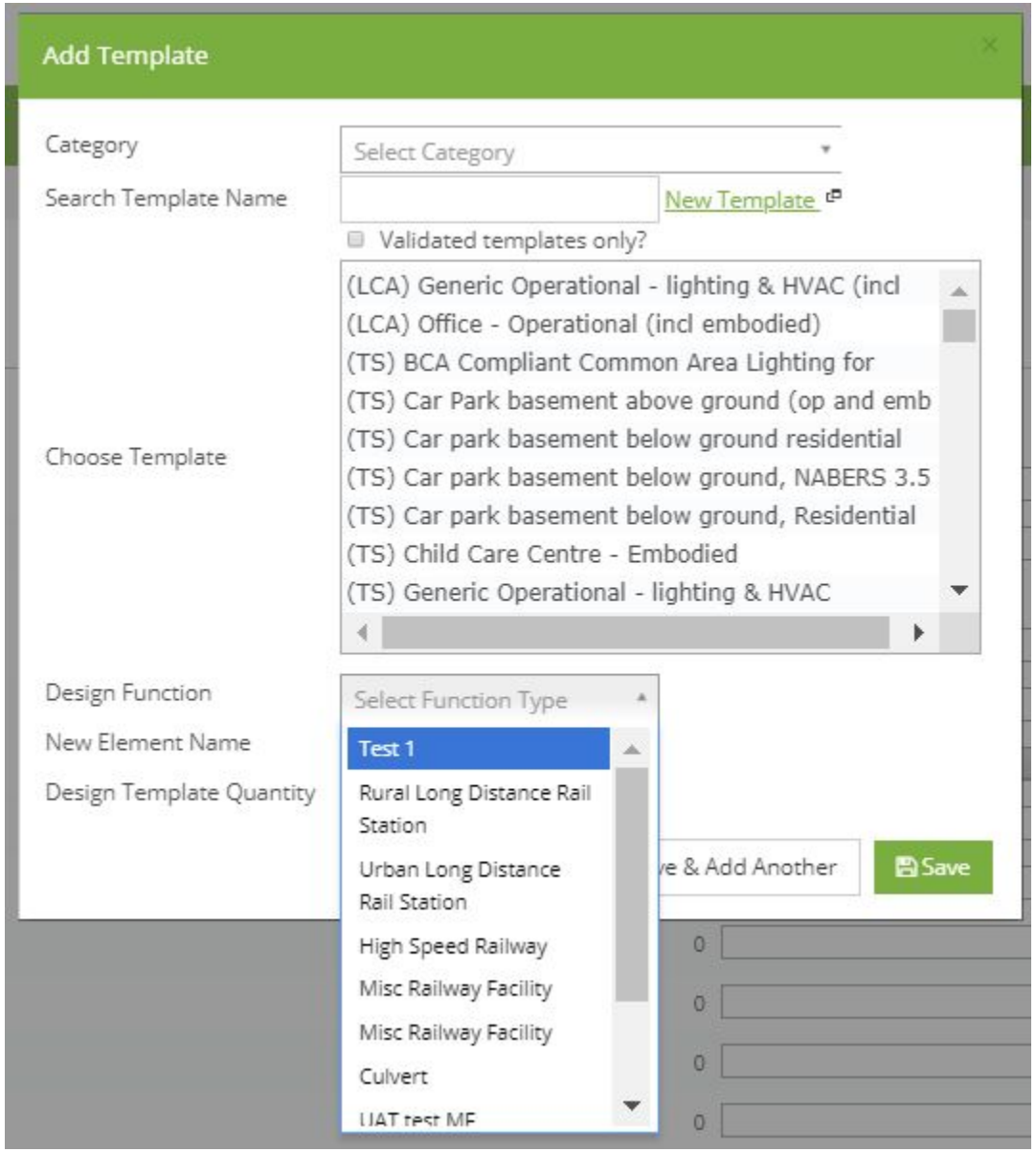
Library – Templates, EPDs and Recommendations

This contains the pre-existing templates, EPDs and recommendation suggestions used to calculate the projects LCA assessment.



+Add Existing Template

- Category - Select category from drop down list, most assets will be substructure or superstructure although others will be applicable.
- Use the Search Template Name to find an appropriate template
- Click validated templates – use these as a preference, unless none available or searching for HS2 specific data set.
- Design Function - Select relevant asset number from the list, you can add additional functions as needed.
- Design Template Quantity - Input amount – hover over final box to see template metric and add appropriate amount – m3/m2/kg

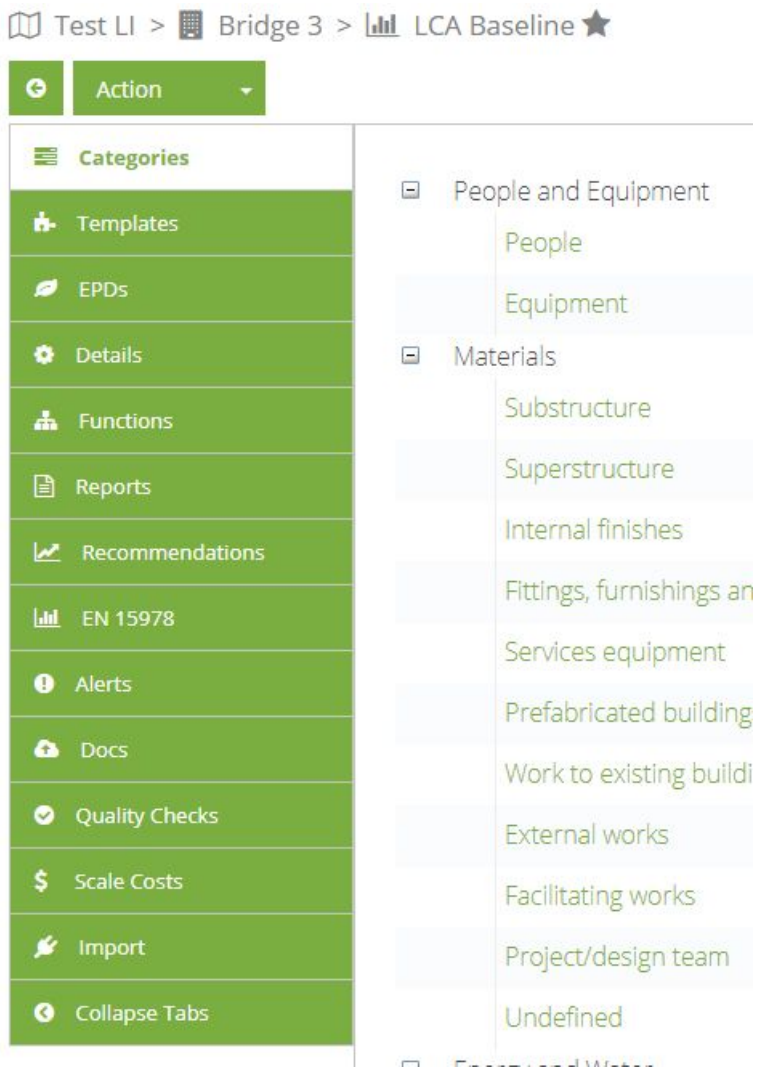


Editing LCA Model

There are several ways to edit the LCA model once created.

Select relevant tab along the left hand side menu.

This is for minor changes and updates – for materials to be used repetitively create a new templates



Edits Existing Templates in the Design

Design Function – Select appropriate function

Material Quantity – Change volume/weight

Construction Waste Factor – leave as standard until as built when accurate % should be input.

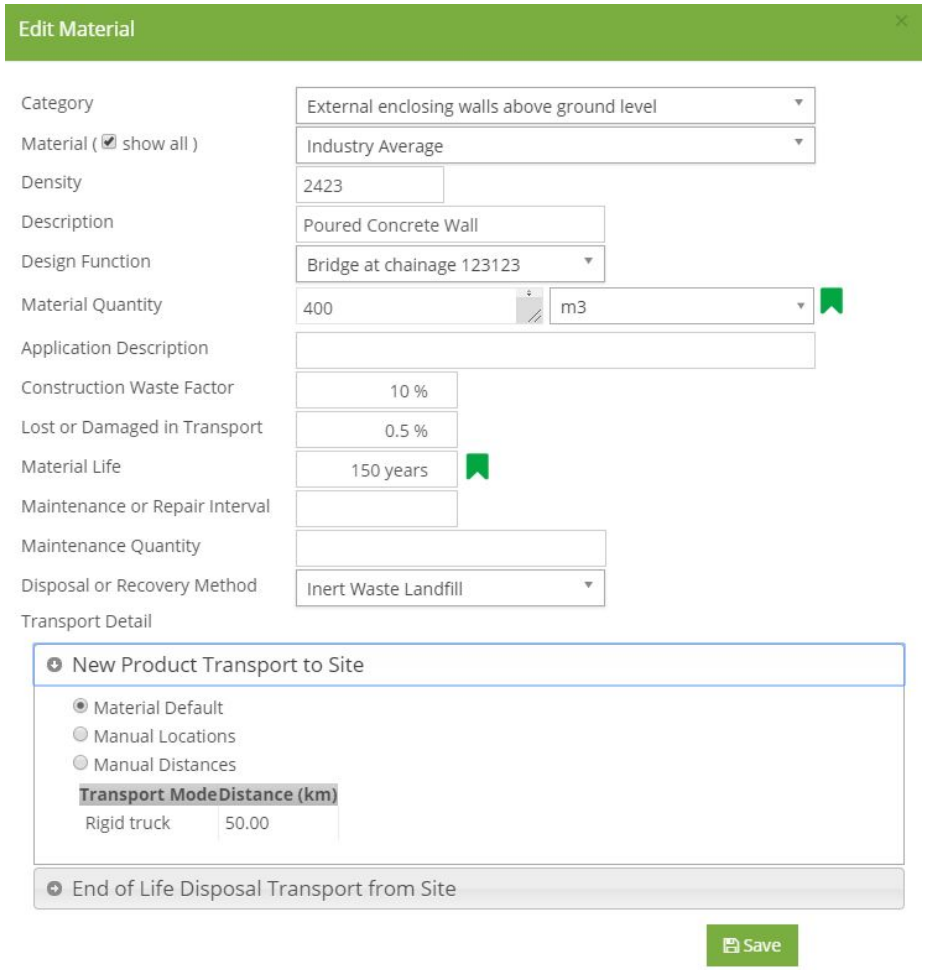
Lost or Damaged in Transport - leave as standard until as built when accurate % should be input.

Material life – set to 120 years unless less.

Maintenance or Repair Intervals – number of years

Maintenance Quantity - % of original construction required at each maintenance events.

Update disposal method and transport figures as appropriate.

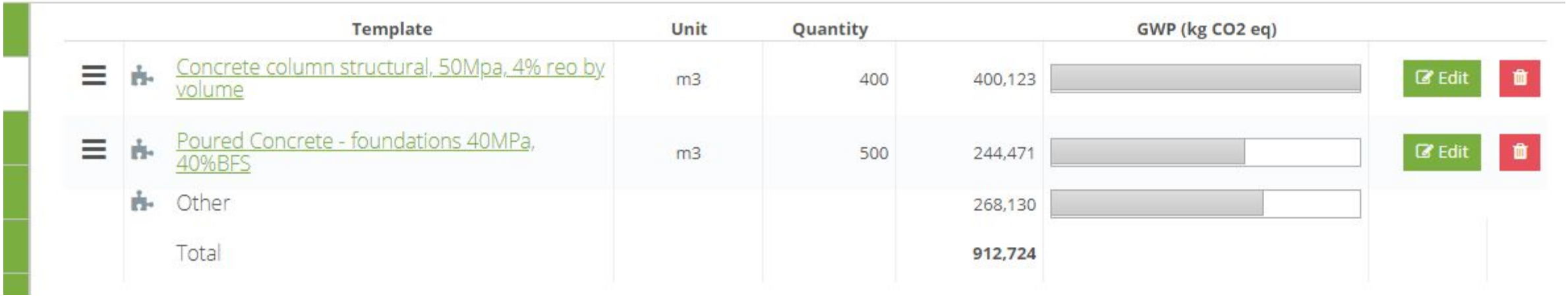


Templates/Nested Templates Tab

This sections provides a list of templates being utilised for your design,

By selecting the template title the details behind each template can be accessed.

Within this section select the details tab on the left menu to evaluate the assumptions behind the template for appropriateness.



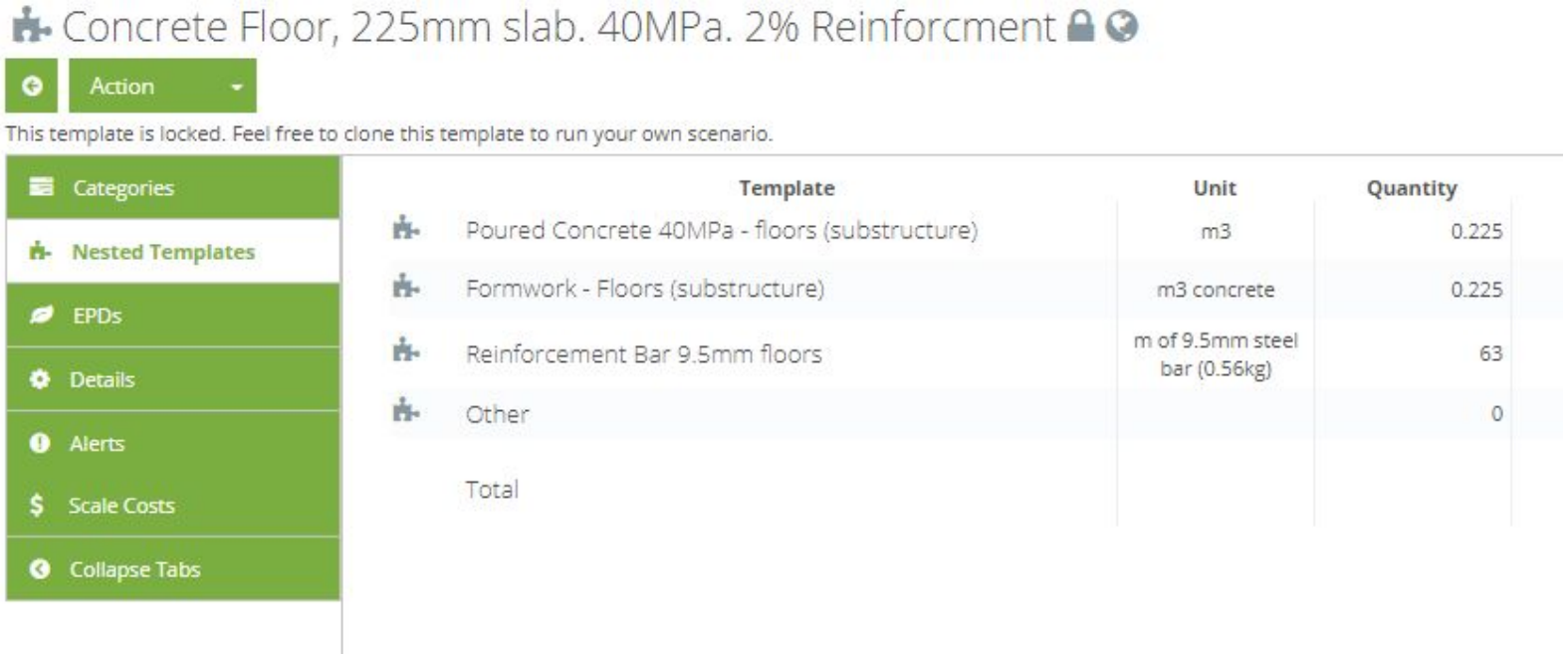
Template	Unit	Quantity	GWP (kg CO2 eq)		
Concrete column structural, 50Mpa, 4% reo by volume	m3	400	400,123	Edit	
Poured Concrete - foundations 40MPa, 40%BFS	m3	500	244,471	Edit	
Other			268,130		
Total			**912,724**		

Nesting Template Effect

Templates are either base elements or developed where the individual template is the product of multiple template.

For example a brick walls nesting templates would contain

- Bricks
- Mortar
- Trade people
- Equipment used
- Etc.

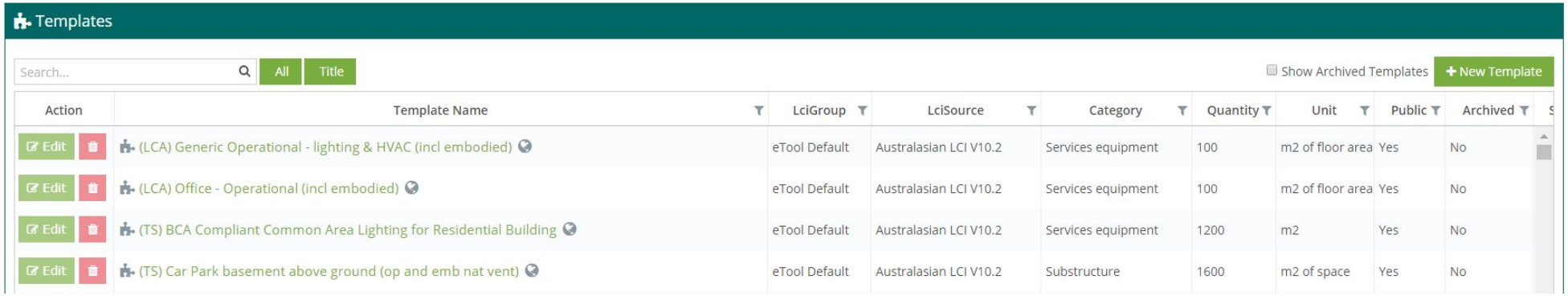


+Add New Templates

Either select an existing template and clone the template, then rename and change the nested template aspects to meet the design needs.

Or select +New Template and create a new template from scratch – detailed background LCA data or material composition will be required for this.

Use Naming convention detailed in guidance document for all new templates



Activity 1

Adding a template to a design

- Go to superstructure
- Select + New Template
- Search for 215mm Concrete Block and add 200m2 to the design

Adding a new template

- Go to template library
- Select +New Template, select etool default as LCI source
- Use the naming convention in table 4 of the guidance note – Pre-cast slab track (Open Route)
- Select appropriate Category – see slide 15
- LCI source – United Kingdom
- Library template Quantity – 1
- Unit – km
- Select appropriate templates and volumes to create 1 km of the pre-cast slab track (open route) from the example sheet provided.
- The add 365km of slab track to the design using the add template to design method

Clone an existing template and edit its properties

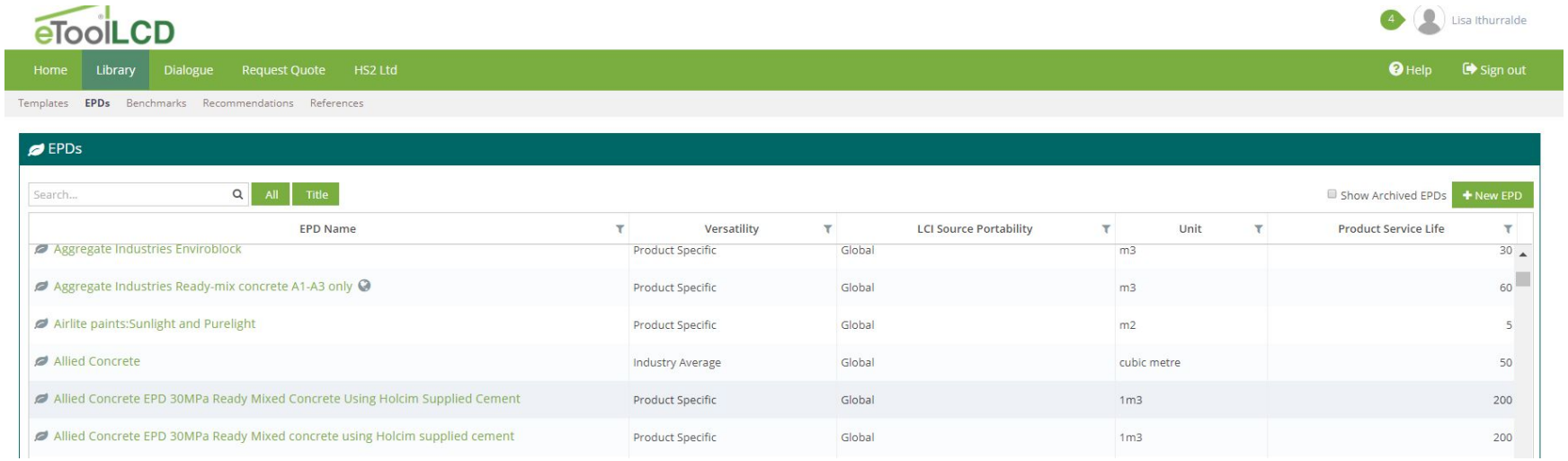
- Go to template library
- Search for Concrete Floor, 225mm slab. 40MPa. 2% Reinforcement
- Select template
- Select Action and Clone from the drop down list.
- Select clone master and all nested templates as new templates
- Rename using naming convention in table 4 of the guidance note – HS2-HS2-Concrete Floor, 450mm slab. 40MPa. 4% Reinforcement
- Go to nested templates – edit the concrete and formwork to double the volume to 450mm, edit reinforcement to 4x original value.
- Then add 100m2 of the new template to design using the add template to design method

Library - EPDs

This contains the pre-existing EPDs used to calculate the projects LCA assessment.

Globe Icon – available to all

Versatility – product specific or industry average – do not use industry average unless the product does not have a specific EPD and there is no compatible template available or buildable.



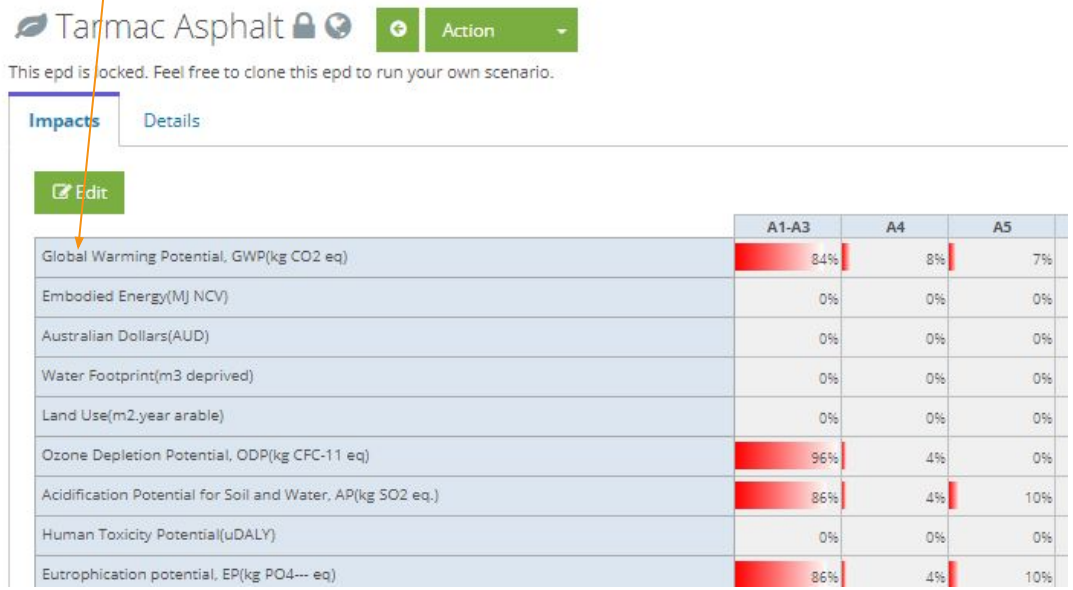
EPD = HS2 requirements

Select the globally available EPD and review the Impacts for compliance with the list.

There should be scoring for all the listed impacts

It is acceptable for product specific EPDs that are actually being used onsite not to meet all requirements, but industry average EPDs should only be used if all impacts are compliant.

Global Warming Potential (kg CO2e)
Ozone Depletion Potential; ODP (kg CFC 11e)
Acidification Potential for Soil and Water; AP (kgSO2-e)
Eutrophication Potential; EP (kg (PO4)3-e)
Photochemical Ozone Creation; POCP(kg C2H4e)
Abiotic Depletion Potential – Elements; ADPE (kg Sbe)
Abiotic Depletion Potential – Fossil Fuels; ADPF (MJe)
Net use of fresh water; FW (m3)
Hazardous waste disposed; HWD
Non-hazardous waste disposed; NHWD (kg)
Radioactive waste disposed (high-level nuclear waste); RWD (kg)



	A1-A3	A4	A5
Global Warming Potential, GWP(kg CO2 eq)	84%	8%	7%
Embodied Energy(MJ NCV)	0%	0%	0%
Australian Dollars(AUD)	0%	0%	0%
Water Footprint(m3 deprived)	0%	0%	0%
Land Use(m2.year arable)	0%	0%	0%
Ozone Depletion Potential, ODP(kg CFC-11 eq)	96%	4%	0%
Acidification Potential for Soil and Water, AP(kg SO2 eq.)	86%	4%	10%
Human Toxicity Potential(uDALY)	0%	0%	0%
Eutrophication potential, EP(kg PO4--- eq)	86%	4%	10%

+Add Existing EPD to design

In design select +Add EPD

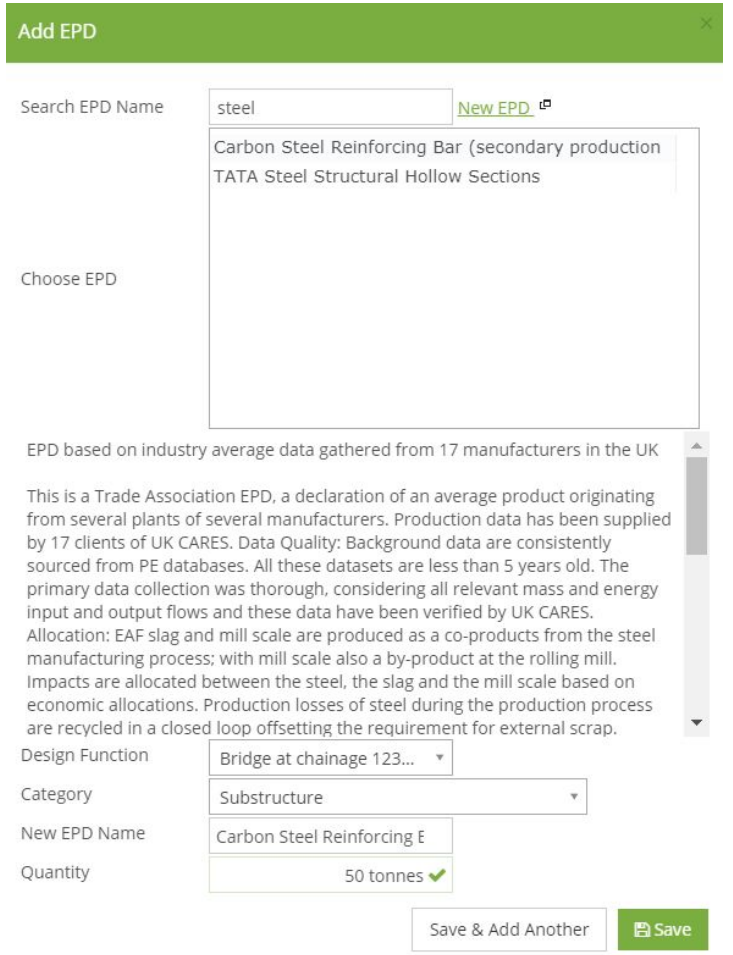
Search EPD Name – add key words to search existing EPDs

Choose EPD – this will bring up the summary information about is covered by the EPD. (globe beside the EPD shows they are available to all)

Design Function - Select relevant asset number.

Category - Select category from drop down list, most assets will be substructure or superstructure although others will be applicable.

Quantity - Input amount – hover over final box to see template metric – m3/m2/kg



EPDs Tab

This section provides a list of environmental product declarations being utilised for your design,

By selecting the EPDs title the details behind each template can be accessed.

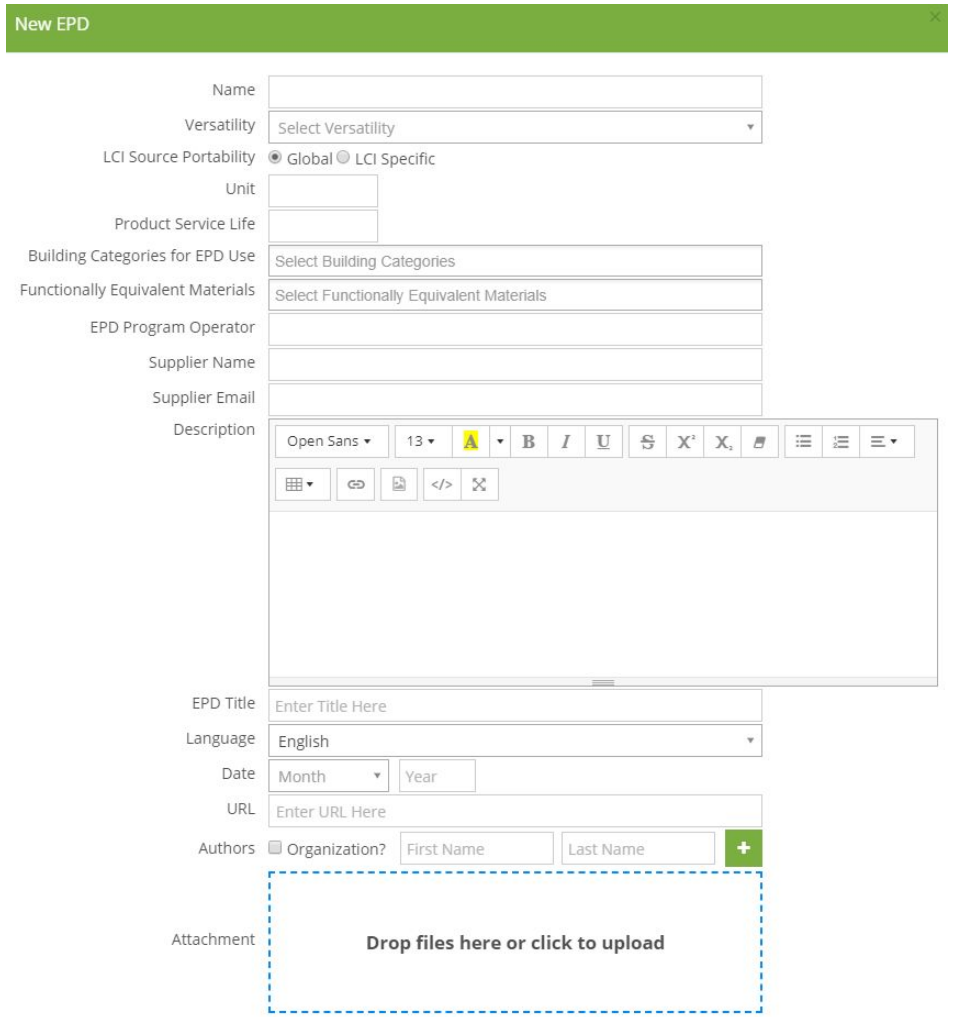
Within this section select the details tab on the left menu to evaluate the assumptions behind the EPD for appropriateness.

+Add New EPDs

New EPDs that you wish to upload should be 3rd party verified EPDs documentation.

See guidance document for further details.

Once submitted they will then be verified by the etool team to ensure data has been correctly inputted.



New EPDs - Details

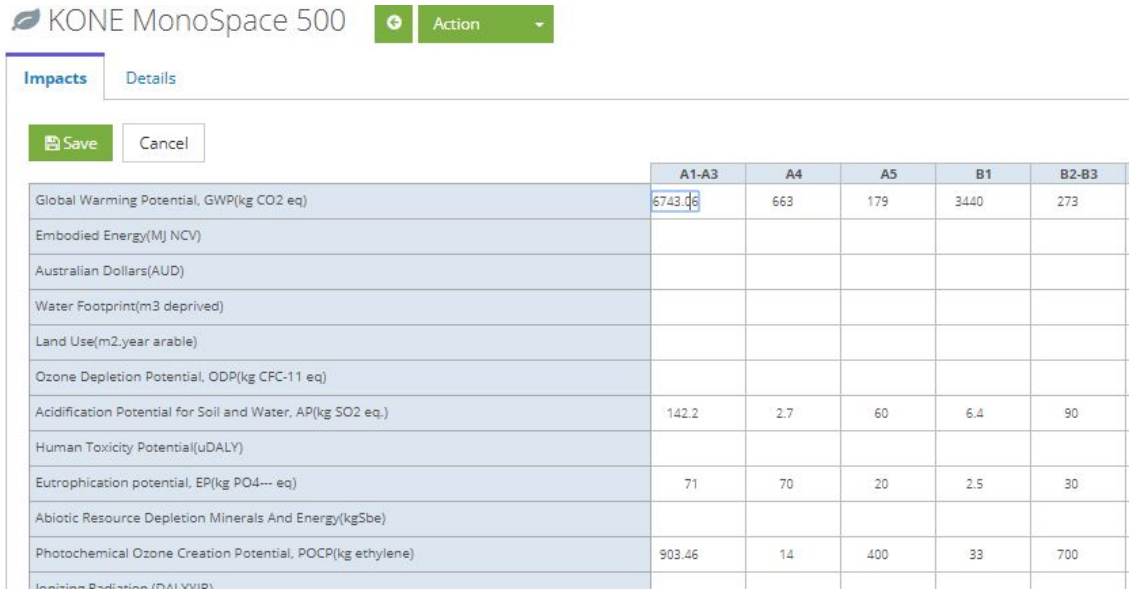
Name – **product name** as listed on the EPD document
Versatility – **Product Specific** or **Industry Average**
LCI Source Portability – **global**
Unit – m3/tonne/m/km/etc.
Product Service Life – in years - until replacement or major maintenance required.
Building Category for EPD use – mostly, **high speed rail** or **station** – see guidance document
Functionally Equivalent Material – **ignore** unless known
Suppliers Name – **Product Manufacture**
Suppliers email – if available
Description – as summarised in the EPD
EPD Title- **product name** as listed on the EPD document
Date – **EPD assured/produced**
URL – if available
Author – **name** or **organisation** – will be listed within the EPD – remember to click the + button
Attachment – drag and drop **EPD document**

New EPDs - Impacts

Align EPD Impacts and add the totals to the relevant impacts.

Most EDPs will not cover all, submit everything that is assessed.

Once complete – click save



	A1-A3	A4	A5	B1	B2-B3
Global Warming Potential, GWP(kg CO2 eq)	6743.06	663	179	3440	273
Embodied Energy(MJ NCV)					
Australian Dollars(AUD)					
Water Footprint(m3 deprived)					
Land Use(m2.year arable)					
Ozone Depletion Potential, ODP(kg CFC-11 eq)					
Acidification Potential for Soil and Water, AP(kg SO2 eq.)	142.2	2.7	60	6.4	90
Human Toxicity Potential(uDALY)					
Eutrophication potential, EP(kg PO4--- eq)	71	70	20	2.5	30
Abiotic Resource Depletion Minerals And Energy(kgSbe)					
Photochemical Ozone Creation Potential, POCP(kg ethylene)	903.46	14	400	33	700
Ionizing Radiation (DALY/IR)					

Activity 2

Add existing EPD to model – does it meet HS2 requirements

- Go to EPD library
- Search for Tarmac Asphalt
- Select and review impacts for compliance with HS2 requirements
- Return to EPD library – select another EPD with a globe beside it and review impacts for HS2 compliance
- Return to Design, select +New EPD, search for Tarmac Asphalt and add an estimated amount for an access road.

Add new EPD to library

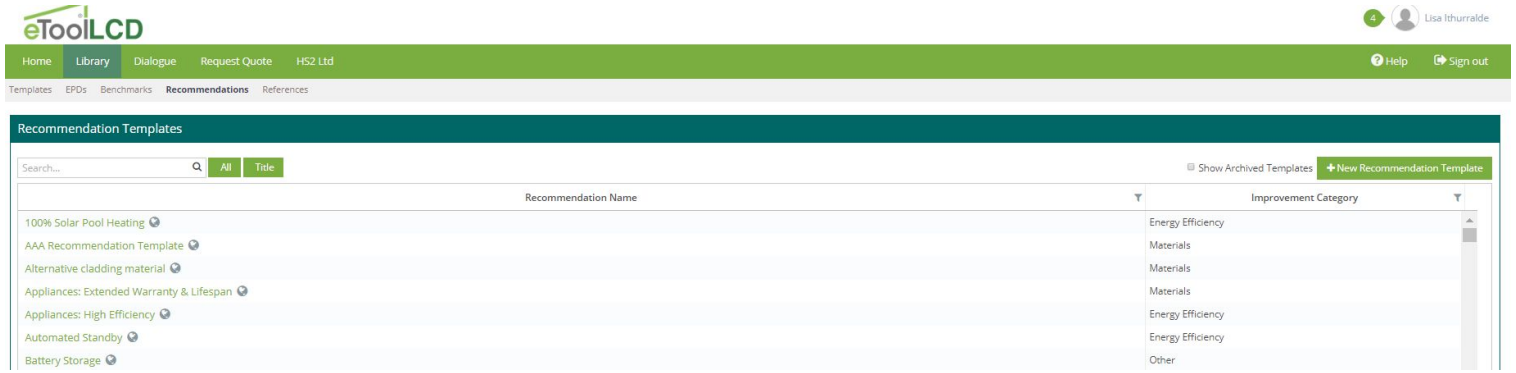
- Go to EPD library, select +New EPD
- Use EPD provided to complete the EPD input and upload

Library - Recommendations

This contains the pre-existing examples of recommended LCA reduction activities.

Globe Icon – available to all

Improvement Category – What aspect of the LCA model is effected by the recommended change

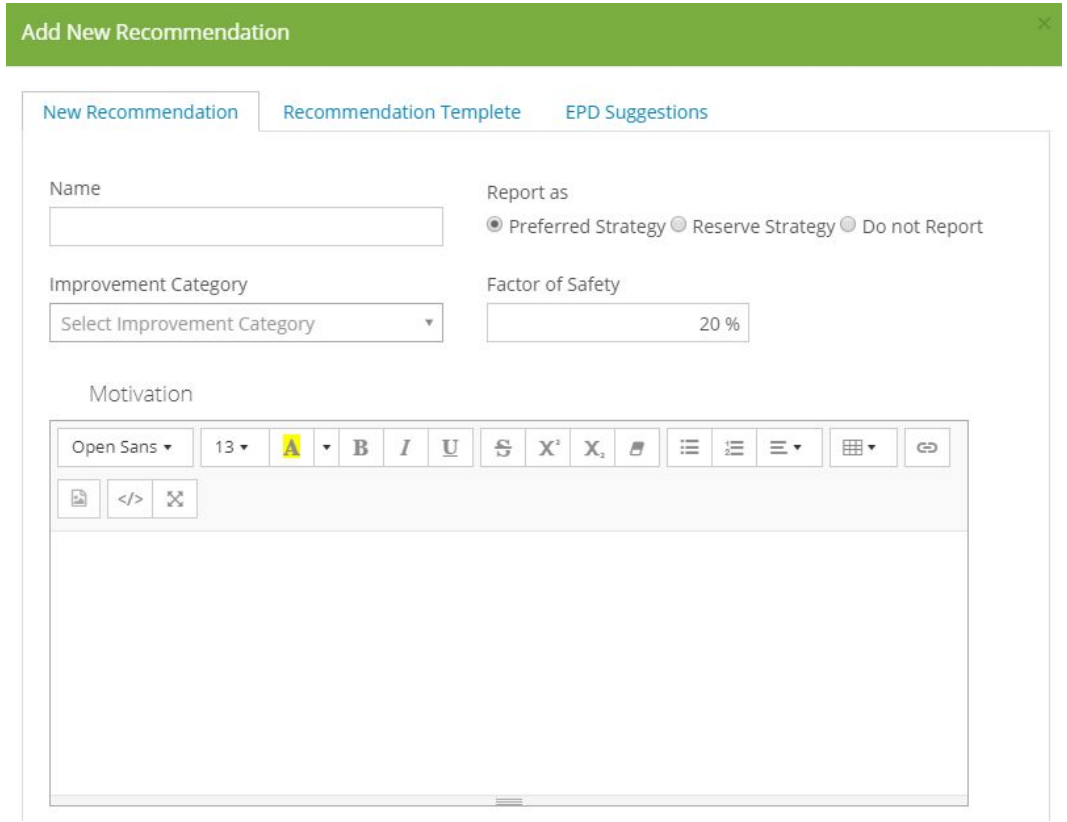


Recommendations Tab

Utilised to record recommendations and alternative design options.

Either select pre-loaded recommendations from the library or create from scratch.

Recommendations record only the changes from the current design – for example – change design to 30% GGBS will have a saving, but in the next design changing this to 40% will have a smaller saving as the 30% has already been banked.



Recording Effect of Recommendations

1. Once LCA design is complete, either clone design and select purpose - LCA Improved and name Design Option 1, 2, etc. or create in baseline to track savings.
2. List all the recommendations in the section, what changes are you planning to the design to improve the LCA model
3. Select the first recommendation, click record in the lower left corner.
4. Make the change to the design.
5. Click stop recording in the top left corner of the screen.
6. The change has now been applied to the design and the specific effect of this change has been recorded on the recommendation page.
7. Select the next recommendation on the list and follow the same process.
8. For further development work, clone the latest version and update – all purpose LCA Improved & update the design option number.

Activity 3

Set up several recommendation – both existing and at least one from scratch

- Go to the recommendation tab within the design
- Select +Add New
- Select one of the three tabs
  - New Recommendation – add recommendation from scratch
  - Recommendation Template – existing recommendation template
  - EPD Suggestions – based on industry standards
- Add several recommendations either based on the information added to the design or

Run the recommendations – some or all

- Select a recommendation and run the through the process on slide 34.

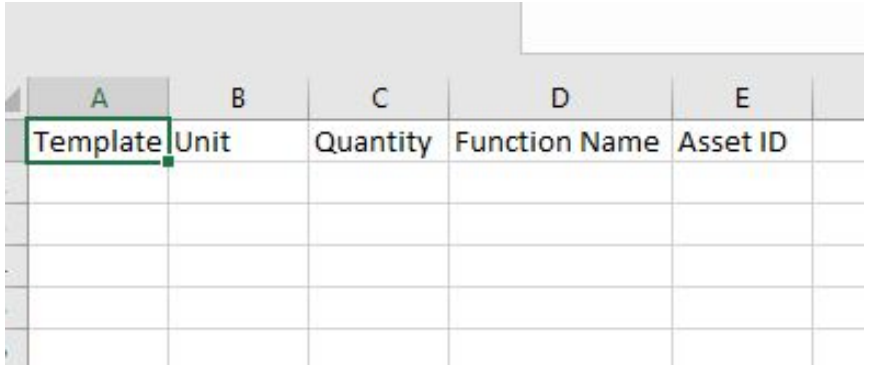
Bulk Upload – Upload File

Select +Import Template

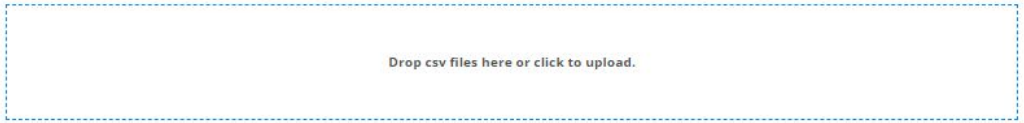
Then either drag and drop or double click to select file to upload.

Data can be bulk uploaded via a CSV file only.

It must contain a Material (template name), Quantity, Unit and either Asset Name or ID Number columns – in this order



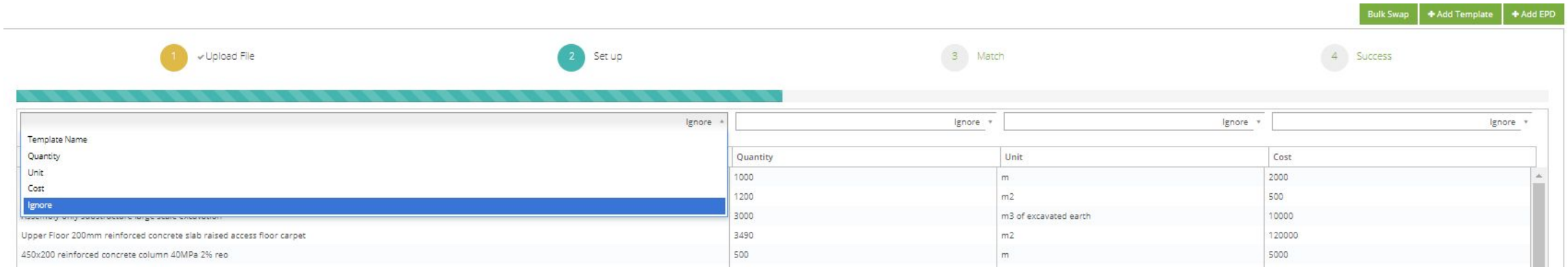
A	B	C	D	E
Template	Unit	Quantity	Function Name	Asset ID



Bulk Upload – Set Up

You then need to select the appropriate header from the top of the column.

Material – Template Name
Volume or weight - Quantity
Unit - Unit
Function Name – Asset Name
Asset ID – Asset Number



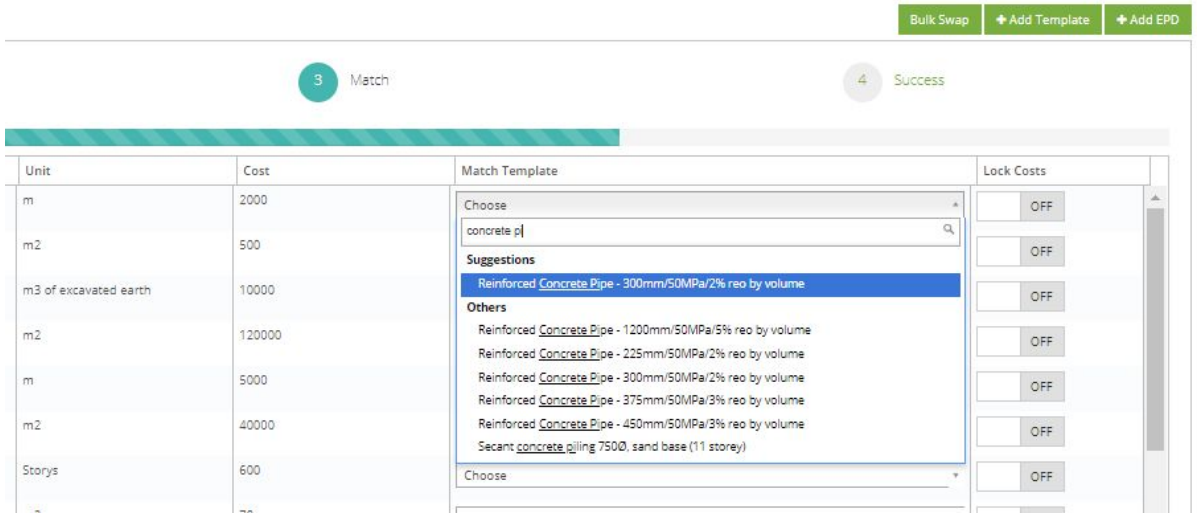
Bulk Upload - Match

Match materials being uploaded to existing library template.

Etool will offer suggestions

Be sure to keep a record of aligned templates – so that they can be used again

Additionally the selected template may need to be edited later if they do not align specifically with the item being uploaded.



Bulk Upload - Success

Once complete Import the file into the doc space.

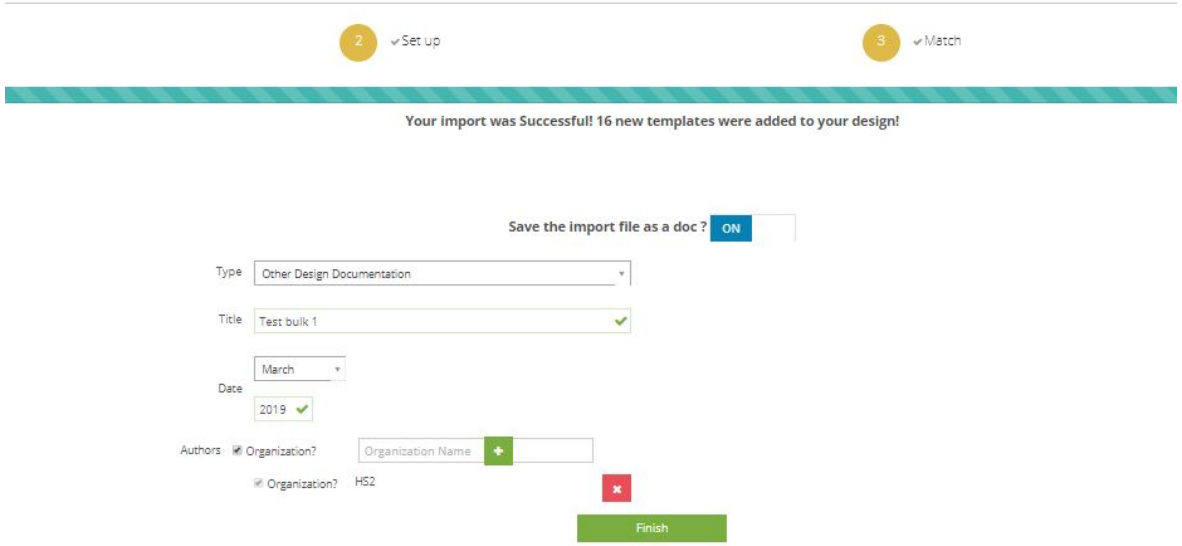
Type – Other Design Document

Title – As appropriate

Date – Month and Year

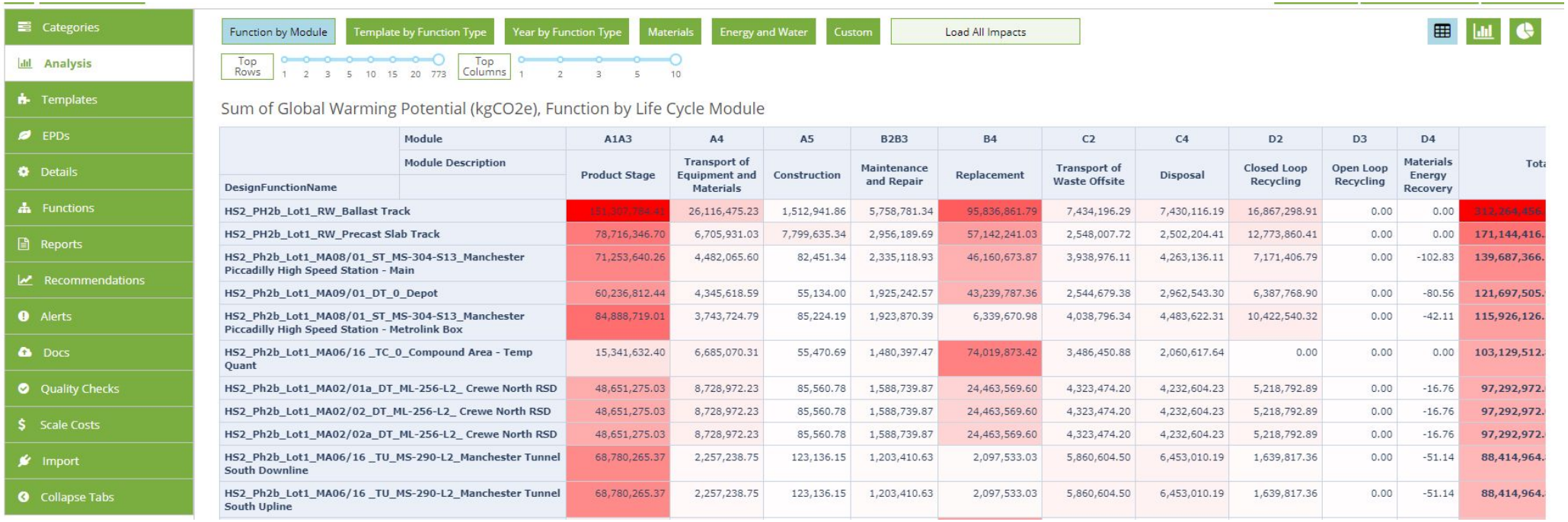
Author/Organisation – write in and select the + button to add.

Select Finish



Analysis Tab

The analysis tab allows for in tool investigation and improvement to the data.

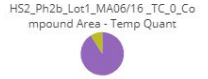


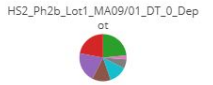
Sum of Global Warming Potential (kgCO2e), Function by Life Cycle Module

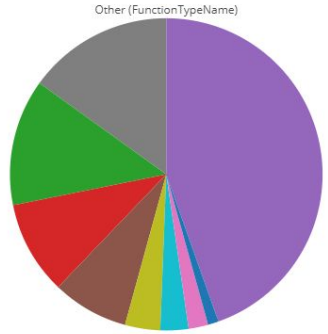
DesignFunctionName	Module / Module Description	A1A3 Product Stage	A4 Transport of Equipment and Materials	A5 Construction	B2B3 Maintenance and Repair	B4 Replacement	C2 Transport of Waste Offsite	C4 Disposal	D2 Closed Loop Recycling	D3 Open Loop Recycling	D4 Materials Energy Recovery	Tota
HS2_PH2b_Lot1_RW_Ballast Track		151,307,784.41	26,116,475.23	1,512,941.86	5,758,781.34	95,836,861.79	7,434,196.29	7,430,116.19	16,867,298.91	0.00	0.00	312,264,456.
HS2_PH2b_Lot1_RW_Precast Slab Track		78,716,346.70	6,705,931.03	7,799,635.34	2,956,189.69	57,142,241.03	2,548,007.72	2,502,204.41	12,773,860.41	0.00	0.00	171,144,416.
HS2_Ph2b_Lot1_MA08/01_ST_MS-304-S13_Manchester Piccadilly High Speed Station - Main		71,253,640.26	4,482,065.60	82,451.34	2,335,118.93	46,160,673.87	3,938,976.11	4,263,136.11	7,171,406.79	0.00	-102.83	139,687,366.
HS2_Ph2b_Lot1_MA09/01_DT_0_Depot		60,236,812.44	4,345,618.59	55,134.00	1,925,242.57	43,239,787.36	2,544,679.38	2,962,543.30	6,387,768.90	0.00	-80.56	121,697,505.
HS2_Ph2b_Lot1_MA08/01_ST_MS-304-S13_Manchester Piccadilly High Speed Station - Metrolink Box		84,888,719.01	3,743,724.79	85,224.19	1,923,870.39	6,339,670.98	4,038,796.34	4,483,622.31	10,422,540.32	0.00	-42.11	115,926,126.
HS2_Ph2b_Lot1_MA06/16 _TC_0_Compound Area - Temp Quant		15,341,632.40	6,685,070.31	55,470.69	1,480,397.47	74,019,873.42	3,486,450.88	2,060,617.64	0.00	0.00	0.00	103,129,512.
HS2_Ph2b_Lot1_MA02/01a_DT_ML-256-L2_ Crewe North RSD		48,651,275.03	8,728,972.23	85,560.78	1,588,739.87	24,463,569.60	4,323,474.20	4,232,604.23	5,218,792.89	0.00	-16.76	97,292,972.
HS2_Ph2b_Lot1_MA02/02_DT_ML-256-L2_ Crewe North RSD		48,651,275.03	8,728,972.23	85,560.78	1,588,739.87	24,463,569.60	4,323,474.20	4,232,604.23	5,218,792.89	0.00	-16.76	97,292,972.
HS2_Ph2b_Lot1_MA02/02a_DT_ML-256-L2_ Crewe North RSD		48,651,275.03	8,728,972.23	85,560.78	1,588,739.87	24,463,569.60	4,323,474.20	4,232,604.23	5,218,792.89	0.00	-16.76	97,292,972.
HS2_Ph2b_Lot1_MA06/16 _TU_MS-290-L2_Manchester Tunnel South Downline		68,780,265.37	2,257,238.75	123,136.15	1,203,410.63	2,097,533.03	5,860,604.50	6,453,010.19	1,639,817.36	0.00	-51.14	88,414,964.
HS2_Ph2b_Lot1_MA06/16 _TU_MS-290-L2_Manchester Tunnel South Upline		68,780,265.37	2,257,238.75	123,136.15	1,203,410.63	2,097,533.03	5,860,604.50	6,453,010.19	1,639,817.36	0.00	-51.14	88,414,964.

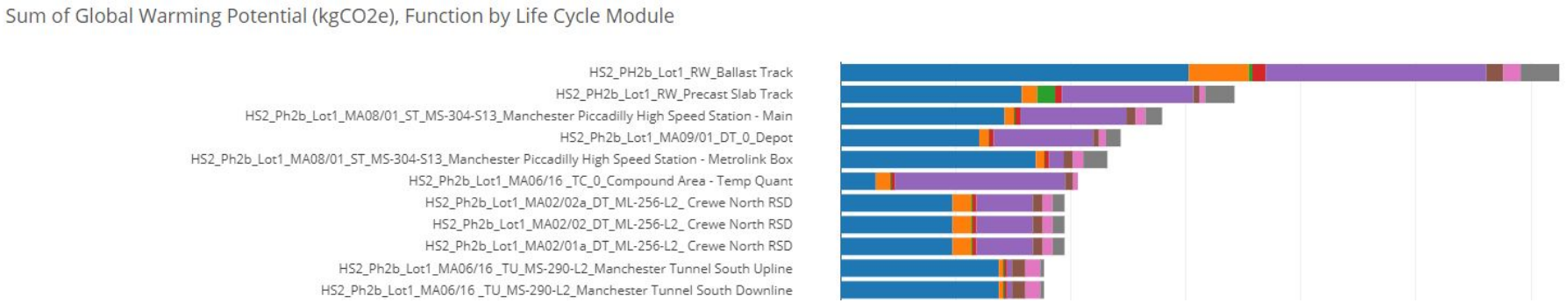
Analysis Tab

The data can be viewed in table, graph and pie chart formatted and copied for use within project reports.







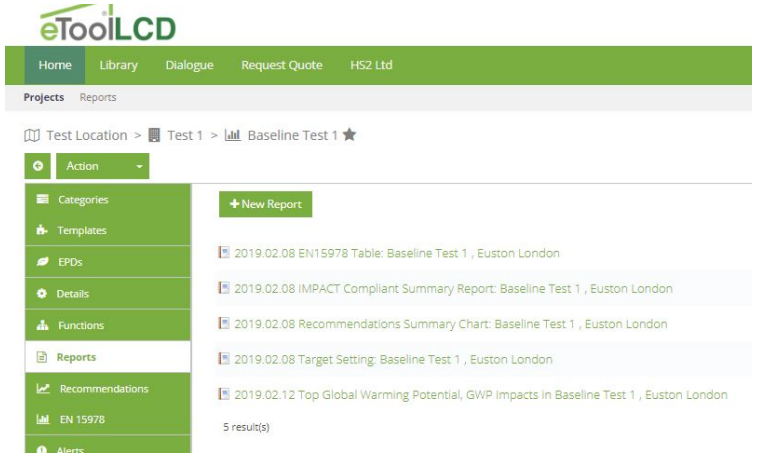


Reports Tab

Reports will be watermarked prior to etool validation – this will occur upon request of HS2 when designs are locked.

Any report that requires comparison to the benchmark can only be used for comparison to the project baseline – there is no industry benchmark for high speed rail currently available.

Click +New Report to run a report, they can be saved for record purposes or downloaded.



Reports described here with a * in beside the title are recommended.

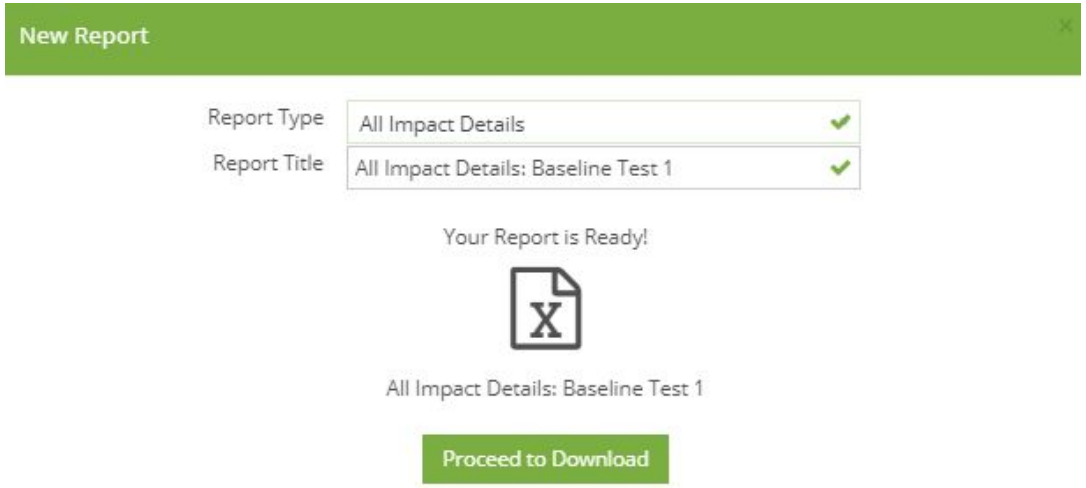
All Impact Details *

Excel export of Life cycle impacts broken down by asset number.

The excel file shows the whole project effect in an editable format.

Also available in this report is the material efficiency metric and its breakdown

Adding a filter function allows review of specific assets.



EN15978 Table

This report provides an evaluation of embedded environmental impacts.

Outputs in either pdf or excel.

Appropriate for AIMs upload

Running multiple reports will allow comparison of design stages

Ensure only the following embedded environmental impacts are selected when the report is run.

- Global Warming Potential, GWP
- Ozone Depletion Potential, ODP
- Acidification Potential for Soil and Water, AP
- Eutrophication potential, EP
- Photochemical Ozone Creation Potential, POCP
- Net use of fresh water, FW
- Abiotic Depletion Potential - Elements, ADPE
- Abiotic Depletion Potential - Fossil Fuels, ADPF
- Hazardous waste, HWD
- Non-hazardous waste, NHWD
- Radioactive waste (total), RWD

IMPACT Compliant Summary Report

BREEAM compliant output to be used for award evidence.

Outputs in either pdf or excel.

Characterised		Materials and Construction			Use Stage								End of Life Stage				Benefits and Loads Beyond the System Boundary	Total
		A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B6+	B7	C1	C2	C3	C4	D	
Global Warming Potential, GWP	kg CO2 eq	1.76e+8	1.53e+7	3.26e+6	0	0	MNA	MNA	15284	9832	0	0	0	1.79e+7	0	5.82e+6	-9.69e+6	2.09e+8
Embodied Energy	MJ NCV	1.34e+9	2.49e+8	6.13e+7	0	0	MNA	MNA	3.11e+5	1.08e+7	0	0	0	3.02e+8	0	1.80e+8	-9.35e+7	2.05e+9
Water Footprint	m3 deprived	7.16e+5	28487	15325	0	0	MNA	MNA	124	10986	0	0	0	33638	0	1.12e+5	-9193	9.07e+5
Land Use	m2.year arable	5.65e+2	1.08e+2	34.474	0	0	MNA	MNA	0.134	1.302	0	0	0	1.46e+2	0	1.96e+2	-26.478	1.02e+3
Ozone Depletion Potential, ODP	kg CFC-11 eq	9.46e+0	2.64e+0	6.36e-1	0	0	MNA	MNA	1.24e-3	1.07e-2	0	0	0	3.07e+0	0	1.80e+0	-4.44e-1	1.72e+1
Acidification Potential for Soil and Water, AP	kg SO2 eq.	5.02e+5	1.07e+5	23471	0	0	MNA	MNA	109	968	0	0	0	1.27e+5	0	41903	-38973	7.64e+5
Human Toxicity Potential	uDALY	2.44e+1	1.1596	0.2311	0	0	MNA	MNA	0.0223	0.0497	0	0	0	1.5972	0	0.3788	-0.7734	2.71e+1
Eutrophication potential, EP	kg PO4--- eq	1.68e+5	2.55e+4	5346.1	0	0	MNA	MNA	98.8	484.6	0	0	0	3.03e+4	0	8476	-1.17e+4	2.27e+5
Abiotic Resource Depletion Minerals And Energy	kgSbe	6.21e+5	1.10e+5	27190	0	0	MNA	MNA	141	649	0	0	0	1.34e+5	0	77882	-56879	9.14e+5
Photochemical Ozone Creation Potential, POCP	kg ethylene	2.73e+4	3.37e+3	890.45	0	0	MNA	MNA	5.03	426.31	0	0	0	4.29e+3	0	1737.5	-6.60e+3	3.15e+4
Ionizing Radiation (DALY)	IR	2.55e-1	3.44e-2	6.03e-3	0	0	MNA	MNA	5.58e-5	1.65e-4	0	0	0	4.35e-2	0	2.13e-2	-7.32e-3	3.54e-1
Marine Aquatic Ecotoxicity	uDay	1.34e-1	4.98e-3	8.45e-4	0	0	MNA	MNA	1.80e-4	4.14e-4	0	0	0	6.70e-3	0	1.13e-3	-6.45e-4	1.47e-1
Terrestrial Aquatic Ecotoxicity	uDay	1.24e-5	5.51e-7	1.24e-7	0	0	MNA	MNA	2.31e-9	1.68e-7	0	0	0	6.66e-7	0	4.00e-7	-2.28e-7	1.40e-5
Ecotoxicity	uCTUe	3.01e-2	4.14e-4	9.95e-5	0	0	MNA	MNA	1.25e-6	5.20e-4	0	0	0	4.28e-4	0	4.49e-4	-1.41e-3	3.06e-2
Particulate Matter	kg PM2.5	5.36e+4	16926	3610.7	0	0	MNA	MNA	10.7	298.9	0	0	0	1.97e+4	0	5587.8	-6609.8	9.31e+4
Net use of fresh water, FW	m3	4.19e+8	2.57e+7	2.15e+7	0	0	MNA	MNA	10134	51101	0	0	0	2.74e+7	0	1.76e+8	-3.00e+6	6.66e+8
Abiotic Depletion Potential - Elements, ADPE	kg antimony	5.51e+3	253.67	82.21	0	0	MNA	MNA	5.08	28.62	0	0	0	745.31	0	54.34	-51.66	6.62e+3
Human Toxicity Cancer	CTUh	5.77e+0	1.38e-1	2.46e-2	0	0	MNA	MNA	4.71e-4	7.31e-3	0	0	0	1.80e-1	0	3.40e-2	-6.70e-2	6.08e+0
Human Toxicity Non-Cancer	CTUh	1.72e+1	5.78e-1	0.115	0	0	MNA	MNA	7.26e-3	2.59e-1	0	0	0	8.30e-1	0	0.1963	-0.4861	1.87e+1
Freshwater Ecotoxicity	CTUe	3.57e+11	1.66e+10	3.29e+9	0	0	MNA	MNA	2.73e+8	1.55e+9	0	0	0	2.40e+10	0	6.15e+9	-2.45e+10	3.84e+11
Water Scarcity	m3 eq	1.18e+6	47008	25290	0	0	MNA	MNA	204	18147	0	0	0	55509	0	1.84e+5	-15170	1.50e+6
Ionizing Radiation	kBq U235 eq	4.90e+6	4.08e+5	80982	0	0	MNA	MNA	127	5188	0	0	0	5.68e+5	0	2.16e+5	-1.47e+5	6.04e+6
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	1.16e+9	2.35e+8	5.81e+7	0	0	MNA	MNA	2.54e+5	1.14e+6	0	0	0	2.82e+8	0	1.69e+8	-8.82e+7	1.82e+9
Hazardous waste, HWD	KG	2.20e+4	2.49e+4	5377	0	0	MNA	MNA	103.9	34.8	0	0	0	2.94e+4	0	8492	-1425.5	8.89e+4
Non-hazardous waste, NHWD	KG	2.75e+7	1.34e+7	7.30e+7	0	0	MNA	MNA	2907	29906	0	0	0	1.28e+7	0	7.19e+8	-5.33e+5	8.45e+8
Radioactive waste (total), RWD	KG	6.74e+3	1.61e+3	3.83e+2	0	0	MNA	MNA	0.948	2.765	0	0	0	1.89e+3	0	1.09e+3	-1.78e+2	1.15e+4

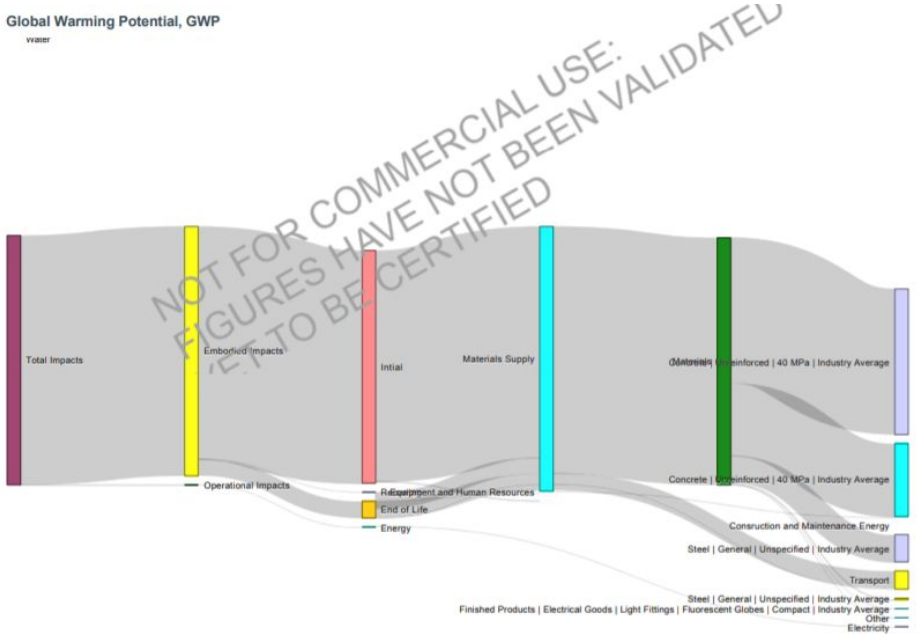
Impact Sankey Diagram Report

Visual breakdown of sources of environmental impact from total down to component materials.

Select from a all available embedded environmental impacts – see difference.

Can be run in pdf – but if live on the website then hovering over areas will bring up further detail

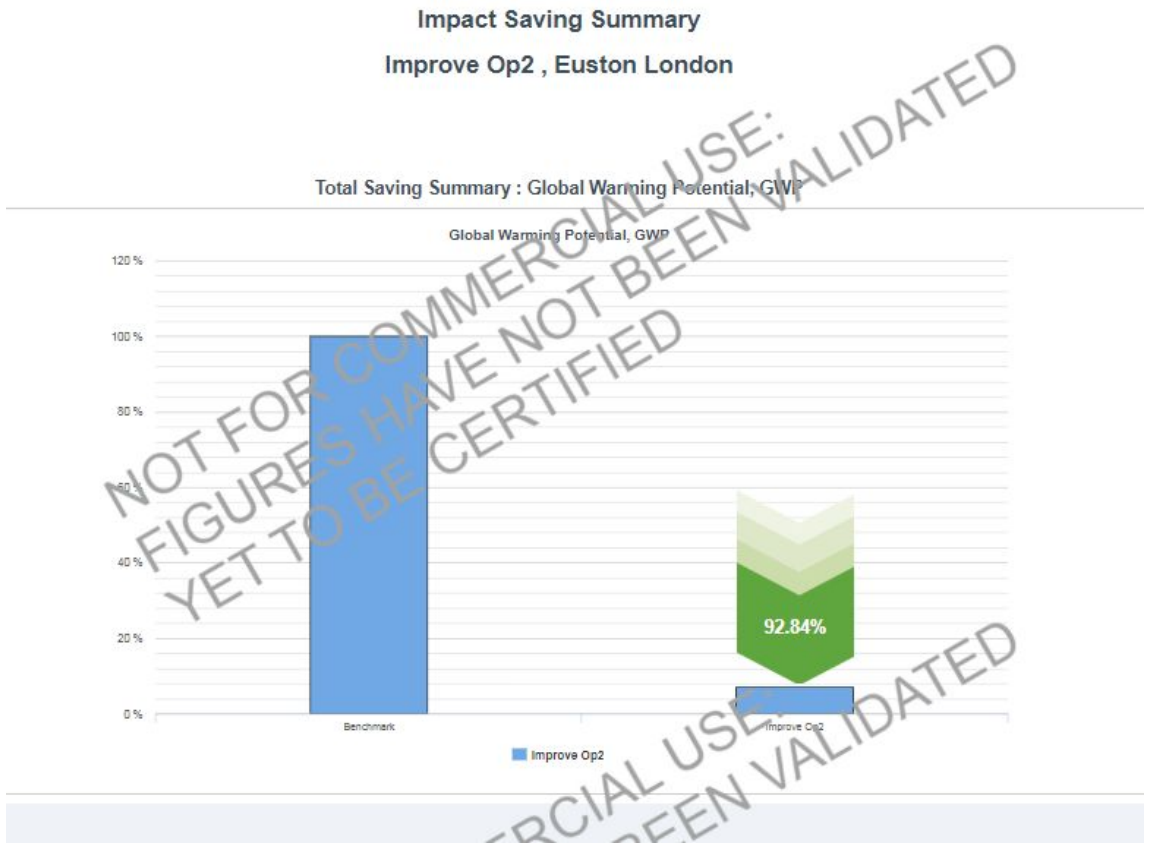
Can be utilised to identify high impact areas for focused reduction activities.



Impact Saving Summary

Only usable on Improved Designs or
As-built as it compares against the baseline.

Visual illustration of saving against the baseline.



Emission Certificate

Only usable on Improved Designs options or As-built as it compares against the baseline.

This clearly shows the reduction between the baseline and the later stage design.

Shows savings in embodied carbon, operational carbon and the total – percentage and bronze to platinum rating.

Clear single page showing % reduction in Carbon. Used to Evidence 50% reduction.

Design Life Inventory

This report breaks the model down into material streams used in the main construction and the amounts required for maintenance activities.

Clearly shows differing material life's and effect of multiple replacements across the 120y project life.

Good for ensuring all material life's are consistent and looking at alternative options

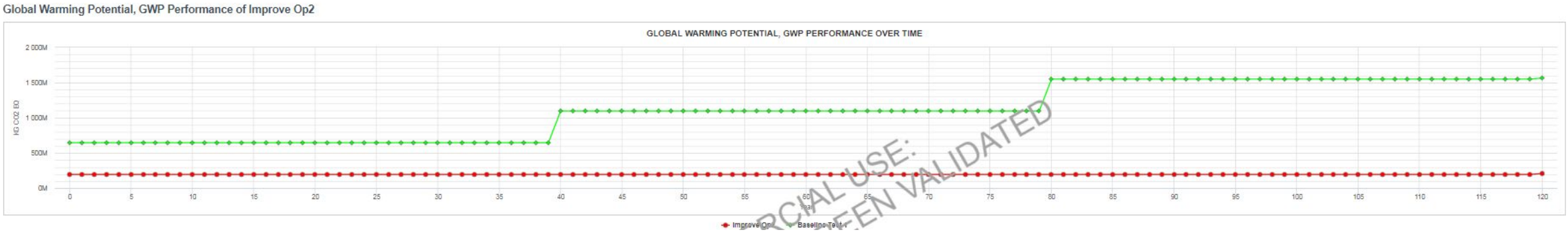
Description	Units	Quantity	Material Life (years)	Recurring Quantity	Recycled Content	Recycling Rate
Light Globes For Internal Fittings	# (Default)	132	4	3,960	0%	0%
Light fittings	kg	66	20	396	40.33%	80%
Light Fittings	kg	264	20	1,584	0%	0%
Poured Concrete wall	m3	100,000	150	0	0%	0%
Steel Piles	kg	775,500	150	0	40.33%	80%
Pour Concrete Foundations	m3	200,000	150	0	0%	0%
steel reinforcement bars (foundation)	kg	15,800,000	150	0	40.33%	80%
White Internal Wall Paint	m3	50,000	40	100,000	0%	0%

Impact Time Series Comparison Report

Compare to design levels against each other.

Shows effect of environmental impact over the 120y life in a visual manor, with increase at maintenance intervals to show the effect of replacement.

Also a table breaking down these impacts across energy & water, materials, labour & equipment for each year from 1-120y.



LCA Design Feedback Report *

This report will only run if all assets have been set up with usable space rather than common space.

This report can only be run for improved designs options - it requires a baseline design for comparison.

When selecting the baseline – choose the project baseline design and up to one other previous version of the design to compare against.

The report provides a summary of all environmental impacts required by HS2 and the Material Efficiency Metric – Available in pdf and word format.

The report highlights savings against the baseline and low impact strategy's recorded at each stage.

Materials Inventory Summary

Lists all materials with kg and m3 of volume currently contained within the model.

e1001LCD

Material Inventory Summary

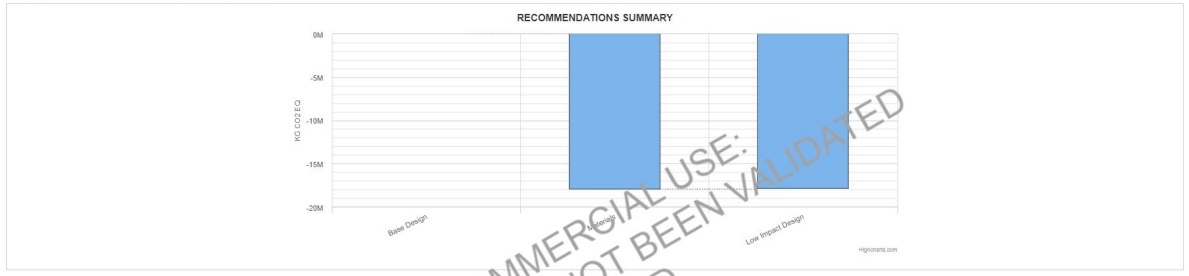
Material	Mass(kg)	Volume(m3)
Concrete | Unreinforced | 40 MPa | Industry Average	238,400,000	100,000
Finished Products | Electrical Goods | Light Fittings | Fluorescent Globes | Compact | Industry Average	0	0
Plastics | General | Unspecified | Industry Average	264	.191
Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm | Industry Average	66	.008

Recommendation Summary Chart

Highlights savings per recommendation against the base design.

This can be run after each substantive update to the main design.

Recommendation Summary of Baseline Test 1



Recommendation(s)

Recommendation	GWP (kg CO2 eq/Absolute(No Functional Unit))			% Saving Against Benchmark
	Initial	10 Year	Life time	
Concrete Replacement: 50% fly-ash blend German Source	-17,705,331.61	-17,684,563.35	-17,913,014.26	N/A
Concrete Reduction: Replace concrete with timber stud walls	0	0	0	N/A
Total	**-17,705,331.61**	**-17,684,563.35**	**-17,913,014.26**	**0**

Recommendation Summary of Baseline Test 1 (Global Warming Potential, GWP)

Item	Value (kg CO2 eq)
Base Design	0
Materials	-17,913,014
Low Impact Design	-17,913,014

Target Setting

Only usable on Improved Designs options as it compares against the baseline and earlier options.

Shows comparisons between design levels and listed recommendations that have not yet been actioned.

Set up as a baseline for a workshop to develop further design improvements

Top Impact Reports

Change top 10 items to 200 to show the main materials used within the model.

Provides report that list all materials in the model in order of greatest impact on the overall model.

This allows for identification of the highest impact materials either by volume or carbon effect.

Can be run for different environmental indicators.

Top 200 Materials By Total Impact

Material	Initial (kg CO2 eq)	Transport (kg CO2 eq)	Recurring (kg CO2 eq)	Recycling (kg CO2 eq)
Paints and Finishes | Water Based | 1 Coat | Industry Average	425,398,979.4000	24,766,893.9892	2,259,680,315.4577	0.0
Concrete | Unreinforced | 40 MPa | Industry Average	102,944,168.6592	5,407,908.4193	0.0000	0.0
Concrete | Unreinforced | Blast Furnace Slag Blends | 20 MPa | 40% BFS | Industry Average	29,365,712.7236	7,125,762.4694	0.0000	0.0
Steel | General | Unspecified | Industry Average	22,048,488.4424	6,476,484.8908	0.0000	-9,687,297.6
Finished Products | Electrical Goods | Light Fittings | Fluorescent Globes | Compact | Industry Average	256.3347	11.3733	7,763.5318	0.0
Plastics | General | Unspecified | Industry Average	787.8313	119.3062	4,535.6874	0.0
Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm | Industry Average	214.2466	2.0325	1,085.2077	-244.2

Top 200 Materials By Transport Impact

Material	Initial (kg CO2 eq)	Transport (kg CO2 eq)	Recurring (kg CO2 eq)	Recycling (kg CO2 eq)
Paints and Finishes | Water Based | 1 Coat | Industry Average	425,398,979.4000	24,766,893.9892	2,259,680,315.4577	0.0
Concrete | Unreinforced | Blast Furnace Slag Blends | 20 MPa | 40% BFS | Industry Average	29,365,712.7236	7,125,762.4694	0.0000	0.0
Steel | General | Unspecified | Industry Average	22,048,488.4424	6,476,484.8908	0.0000	-9,687,297.6
Concrete | Unreinforced | 40 MPa | Industry Average	102,944,168.6592	5,407,908.4193	0.0000	0.0
Plastics | General | Unspecified | Industry Average	787.8313	119.3062	4,535.6874	0.0
Finished Products | Electrical Goods | Light Fittings | Fluorescent Globes | Compact | Industry Average	256.3347	11.3733	7,763.5318	0.0
Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm | Industry Average	214.2466	2.0325	1,085.2077	-244.2

Top 200 Materials By Recurring Impact

Material	Initial (kg CO2 eq)	Transport (kg CO2 eq)	Recurring (kg CO2 eq)	Recycling (kg CO2 eq)
Paints and Finishes | Water Based | 1 Coat | Industry Average	425,398,979.4000	24,766,893.9892	2,259,680,315.4577	0.0
Finished Products | Electrical Goods | Light Fittings | Fluorescent Globes | Compact | Industry Average	256.3347	11.3733	7,763.5318	0.0
Plastics | General | Unspecified | Industry Average	787.8313	119.3062	4,535.6874	0.0
Steel | Coated Sheet | Zinc Coated & Coloured Sheet 0.43mm | Industry Average	214.2466	2.0325	1,085.2077	-244.2

Activity 4

Run reports

- Go to report tab in design
- Select +New Report
- Create a LCA Design Feedback Report
- Create a All Impact Details Report
- Create a Impact Time Series Comparison Report
- Choose another report to create

Workshop time

Any Questions?