TrainERGY project

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Virtual Learning Environment Manual

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CONTENT

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1: HOME PAGE

1.1 The *Intelligent* Version of the Supply Chain Environmental Analysis Tool (SCEnAT*i*) operates on the Windows Azure Cloud Platform and can be accessed online at (select the Login from the red rectangle in Figure 1):

http://www.scenat.com/

SCEnAT*i* can operate on any internet browser; however, for an optimal performance, we recommend using Google Chrome which can be installed freely on any computer.

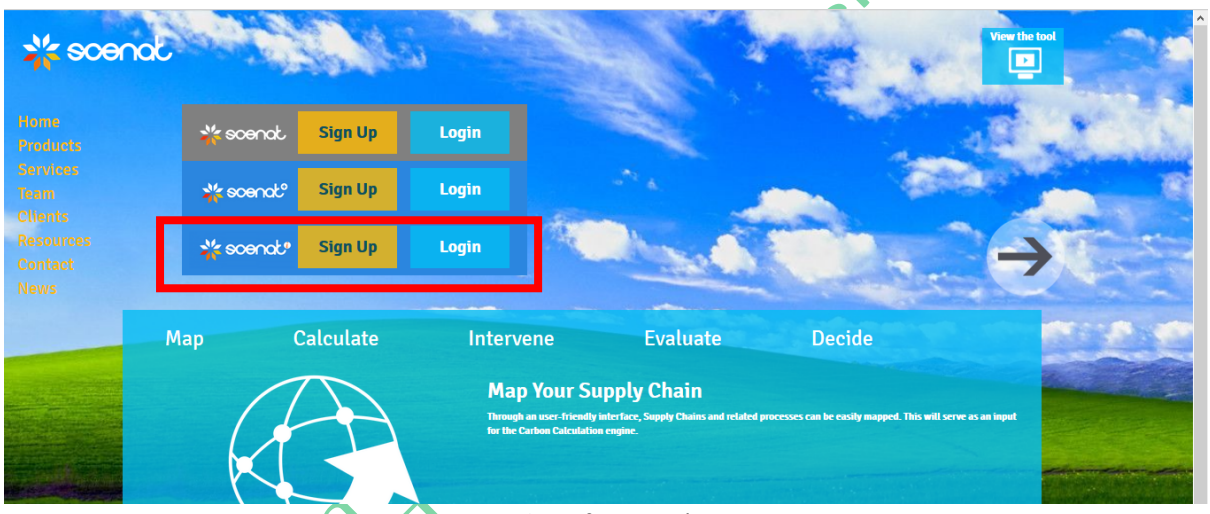

Figure 1: *Screen-shot of SCEnATi's Home Page*

1.2 On the home page, user can ***'Sign-Up'*** to gain access to the tool or read on some background information of the tool by clicking on ***'Find Out More'.***

1.3 To ***'Register'***, you will need to provide email details, name of user and of organisation and a choice of password. Registered users can click on ***'Login'*** after signing up to SCEnAT*i*. To gain access to the tool, click on ***'Access the Tool'*** after Logging in.

1.4 The Home Page also has the following tabs: ***'Map', 'Calculate', 'Intervene', 'Evaluate', 'Decide'.*** These tabs describe the integrated inter-disciplinary modules on which the SCEnAT (and its intelligent version SCEnAT*i*) was developed. By clicking on these, you can gain methodological and background information on each module

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1.5 The Home Page also has a ***'Search'*** functionality

1.6 Useful links to some external websites are also provided on the Home Page

2: DEVELOPING A SUPPLY CHAIN MAP

2.1 To create a new Supply Chain Map:

- Either: click on ***'Create New'*** after '***Accessing the Tool'***
- Or: click on ***'Upload*** after '***Accessing the Tool'***

2.2 In both cases, user will be asked to provide the following information

- Name of your Supply Chain
- Organisation
- Product Name
- Country
- Economic Input-Output Classification[1]
- Economic Input-Output Sub-Classification[2]
- Functional Unit[3]
- Unit
- Currency

2.3 A user has the choice of sharing your results with other users by ticking the check box

2.4 These information should be ***'saved'*** before continuing

[1] Refer to Appendix 1

[2] Refer to Appendix 2

[3] The functional unit defines the product being studied and provides the reference of the product supply chain to which all inputs and outputs can be related

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2.5 In case the user clicked on "***Upload***" then the user must click on "***Browse***" after performing steps 2.1, 2.2, 2.3 and 2.4 and select only the desired Excel file which contains the data input template. Please make sure not to alter the template fields (check the detailed instruction in the Excel file). Download the Excel file from here: http://www.scenat.com/wp-content/uploads/2016/11/data_upload_template.xlsx

2.6 The user is taken to the dynamic ***'Supply Chain Mapping Screen'***

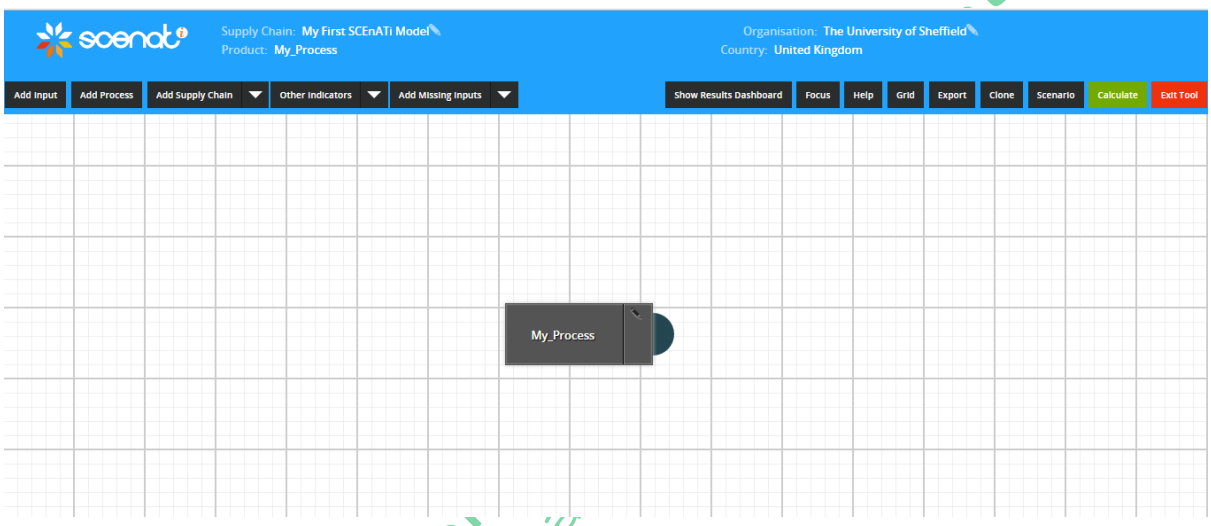

Figure 2: SCEnATi *Dynamic Mapping Screen*

2.7 The following steps provides guidance on building a new Supply Chain Map

- Supply Chain products consist of either ***'Inputs'***and ***'Processes'***which are linked to the final or reference product
- To add a ***'Process'*** to the supply chain, click on ***'Add Process'*** and specify the name of the process before saving
- Similarly, to add an ***'Input'***to the product Supply Chain, click on ***'Add an Input'***and specify the following:
    - ***'Name'*** of the Input[4]

[4]**Name**: This specifies the name of an 'INPUT' required in the supply chain. Example 'STEEL'

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- The Economic Input-Output ***'Sector'*** that the Inputcan be classed[5]
- The Economic Input-Output Sub-Sector describing the ***'Classification'*** of the Input[6]
- Specify the ***'Quantity'*** of Input into the Supply Chain[7]
- The ***'Unit'*** of the Input[8]
- The ***'Emissions Intensity'*** of the Input[9]
- The average ***'Unit Cost'*** of the Input[10]
- When building a product supply chain, specified ***'Inputs'*** are usually linked directly to the ***'Final Product'*** or linked to a named ***'Process'***. In the example shown below in Figure 3, ***'Input 1'*** is linked to ***'Process 1'*** which in-turn is linked to the ***'Final***

[5]**Sector**: The whole national economy has been divided into 18 different broad sectors. Choose the sector that most identifies with the' input' specified above. Example: If the 'NAME' of the input is specified as 'STEEL' then 'METALS' must be chosen as the Sector. For further details refer to Appendix 1

[6]**Classification**: The classification is a disaggregation of the sectors. It follows the UK Standard Industrial Classification of Economic Activities. Choose the classification that best describes the specified 'input' into the supply chain. For example: Having specified 'Steel' as the 'NAME' and 'METALS' as the sector, then 'BASIC IRON and STEEL and of FERROUS ALLOY' but be selected as the classification. For further details refer to Appendix 2

[7]**Quantity**: This specifies the quantity of 'INPUT' required in the supply chain to produce or manufacture the final product.

[8]**Unit**: The 'UNITS' should correspond to the quantity of 'INPUT' specified above required to produce the final product. Common units include: kg, tonne, MJ, tonne-kilometre or (tkm), GJ, litre, etc. Example, for steel, the UNITS can be specified in terms of [tonne].

[9]**Emissions Intensity**: This is the level of equivalent greenhouse gas emissions per unit of input. The units must be specified in terms of [kg CO_2-eq/unit]. Example: the emissions Intensity for STEEL can be specified as 0.88053 kg CO_2-eq per kg. Given that the quantity of STEEL was specified in terms of kg; the EMISSIONS INTENSITY must be in terms of kgCO_2-eq per tonne. EMISSIONS INTENSITIES vary widely across countries owing to variety of factors.

[10]**Unit Cost:** The unit cost is the average basic price of the INPUT specified above expressed as [£/unit]. For example, since the quantity of steel was expressed in terms of tonnes, the unit cost of steel must be in terms of [£/tonne].

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Product'. As shown, ***'Input 2'***for example is also linked directly to the ***'Final Product'***.

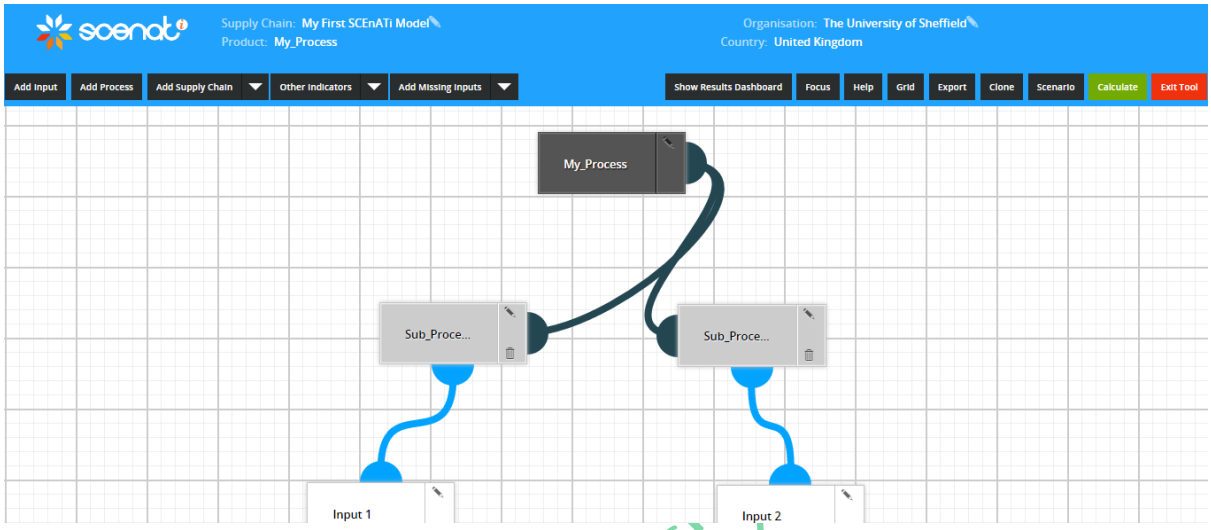

Figure 3: Linking Inputs, Processes and Final Product when building Supply Chain Map

- The mapping screen is dynamic, hence all specified ***'Inputs'***and ***'Processes'***can be moved around on the screen when creating the supply chain map
- Each ***'Inputs'***and ***'Processes'***added to the supply chain has ***'Delete'*** and ***'Edit'*** icons which can be used to either remove any ***'Inputs'***and ***'Processes'***added to the supply chain or to modify the parameters.
- After building the supply chain and specifying all ***'Direct Inputs',*** the missing inputs[11] into the supply chain should also be specified

[11]**Missing Inputs:** Inputs into supply chains are either direct or indirect. Emissions associated with Indirect Inputs are estimated using Environmental Input-Output Analysis within SCEnAT*i*. Using prior knowledge and understanding of the product supply chain, specify the Indirect Input that have not been added to the product supply chain by choosing an Economic Sector under ***'Select Industry Type'*** and subsequently ***'Select Input Descriptor'.*** These can be found under ***'Add Missing Inputs'***. For example, if the indirect impacts associated with a factory has not been added to the product supply chain but is classed as an Indirect Input; under ***'Add Missing***

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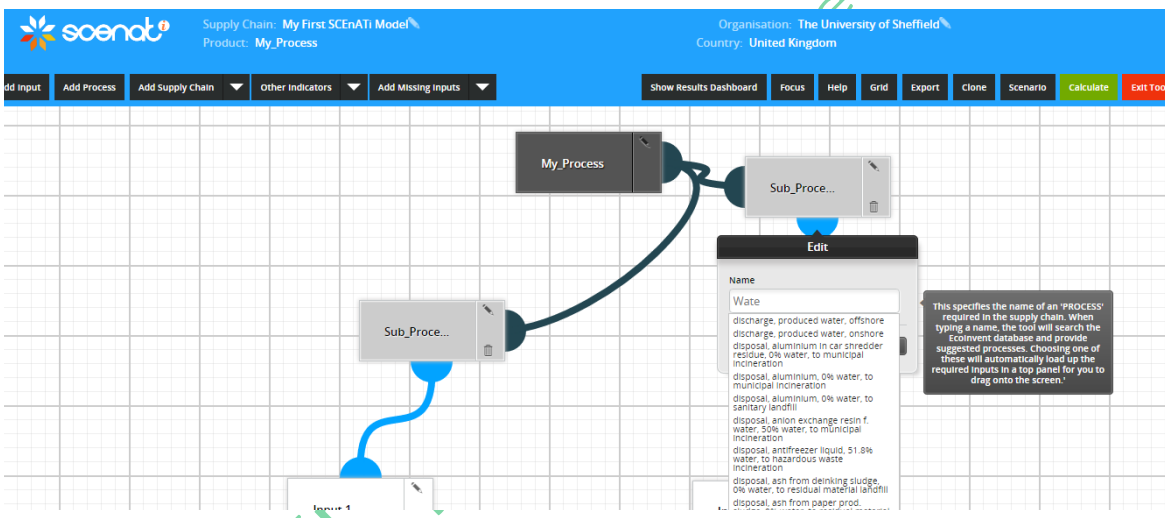
2.8 It is worth to mention that supply chains can be also mapped by utilising secondary data stored at the back of the tool. When adding ***'Processes'*** to the supply chain, a look-up functionality is activated (see Figure 4). This functionality *suggests* similar supply chains that are available in the system and can be selected.

Once a process is selected, inputs associated with this process in typical supply chains are then suggested. The user can drag them and start populating the mapping screen with some predefined data (both in terms of quantities and emissions).



Inputs' choose: ***'Construction'*** under ***'Select Industry Type'*** and then ***'Construction of Commercial Buildings'*** under ***'Select Input Descriptor'***.

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Figure 4: Looking for secondary data

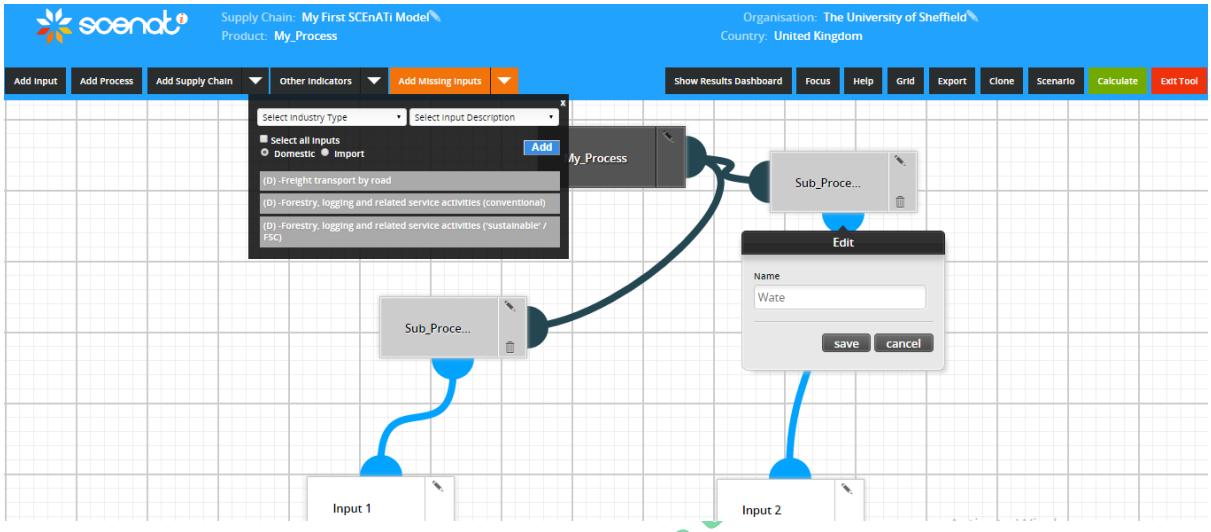

Figure 5: Adding inputs related to secondary data processes

2.9 It must also be highlighted that SCEnAT*i* allows computing the environmental impact of supply chains not just through the estimation of carbon emissions, but taking into account a wide range of environmental indicators. By clicking on the button "Other Indicators" (see Figure 6), the user can incorporate further 5 indicators in the calculations. The most common calculation methodologies for environmental impacts are included, along with a wide range of impact categories. By clicking on the button, a drop-down menu is activated. Indicators are classified based on the calculation paradigm and on the impact category.

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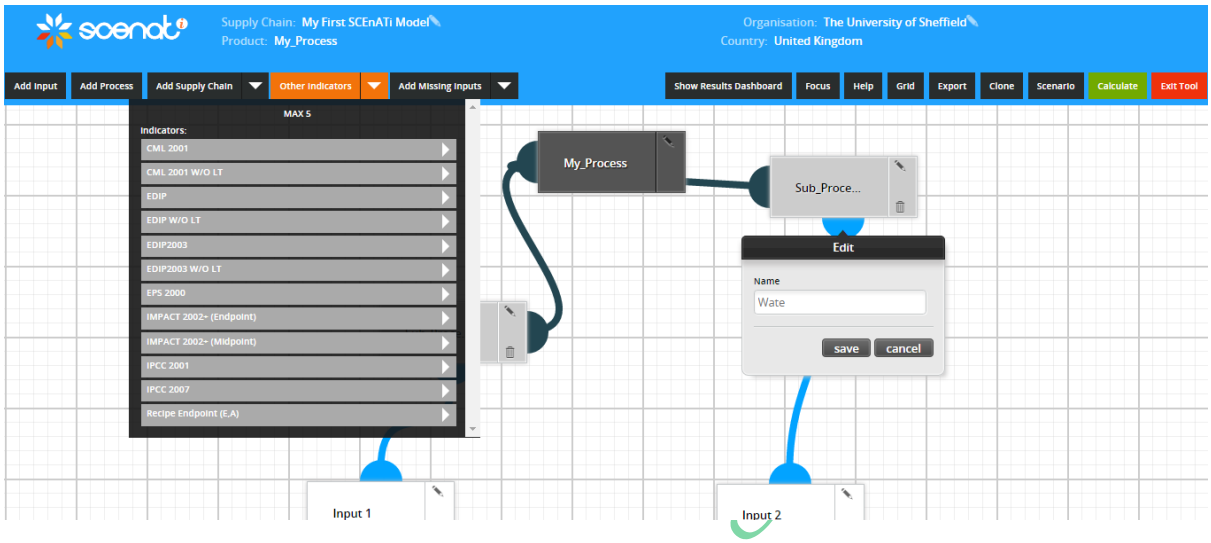

Figure 6: Adding additional environmental indicators to the assessment

2.10 Once an indicator is selected, the user will be asked to specify, for each input, the impact intensity, in a very similar fashion to what is done for carbon intensities. Figure 7 below details the data entry process for an input, where, alongside Carbon Emissions, indicators such as *Land Use Competition* and *Eco-System Quality* are measured. Also in this case, it is possible leveraging on secondary data stored in the tool. When adding 'Processes' to the supply chain, the above-mentioned look-up functionality suggests similar supply chains that are available in the system and can be selected; once a process is selected, inputs associated with this process in typical supply chains are then suggested. The user can drag them and start populating the mapping screen with some predefined data, both in terms of quantities and of any environmental impact indicator that has been selected.

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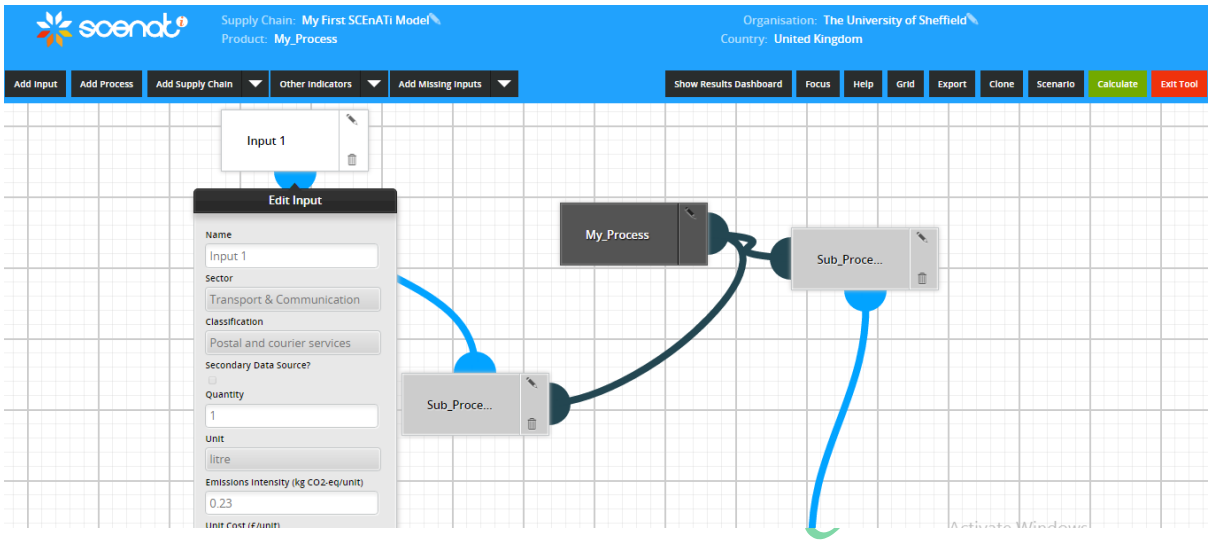

Figure 7: Adding environmental indicators intensities

3: SUPPLY CHAIN CARBON MAP/CALCULATION

3.1 To obtain the product supply chain carbon map after building the supply chain, click on ***'Calculate'***. The map automatically transforms into a carbon map[12]as illustrated in Fig 4. The Hybrid LCA methodology[13,14,15] (an integration of Process LCA and Environmental Input-Output LCA) within a Multi-Regional Input-Output framework is the carbon accounting model built behind SCEnAT*i*.

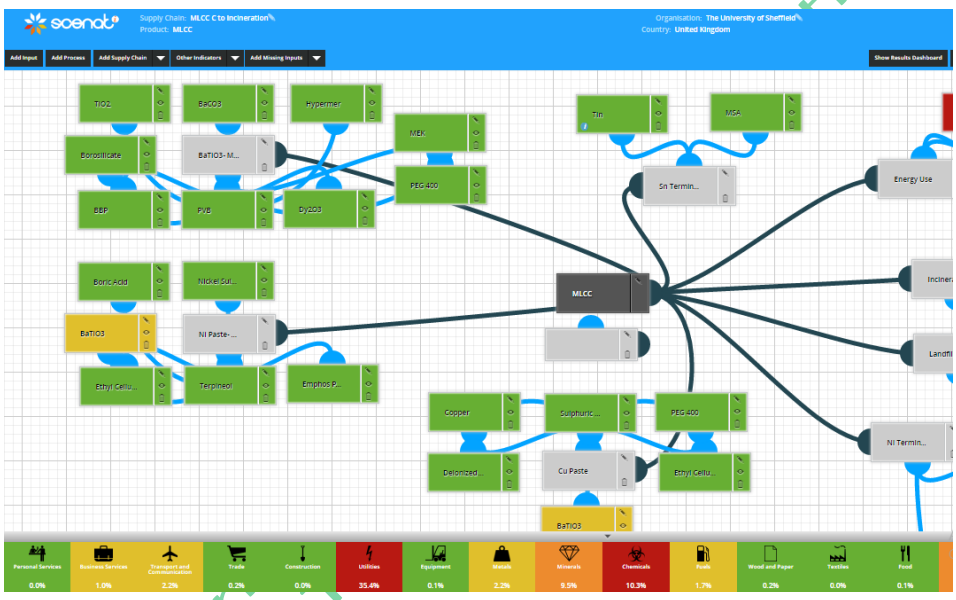

Figure 8: *Example of Supply Chain Carbon Map*

[12]**Supply Chain Carbon Map:** SCEnAT*i* defines a product supply chain carbon map as a whole supply chain representation of the lifecycle carbon emissions associated with the production of a given product. The supply chain carbon map as shown in Figure 4 consist of both direct and indirect emissions associated with the supply chain, hence it accounts for both Scope 1, 2 and 3 emissions associated with the product supply chain.

[13]***Acquaye et al.*** (2011) Identification of 'Carbon Hot-Spots' and Quantification of GHG Intensities in the Biodiesel Supply Chain Using Hybrid LCA and Structural Path Analysis; Environmental Sci. & Tech., 45 2471-2478

[14]***Wiedmann et al*** (2011) Application of Hybrid Life Cycle Approaches to Emerging Energy Technologies – The Case of Wind Power in the UK. Environmental Sci. & Tech, 45, 5900-5907.

[15]***Suh et al*** (2005) Methods for Life Cycle Inventory of a product; Journal of Cleaner Production, 13, 687-697

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3.2 The Product Supply Chain Carbon Map has the following characteristics:

- ***Automatic Carbon Hot-spotting:*** High carbon inputs into the supply chain are automatically identified and classed as hot-spots. These hot-spots are relative to the total lifecycle emissions. For example ***'Inputs'***with emissions greater that 10% are automatically tagged with the colour ***'RED'.***
- ***Direct Emissions:*** The Direct Emissions associated with the product supply chain are presented on the main grid of the mapping screen.
- ***Indirect Emissions***: The Indirect Emissions associated with the product supply chain from the wider economy are represented at the bottom of the supply chain carbon map across 18 aggregated sectors. Refer to Appendix I for details of these economic sectors. The relative percentage contributions from each of these sectors are indicated on the carbon map. Click on the arrow ( ) at the bottom of the screen if the indirect emissions are not showing on the map.
- ***Results in Graphical Form:*** The total lifecycle emissions (direct and indirect) are presented as a pie chart on the left pane. Click on the arrow **(>>)** if the pie charts is not showing on the carbon map. The emissions of each supply chain input is also summarised on the left pane under ***'Input Summary'*** when the user clicks on ***'View Emissions Data'*** symbol on the input.
- ***Automatic linkage to Low Carbon Intervention***: SCEnAT*i* is populated with a number of interventions. If there is a matching intervention within the database for an identified carbon-hotspot, on clicking on ***'View Emissions Data'***for thatHot-spot Input, a link to the matching intervention is shown under ***'Matching Intervention'*** in the left hand pane.

3.3 The supply chain carbon mapping screen also has the following functionalities:

- ***Clone:*** By clicking on ***'Clone'*** the supply chain map or carbon map is cloned or replicated. This can be useful when performing different scenarios.
- ***Grid:*** By clicking on **'Grid'**, the data and results are displayed in Tabular form
- ***Export:*** By clicking on **'Export'**, data and results are exported into a Portable Document Format (pdf) report.

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- ***Exit:*** By clicking on **'Exit'**, the supply chain map is saved and the user exits the tool.

3.4 The result dashboard (that is accessible through the dedicated button in the top frame) displays a variety of information that can be of use to the decision-maker.

- The box ***'calculation summaries'***(at the top of the dashboard) reports the total carbon emissions (and detail of matching interventions) along with the total cost associated with the product lifecycle (comprehensive of the cost of direct and indirect inputs). Also, a summary of further environmental indicators will be reported here.
- The box ***'sector emissions'***reports the following information:
  - *Sector Total*: Carbon Emissions from the mapped supply chain (including estimated missing inputs) are aggregated based on their macro-economic classification (see Appendix I) and reported here.
  - *Benchmark Total*: Emissions from the supply chain of a typical product belonging to the same sector of the mapped one are shown here, broken down in contributions from macro-economic sectors.
  - *Benchmarking Comparison:* Emissions from the mapped supply chain and from the mapped one are compared; absolute differences across macro-economic sectors are shown here.
- The box ***'Input chart data'*** (at the bottom of the dashboard) reports the pie charts showing, respectively:
  - the contribution of direct inputs to carbon emissions;
  - the split between emissions from direct and indirect inputs;
  - the contribution of direct inputs to the cost of the product;
  - the split between costs from direct and indirect inputs;
  - the contribution of direct inputs to additional selected environmental indicators.
- At the very bottom of the screen, the split of indirect carbon emissions associated with the product supply chain from the wider economy can be retrieved again.

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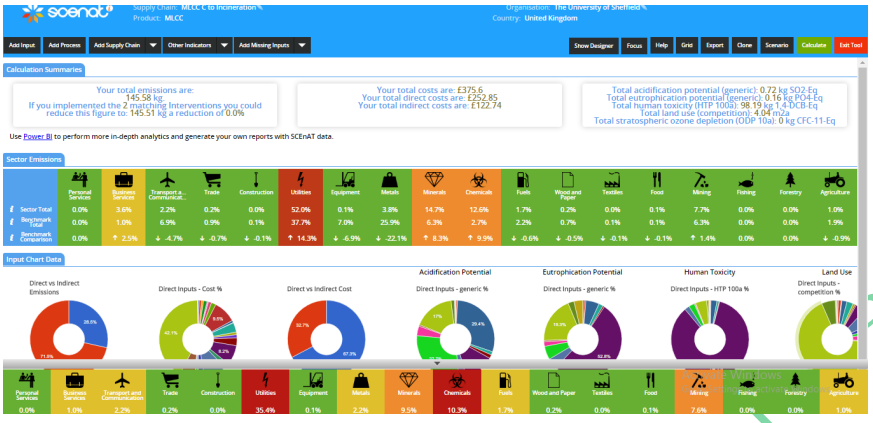

Figure 9:*Results Dashboard*

4: LOW CARBON INTERVENTIONS

4.1 ***Definition***: SCEnAT*i* defines a Low Carbon Intervention as any decision or deliberate change that directly leads to a reduction in CO_2 emissions in a supply chain.

4.2 ***Intervention Topology:*** SCEnAT*i* has developed a database of Low Carbon Interventions divided into 16 broad types as presented in Table 1 below:

Technological	Offsetting and carbon neutrality
ICT	Awareness
Building	Employee
Logistics and Transport	Strategic
Energy Interventions	Supply Chain/Networked
Process and Practice	Knowledge-based
Product, Packaging and Waste	Bolt on
Procurement	End User

Table 1: *Topology of Low Carbon Intervention*

4.3 ***Functionalities:*** The Low Carbon Intervention database has a dual functionality within SCEnAT*i*

- A one-stop-shop for information regarding low carbon interventions for businesses. Including a keyword search function.

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- Each relevant intervention will be linked to the supply chain mapping/calculation function of automatically directing businesses to low carbon interventions applicable to their supply chain.

4.4 ***Linkage to Hot-spots****:* On clicking on ***'View Emissions Data'*** for an Input which is identified as aHot-spot in the supply chain carbon map, a link to a matching intervention is shown under ***'Matching Intervention'*** in the left hand pane of the mapping screen.

4.5 ***Access all Interventions***: All interventions currently populated within the database can also be accessed at: ***Home***>***Intervene***>***View all Interventions*** (under Next Steps) on the right hand pane.

4.6 ***Sector specific Interventions*****:** On the right hand pane, users can choose interventions specific to certain sectors or general interventions by choosing from the drop down button under Sector Specific Resources on the right hand pane on the Interventions page.

5.0 SUPPLY CHAIN PERFORMANCE EVALUATION

5.1 ***Definition***: A set of performance evaluation measures that track the change in supply chain performances due to the potential implementation of low carbon interventions.

5.2 ***Performance Evaluation Measures& Indicators:*** These are based on a set of Key Performance Indicators (KPI) across Economic, Social and Environmental measures as illustrated in Figure 10.

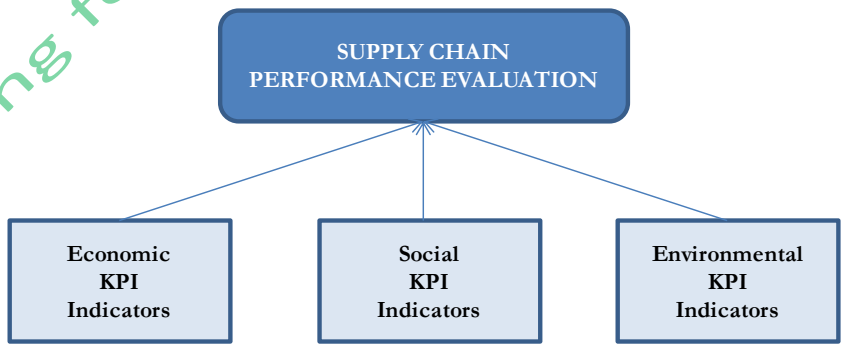

Figure 10:SCEnATi*'s Supply Chain Performance Evaluation Framework*

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5.3 *How it Works*

- This step in SCEnAT*i* is closely linked to the supply chain mapping/calculation and the interventions stages. A series of performance evaluation measures relevant to each type of intervention are provided in SCEnAT*i*. Within each category, users can select the measures they think to be relevant. The user can select indicators within each category by simply ticking the relevant box. The inbuilt mechanism of this step is so flexible that each user can customise the performance measurement system.
- The user defined performance measurement system, would produce the set of KPIs across which SCEnAT*i* would evaluate the supply chain.
- A performance measure is associated with each KPI. These measures can be evaluated at each level within the supply chain: (the user should specify, after the selection of the KPIs, if they want to measure them at a focal firm or at a whole supply chain level)
- At the end of this step, the user would be able to visualize an impact table and impact charts (percentage impact of interventions on associated KPIs) for each tested intervention.

6.0 BUSINESS INTELLIGENCE AND DATA VIRTUALISATION

6.1 About the business intelligence capability of SCEnAT*i*

- SCEnAT*i* enables you to make better use of your full data underlying your already mapped supply chain in order to understand what implications do the revealed findings (i.e. carbon map, indicators, etc) have on the wider business context (i.e. business intelligence).
- Such action is being done in conjuncture with the Microsoft Power BI tool which uses big data analytics to reveal key intelligence from your model.
- The big data analytics process is being done based on cutting-edge algorithms focused on data clustering and extraction of intelligence factors from the wide amount of available information.
- The key intelligence is being displayed in a highly managerial manner with concrete and visually appealing charts, dashboards and geographic information systems (GIS) maps to show the global benchmark of your supply chain.

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- You can then use these features in order to either take informed and intelligent decisions and corrective measures for your supply chain or simply to show these cutting-edge findings and reports to your management team or clients.

6.2 How to download Microsoft Power BI

- In order to use the business intelligence feature of SCENAT*i*, please download a version of Microsoft Power BI from here: https://powerbi.microsoft.com/en-us/downloads/
- Then follow the steps you are prompted with to fully install a version of Microsoft Power BI on your local device (i.e. laptop).

6.3 How to connect your model with Microsoft Power BI

- Firstly, go to your **Result Dashboard** view and click on Use **Power BI** to perform more in-depth analytics and generate your own reports with SCEnAT data. Check the red square on Figure 11 to pinpoint the download link.

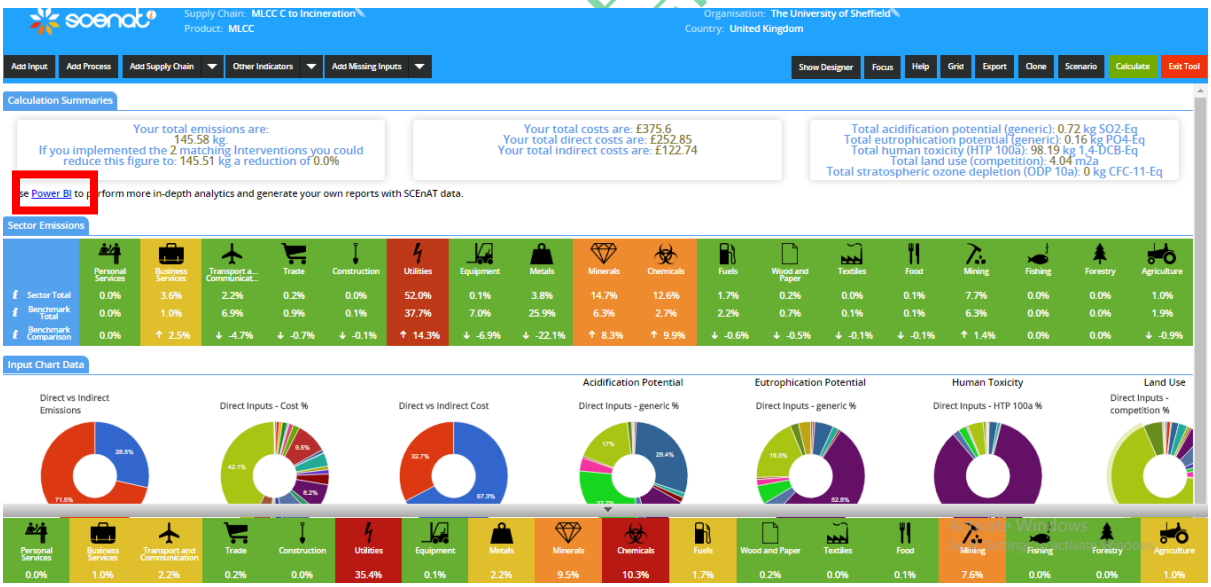

Figure 11:SCEnATi's Power BI Download Button

- Secondly, after your Power BI file has been downloaded, please unzip it and double-click on it for the already installed Microsoft Power BI tool to open it.

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- You will be prompted (by Power BI) to input a username and password at this point to unlock the file you have just tried to open (please input the login details you utilized to sign in into SCEnAT*i*). Press enter (or follow the relevant button).
- If the authentication is successful a screen similar to the following will appear (please wait for several minutes until the visualisation is developed and the business intelligence data is calculated):

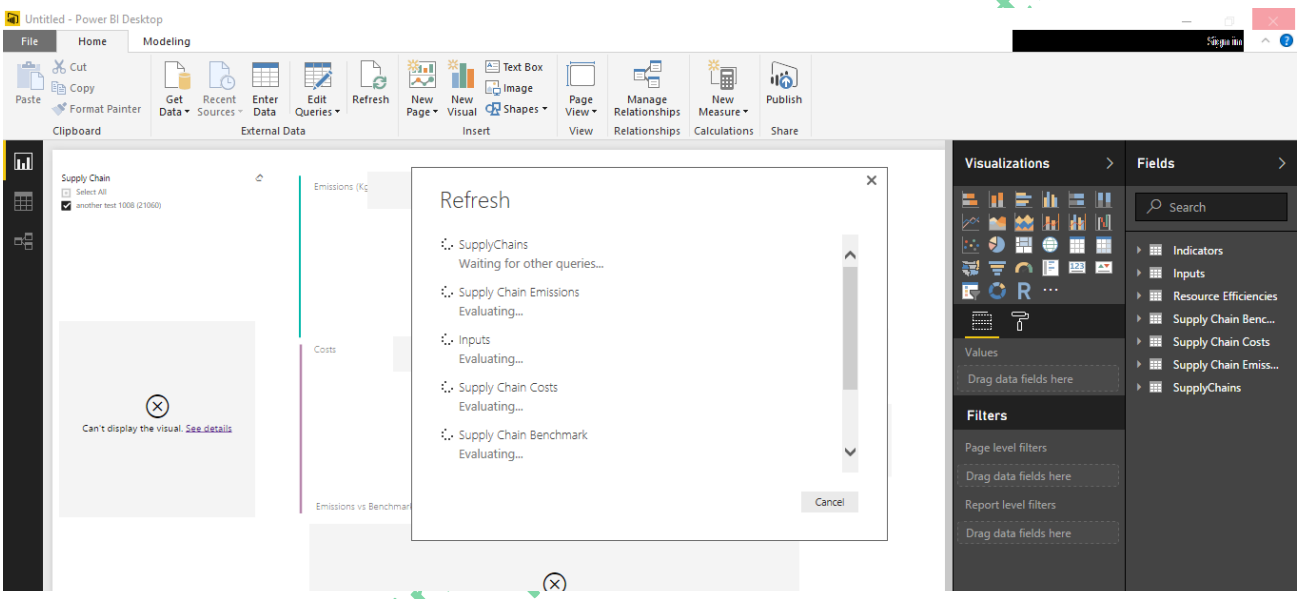

***Figure 13:SCEnATi**'s Power BI Model Load Process*

- The next screen that appears should be the following:

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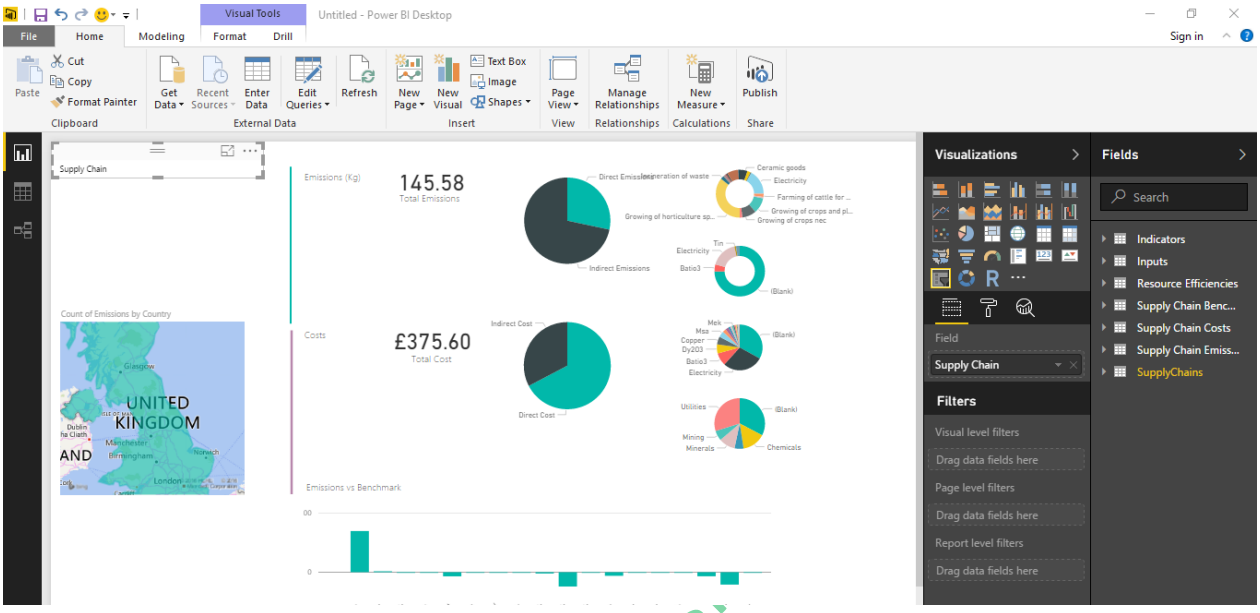

***Figure 13:SCEnATi**'s Power BI Loaded Model*

- Use the tab/sheet changer (red square below) to generate various data views and charts (i.e. Figures 14 and 15 show the GIS mapping and benchmarking of the model's emissions)

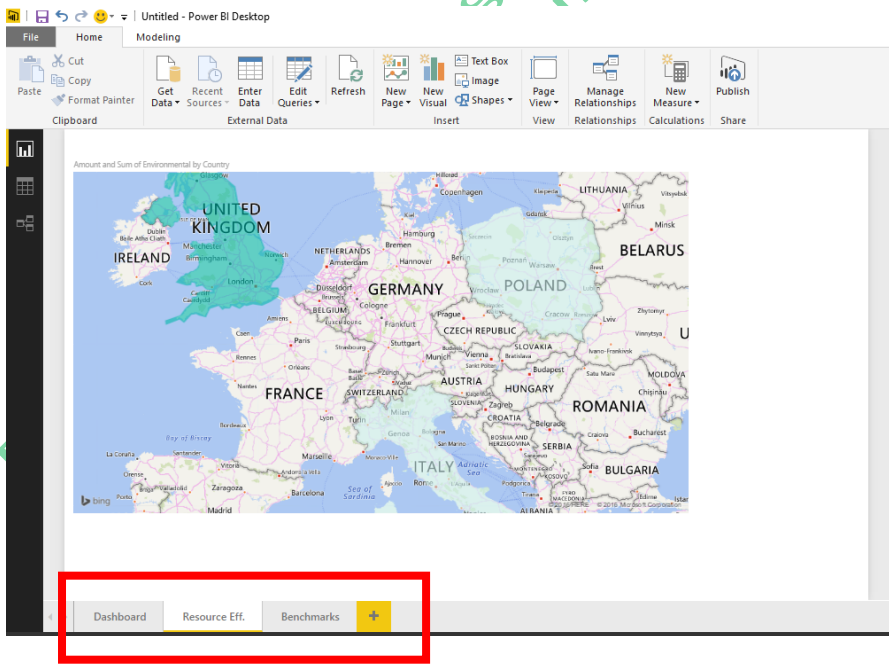

***Figure 14:SCEnATi**'s Power BI GIS Visualisation*

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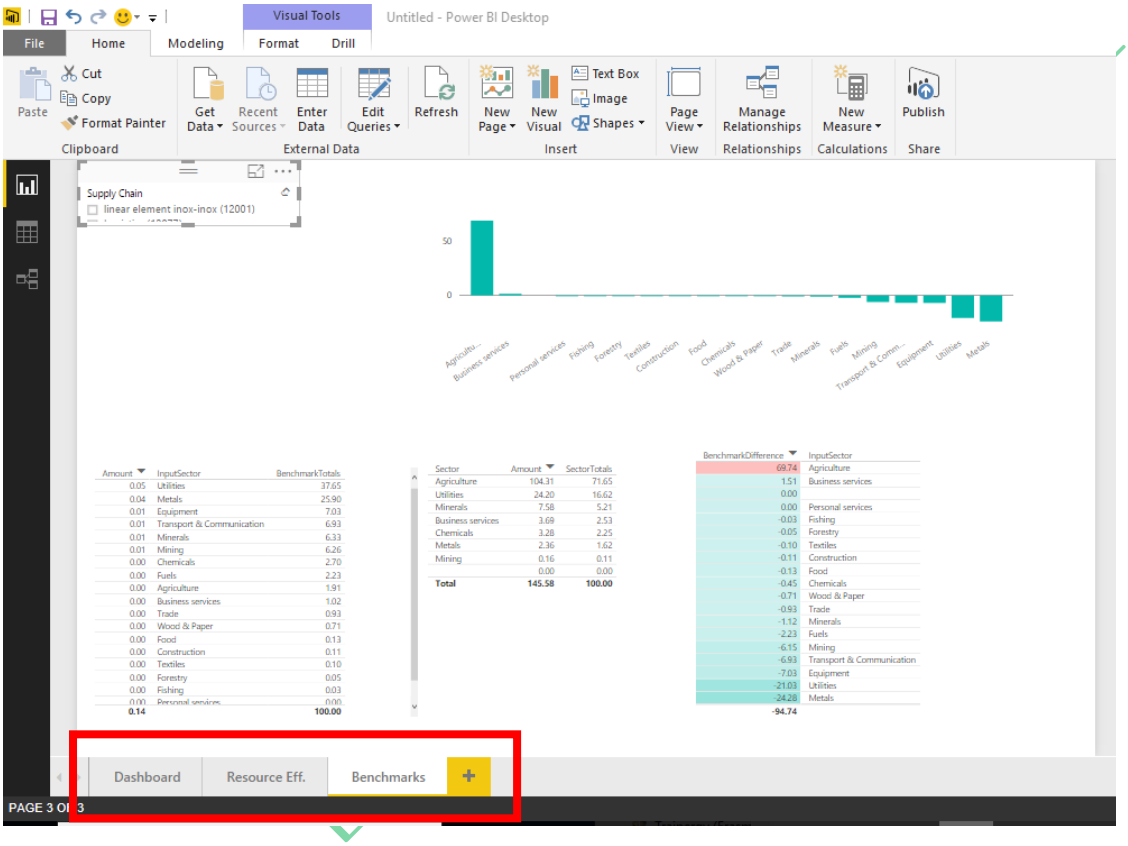

***Figure 15:SCEnATi**'s Power BI Benchmark Visualisation*

6.4 Next steps

- Section 6.3 showed several built-in data views and business intelligence reporting that are provided by default, however in order to create more specialized reporting, you need to access the Power BI editors/tools that you can find in Figure 16 (follow the red rectangle).
- For a detailed guide throughout Microsoft Power BI please follow the following link: https://powerbi.microsoft.com/en-us/documentation/powerbi-landing-page/

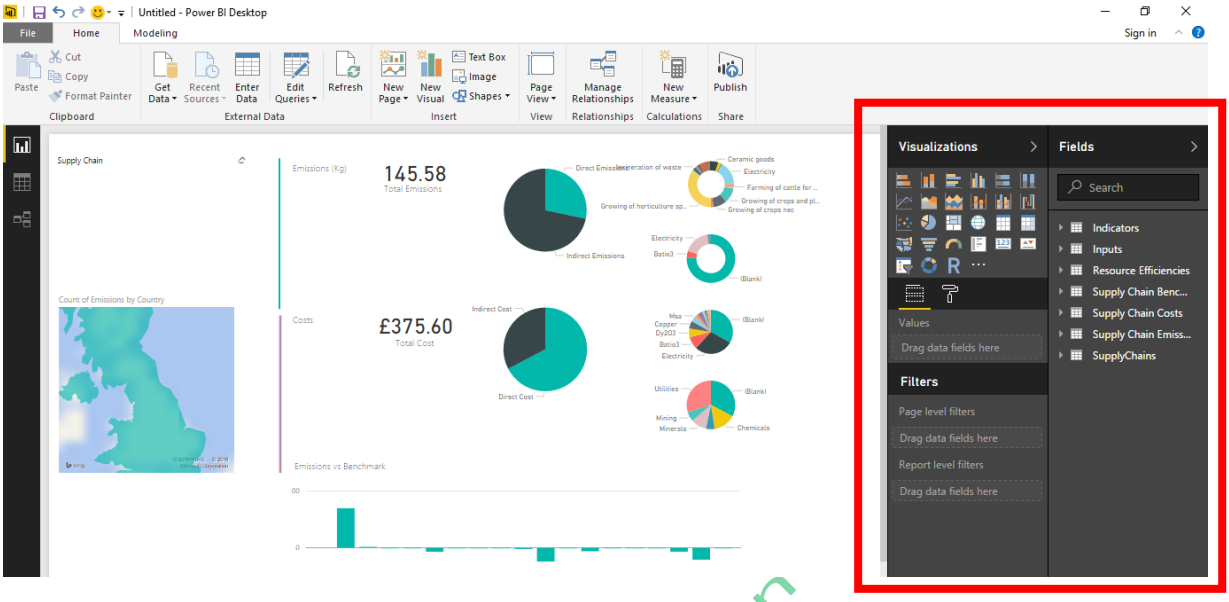

***Figure 16:SCEnATi**'s Power BI Extra Functions*

- Finally, global benchmarking of the supply chains is being displayed in a hot-spot relevance manner (i.e. check the circles from Figure 17 which compare the amount of emissions of the country where your supply chain is with the other places in the world where similar supply chains with similar inputs exist (the circle size shows the intensity of emissions)).

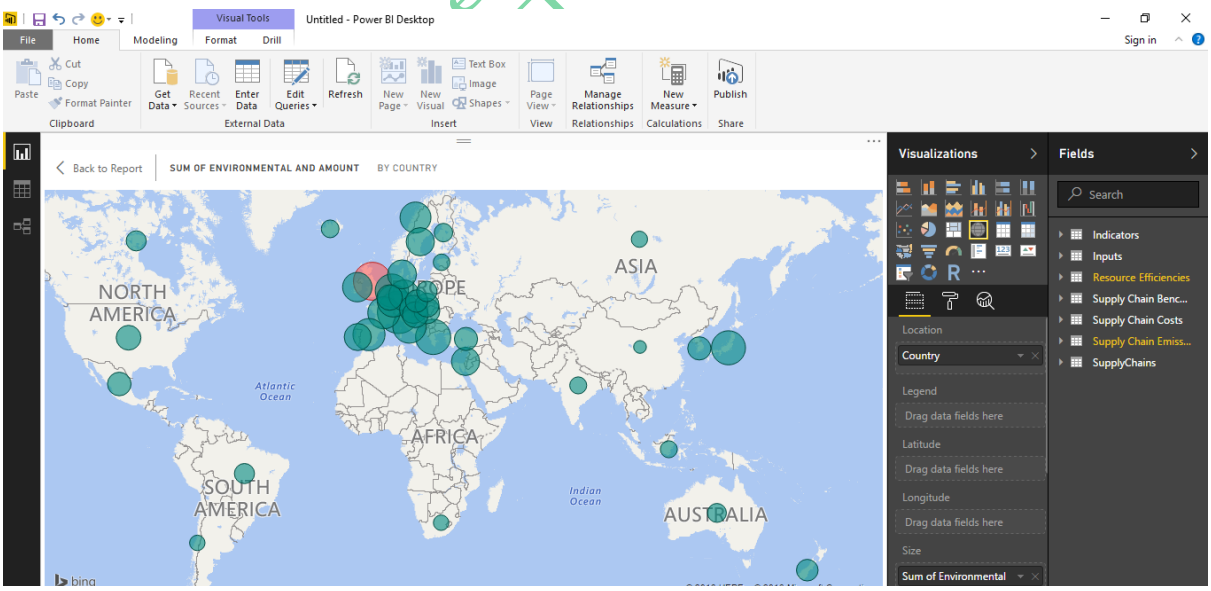

***Figure 17:SCEnATi**'s Power BI Global Benchmarking*

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APPENDIX I: Economic Input-Output Classification

Sector Number	Aggregated Sector
1-28	Agriculture
29-30	Forestry
31-33	Fishing
34-42	Mining
43-66	Food
67-76	Textiles
77-83	Wood & paper
84-91	Fuels
92-102	Chemicals
103-113	Minerals
114-121	Metals
122-150	Equipment
151-164	Utilities
165-167	Construction
168-174	Trade
175-190	Transport & communication
191-223	Business services
224	Personal services

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APPENDIX II: Economic Input-Output Sub-Sectors

Sector Number	Disaggregated Sector	Aggregated Sectors
1	Growing of cereals and other crops n.e.c. (except wheat)	Agriculture (1-28)
2	Organic: Growing of cereals and other crops n.e.c. (except wheat)	
3	Growing of wheat	
4	Organic: Growing of wheat	
5	Growing of oil seeds	
6	Growing of rice	
7	Growing of sugar beet and sugar cane	
8	Growing of fibre crops	
9	Growing of crops and plants for biofuels	
10	Growing of crops nec	
11	Conventional Growing of vegetables, fruits and other crops	
12	Organic Growing of vegetables, fruits and other crops	
13	Growing of horticulture specialities and nursery products	
14	Raising of diary cattle and production of raw cow milk	
15	Organic: Raising of diary cattle and production of raw cow milk	
16	Farming of cattle for meat	
17	Organic: Farming of cattle for meat	
18	Raising of horses, equines and other animals; animal hair	
19	Raising of sheep and goats; Production of raw wool, sheep or goat milk	

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20	Organic: Raising of sheep and goats; Production of raw wool, sheep or goat milk	
21	Farming of swine	
22	Organic: Farming of swine	
23	Farming of poultry	
24	Organic: Farming of poultry	
25	Other farming of animals	
26	Growing of crops combined with farming of animals (mixed farming)	
27	Agricultural service activities; landscape gardening	
28	Animal husbandry service activities, except veterinary activities	
29	Forestry, logging and related service activities (conventional)	**Forestry (29-30)**
30	Forestry, logging and related service activities ('sustainable' / FSC)	
31	Fishing	**Fishing (31-33)**
32	Fish farming (non-organic)	
33	Fish farming (organic/sustainable)	
34	Mining of coal and lignite; extraction of peat	**Mining(34-42)**
35	Oil: Crude petroleum and services related to crude oil extraction, excluding surveying	
36	Gas: Natural gas and services related to natural gas extraction, excluding surveying	
37	Mining of uranium and thorium ores	
38	Mining of iron ores	
39	Mining of non-ferrous metal ores and concentrates	
40	Stone	
41	Sand and clay	
42	Chemical and fertilizer minerals, salt and other mining and quarrying products n.e.c.	
43	Processing and preserving of meat from cattle (beef)	**Food (43-66)**
44	Organic: Processing and preserving of meat from cattle (beef)	
45	Processing and preserving of meat from pigs	

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46	Organic: Processing and preserving of meat from pigs	
47	Conventional poultry meat and poultry meat products	
48	Organic poultry meat and poultry meat products	
49	Meat products nec	
50	Organic: Meat products nec	
51	Fish and fish products	
52	Conventional Fruit and vegetables	
53	Organic Fruit and vegetables	
54	Vegetable and animal oils and fats	
55	Dairy products (conventional)	
56	Organic dairy products	
57	Grain mill products, starches and starch products	
58	Prepared animal feeds	
59	Bread, rusks and biscuits; manufacture of pastry goods and cakes (conventional)	
60	Organic bread, rusks and biscuits; manufacture of pastry goods and cakes	
61	Sugar	
62	Cocoa, chocolate and sugar confectionery	
63	Other food products	
64	Alcoholic beverages	
65	Production of mineral waters and soft drinks	
66	Tobacco products	
67	Preparation and spinning of textile fibres	Textile (67-76)
68	Textile weaving	
69	Finishing of textiles	
70	Made-up textile articles, except apparel	
71	Carpets and rugs	
72	Other textiles	
73	Knitted and crocheted fabrics and articles	
74	Wearing apparel; dressing and dying of fur	
75	Tanning and dressing of leather; manufacture of luggage, handbags,	

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	saddlery and harness	
76	Footwear	
77	Wood and wood products, except furniture	Wood & Paper (77-83)
78	Pulp	
79	Paper and paperboard	
80	Articles of paper and paperboard (except paper stationary)	
81	Paper stationary	
82	Paper-based publishing, printing and reproduction	
83	Non paper-based publishing and reproduction of recorded media	
84	Coke oven products	Fuel (84-91)
85	Motor spirit (gasoline)	
86	Kerosene, including kerosene type jet fuel	
87	Gas oils	
88	Fuel oils n.e.c.	
89	Petroleum gases and other gaseous hydrocarbons, except natural gas	
90	Other petroleum products	
91	Processing of nuclear fuel	
92	Industrial gases	Chemicals (92-102)
93	Dyes and pigments	
94	Inorganic basic chemicals	
95	Organic basic chemicals	
96	Fertilisers and nitrogen compounds	
97	Plastics and synthetic rubber in primary forms	
98	Pesticides and other agro-chemical products	
99	Paints, varnishes and similar coatings, printing ink and mastics	
100	Pharmaceuticals, medicinal chemicals and botanical products	
101	Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	
102	Other chemical products	
103	Man-made fibres	als (10 3-
104	Rubber products	

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105	Plastic plates, sheets, tubes and profiles, builders' ware of plastic and other plastic products (excl. plastic packing goods)	
106	Plastic packing goods	
107	Glass and glass products	
108	Ceramic goods	
109	Bricks, tiles and other structural clay products for construction	
110	Manufacture of cement	
111	Manufacture of lime	
112	Manufacture of plaster	
113	Articles of concrete, plaster and cement; cutting, shaping and finishing of stone; manufacture of other non-metallic products	
114	Basic iron and steel and of ferro-alloys; manufacture of tubes and other first processing of iron and steel	Metals (114-121)
115	Precious metals production	
116	Aluminium production	
117	Lead, zinc and tin production	
118	Copper production	
119	Other non-ferrous metal production	
120	Casting of metals	
121	Structural metal products	
122	Tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers; manufacture of steam generators	Equipments (122-150)
123	Forging, pressing, stamping and roll forming of metal; powder metallurgy; treatment and coating of metals	
124	Cutlery, tools and general hardware	
125	Other fabricated metal products	
126	Machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	
127	Other general purpose machinery	
128	Agricultural and forestry machinery	
129	Machine tools	

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130	Other special purpose machinery	
131	Weapons and ammunition	
132	Domestic appliances (e.g. white goods)	
133	Computers and other office machinery and equipment	
134	Electric motors, generators and transformers; manufacture of electricity distribution and control apparatus	
135	Insulated wire and cable	
136	Electrical equipment not elsewhere classified	
137	Electronic valves and tubes and other electronic components	
138	Television and radio transmitters and line for telephony and line telegraphy	
139	Television and radio receivers, sound or video recording or reproducing apparatus and associated goods	
140	Medical, precision and optical instruments, watches and clocks	
141	Motor vehicles, trailers and semi-trailers	
142	Building and repairing of ships and boats	
143	Railway transport equipment, motorcycles, bicycles and transport equipment n.e.c.	
144	Aircraft and spacecraft	
145	Furniture	
146	Jewellery and related articles; manufacture of musical instruments	
147	Sports goods, games and toys	
148	Miscellaneous manufacturing not elsewhere classified; recycling	
149	Recycling of metal waste and scrap	
150	Recycling of non-metal waste	
151	Electricity production - coal	Utilities (151-164)
152	Electricity production - gas	
153	Electricity production - oil	
154	Electricity production - nuclear	
155	Electricity by hydro power (inland)	
156	Electricity by wind power	
157	Electricity by biomass	

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158	Electricity by geothermal, solar, tidal or wave power	
159	Electricity by waste incineration	
160	Transmission of electricity	
161	Distribution and trade in electricity	
162	Gas distribution	
163	Steam and hot water supply	
164	Collection, purification and distribution of water	
165	Construction (other than commercial and domestic buildings)	Const' n (165-167)
166	Construction of commercial buildings	
167	Construction of domestic buildings	
168	Sale, maintenance and repair of motor vehicles, and motor cycles; retail sale of automotive fuel	Trade (168-174)
169	Retail sale of automotive fuel	
170	Wholesale trade and commission trade, except of motor vehicles and motor cycles	
171	Retail trade, except of motor vehicles and motor cycles	
172	Repair of personal and household goods	
173	Hotels and accommodation	
174	Restaurants, cafes, bars etc.	
175	Passenger transport by railways	Transport & Telecommunication (175-190)
176	Freight transport by inter-urban railways	
177	Inter-city coach service	
178	Urban and suburban passenger railway transportation by underground, metro and similar systems	
179	Other scheduled passenger land transport n.e.c.	
180	Taxi operation	
181	Other passenger land transport	
182	Freight transport by road	
183	Transport via pipeline	
184	Sea and coastal water transportation services	
185	Inland water transportation services	

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186	Passenger air transport	
187	Freight and other air transport	
188	Supporting and auxiliary transport activities: travel agencies, cargo handling, storage, etc.	
189	Postal and courier services	
190	Telecommunications	
191	Banking and financial intermediation, except insurance and pension funding	Business Services (191-223)
192	Insurance and pension funding, except compulsory social security	
193	Auxiliary financial services	
194	Real estate activities with own property; letting of own property, except dwellings	
195	Letting of dwellings, including imputed rent	
196	Real estate agencies or activities on a fee or contract basis	
197	Renting of cars and other transport equipment	
198	Renting of machinery and equipment, excl. office machinery and computers	
199	Renting of office machinery and equipment including computers	
200	Renting of personal and household goods	
201	Computer services and related activities	
202	Research and development	
203	Legal activities	
204	Accounting, book-keeping and auditing activities; tax consultancy	
205	Business and management consultancy activities; management activities; market research and public opinion polling	
206	Technical consultancy; technical testing and analysis; architectural and engineering related activities	
207	Advertising	
208	Other business services	
209	Public administration (not defence); compulsory social security	
210	Public administration - defence	
211	Primary, secondary and other education	
212	Higher-level education	

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213	Human health and veterinary activities	
214	Social work activities	
215	Collection and treatment of sewage and liquid waste	
216	Collection of waste	
217	Incineration of waste	
218	Landfill of waste	
219	Sanitation, remediation and similar activities	
220	Activities of membership organisations	
221	Recreational and cultural activities	
222	Sporting and other activities	
223	Dry cleaning, hair dressing, funeral parlours and other service activities	
224	Private households as employers of domestic staff	**Personal Services**

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