Annex II

Guidelines to create Sankey diagrams

How to create visualisation products such as Sankey diagrams using RAWGraphs and e!Sankey
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Introduction

As discussed in Module 7 of the Land-use Finance Tool, Sankey diagrams can be useful visualisation products to provide an overall picture of the land-use finance mapping results. Several tools and software can be used to create Sankey diagrams based on the data collected during the study. Module 7 offers a comparison between three tools that have been used to create Sankey diagrams in the context of finance mapping studies. This annex provides detailed guidelines on the use of two of these tools: RAWGraphs¹,² and e!Sankey³.

The choice of tool will mostly depend on the complexity of the dataset and your objectives. We recommend using RAWGraphs for small datasets with few categorical dimensions. The tool allows you to generate small and well-designed Sankey diagrams in only a few clicks by uploading a cleaned dataset in Excel. However, it is ill-suited to illustrate layers of information, such as the distinction among green, grey or brown flows (see 3.1 Steps to develop a detailed typology of land-use activities). On the other hand, e!Sankey is a more flexible tool that allows you to tailor a Sankey diagram according to the study objectives, and reflect various dimensions and layers of information.

¹ http://RAWGraphs.io/gallery/
³ https://www.ifu.com/en/e-sankey/
For the purpose of these guidelines, we highlight the distinction between horizontal and vertical dimensions.

**Horizontal dimensions** in a land-use finance landscape are the categories through which finance flows through the finance life cycle.

**Vertical dimensions**, called *nodes* in these guidelines (as per the terminology used in Sankey software), are the different actors in the horizontal dimension.

Figure 1 illustrates this distinction. **Dimensions** are split among sources/intermediaries, instruments, and disbursement channels and uses. **Nodes** gather, for example, government revenues, bilateral donors and agencies, bilateral development finance institutions, etc. Additionally, this example shows green (aligned) and grey (conditionally-aligned) flows.
Figure 2, which was created with RAWGraphs, features the following **Dimensions**: sources of finance/intermediaries, financial instrument, disbursement channel and use; and **Nodes**: government budgets, climate funds, agencies, public financial institutions, grants, low-cost project debt, etc.

A Sankey diagram is created using quantitative input from either a dataset or data extracted from it (through pivot tables for instance). The preparation of data input that precedes the design process is essential. The following section explains how to prepare the data to use it in a Sankey tool.
1. Preparatory steps: cleaning the database and creating pivot tables

1.1 Cleaning the database

After gathering and consolidating all the data in the Excel template (see Template 10), it is important to clean it before moving to data analysis, as you do not always control the format and type of data imported from external data sources.

Figures 3 and 4 give examples of datasets that need to be cleaned and completed before data can be used to create a Sankey diagram.

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Component name</th>
<th>Responsibility</th>
<th>Mandate</th>
<th>Methodology</th>
<th>Database structure</th>
<th>Description</th>
<th>Sankey Type of output</th>
<th>Sankey Source of reference</th>
<th>Total actions (expected)</th>
<th>Total actions (actual)</th>
<th>Summary of activities</th>
<th>Summary of activities</th>
<th>Summary of activities</th>
<th>Summary of activities</th>
<th>Summary of activities</th>
</tr>
</thead>
</table>

Figure 3: Example of the Vietnam case study dataset before cleaning.
Cleaning your data ensures that values are comparable and are correctly read/recognised by tools. Before you start cleaning the data, make sure you create a backup of the original data in a separate Excel file. Below is a list of 11 simple actions to clean your data⁴:

1. Remove extra spaces: extra spaces before or after a word or value in a cell need to be removed to remain consistent
2. Select and treat all blank cells: if there is no value (text or number) in a cell, remove the entire row
3. Convert numbers stored as text into numbers
4. Write numbers with decimal points ‘.’ not ‘,’
5. Convert financial values to the preferred currency (EUR, USD, etc.)
6. Convert numbers to millions, billions or trillions, as preferred
7. Ensure all text is stored as text
8. Remove duplicate rows by using ‘Remove Duplicates’
9. Check the spelling: clean up misspelled words to ensure a consistent use of categories and nodes
10. Use upper case for the first letter of each text entry
11. Remove all font styles and colours for all values except for the column titles

Once the data has been cleaned, the columns and rows needed to create the Sankey can be copied and pasted to another Excel tab to simplify the next steps. You only need to cluster columns corresponding to the dimensions that you want to illustrate in the Sankey diagram and their respective quantitative values (see the final result in Figure 5).

1.2 Creating pivot tables

When information is consolidated in one spreadsheet, different pivot tables need to be created to provide the values to be imported into the software. Pivot tables allow to calculate the values for the flows from one dimension to the following dimension.

In the example below, the first pivot table created is between the sources of finance and financial instruments dimensions.

These pivot tables can be created in the 'Sankey Pivot Tables' tab in Template 10, by clicking on the button 'PivotTable' in the 'Insert' menu. In this tab, you have previously defined steps as placeholders for their individual pivot tables (see Figure 6 below).
Next, the prepared data has to be selected in the ‘Database Structure’ tab.

After selecting your data range and creating the pivot table, the ‘PivotTable Field List’ panel appears where you can select the exact data columns you want to include in your specific pivot table. Pivot Table 1 should contain finance that flows from dimension ‘Sources of finance’ to dimension ‘Financial instrument’ (see Figure 8).
This pivot 1 provides many insights:

- It summarises **how much each source of finance contributed**: ‘government budgets’ are the largest source of finance, and provided a total of USD 2 049 million of climate-aligned finance.
- It shows **how much was spent, in total, on each instrument**: USD 3 186 million was spent on grants, by far the most important instrument in this example.
- It quantifies the financial flows between sources of finance and financial instruments: out of the USD 2 049 million contributed by ‘government budgets,’ USD 1 855 million were issued as grants, and USD 194 million as low-cost project debt.
- It shows the distribution of financial instruments used by each source: ‘climate funds’ have invested roughly equal amounts in ‘grants’ and ‘low-cost project debt,’ while ‘agencies’ have only used grant financing.

### Table 1: Pivot 1 linking sources of finance to financial instruments

<table>
<thead>
<tr>
<th>Sum Sankey Value USD m</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grant</td>
</tr>
<tr>
<td>Climate funds</td>
<td>910</td>
</tr>
<tr>
<td>Government budgets</td>
<td>1855</td>
</tr>
<tr>
<td>Agencies</td>
<td>421</td>
</tr>
<tr>
<td>Public FI - General</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3186</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4354</strong></td>
</tr>
</tbody>
</table>

The data selected to create pivot 1 can be visualised in a Sankey diagram, which is more intuitive than the table (see Figure 9).
To complete the climate finance cycle, more pivots are needed. Pivot 2 shows how much climate-aligned finance was actually delivered by each instrument and to which disbursement channel. Finally, pivot 3 quantifies the uses of climate-aligned finance for disbursement channel.

### Table 2: Pivot 2 relating financial instruments to disbursement channels

<table>
<thead>
<tr>
<th>Sum Sankey Value USD m</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low-cost project debt</td>
</tr>
<tr>
<td>Rows</td>
<td>project-level equity</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>421</td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td></td>
</tr>
<tr>
<td>2684</td>
<td>1147</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3832</td>
<td></td>
</tr>
<tr>
<td>Public-Private</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>19</td>
</tr>
<tr>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3187</td>
</tr>
<tr>
<td></td>
<td>1147</td>
</tr>
<tr>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>4353</td>
</tr>
</tbody>
</table>

### Figure 10: Sankey diagram relating financial instruments to disbursement channels

### Table 3: Pivot 3 relating channels to end uses

<table>
<thead>
<tr>
<th>Sum Sankey Value USD m</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adaptation</td>
</tr>
<tr>
<td></td>
<td>Mitigation</td>
</tr>
<tr>
<td></td>
<td>Multiple objectives</td>
</tr>
<tr>
<td>Rows</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td>Private</td>
<td>218</td>
</tr>
<tr>
<td></td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>421</td>
</tr>
<tr>
<td>Public</td>
<td>955</td>
</tr>
<tr>
<td></td>
<td>2144</td>
</tr>
<tr>
<td></td>
<td>733</td>
</tr>
<tr>
<td></td>
<td>3832</td>
</tr>
<tr>
<td>Public-Private</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1207</td>
</tr>
<tr>
<td></td>
<td>2251</td>
</tr>
<tr>
<td></td>
<td>896</td>
</tr>
<tr>
<td></td>
<td>4353</td>
</tr>
</tbody>
</table>
Illustrating green vs grey finance

To create a Sankey diagram in which financial flows can be segregated among green, grey or brown finance, it is crucial that the related dataset provides enough detail to filter these categories. To do so, an extra layer is added in the pivot tables to filter flows. Figure 12 provides an example. In this case, the category ‘Is the activity helping to reduce pressure on/protect forests?’ segregates ‘Yes’ (green) flows from ‘Unknown’ (grey) flows.
### Figure 13: Vietnam case study example featuring a green vs grey finance filter in the pivot table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National budget</strong></td>
<td>6924560,497</td>
<td>6250</td>
<td>6930810,5</td>
</tr>
<tr>
<td>Unknown</td>
<td>5325678,793</td>
<td>5325678,79</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1598881,704</td>
<td>6250</td>
<td>1605131,7</td>
</tr>
<tr>
<td><strong>ODA-grant</strong></td>
<td>1162391,078</td>
<td>1162391,08</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>683977</td>
<td>683977</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>478414,0781</td>
<td>478414,078</td>
<td></td>
</tr>
<tr>
<td><strong>ODA-loans</strong></td>
<td>5469773,75</td>
<td>5469773,75</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>5251075</td>
<td>5251075</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>218698,75</td>
<td>218698,75</td>
<td></td>
</tr>
<tr>
<td><strong>Offset plantation</strong></td>
<td>403293,584</td>
<td>403293,584</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>403293,584</td>
<td>403293,584</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>596924,3398</td>
<td>75000</td>
<td>671924,34</td>
</tr>
<tr>
<td>Unknown</td>
<td>12243,33976</td>
<td>75000</td>
<td>87243,3398</td>
</tr>
<tr>
<td>Yes</td>
<td>584681</td>
<td>584681</td>
<td></td>
</tr>
<tr>
<td><strong>PFES</strong></td>
<td>3360148,845</td>
<td>3360148,84</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3360148,845</td>
<td>3360148,84</td>
<td></td>
</tr>
<tr>
<td><strong>Provincial budget</strong></td>
<td>1330684,372</td>
<td>1213027,576</td>
<td>2543711,95</td>
</tr>
<tr>
<td>Unknown</td>
<td>873420,5181</td>
<td>1111101,576</td>
<td>1984522,09</td>
</tr>
<tr>
<td>Yes</td>
<td>457263,854</td>
<td>101926</td>
<td>559189,854</td>
</tr>
<tr>
<td><strong>State bond</strong></td>
<td>2886046,542</td>
<td>2886046,54</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>2886046,542</td>
<td>2886046,54</td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>22133823,01</td>
<td>1294277,576</td>
<td>23428100,6</td>
</tr>
</tbody>
</table>
2. Creating a Sankey diagram using RAWGraphs

The graphics in this section will show how to create a Sankey diagram using the RAWGraphs website: http://app.RAWGraphs.io. The Sankey example is based on a CPI climate finance study.

The datasheet can easily be pasted or dragged and dropped into the box on the webpage, or uploaded, as shown in Figures 14 and 15.

Figure 14: Paste the data from your spreadsheet
Once the data is successfully recognised, you can choose the type of diagram you want to create. Select ‘Alluvial diagram’, also known as Sankey diagram.

Next, the different dimensions that need to be visualised in the Sankey diagram can be mapped. The dimensions from the left column can be dragged into the ‘Steps’ box. You must do so in a sequential manner to ensure that the dimensions of the Sankey diagram start on the left with **sources of finance** and end on the right with **uses**. The values are dragged to the ‘Size’ box, which will give the flows the corresponding volume/thickness. Note that only data that is recognised as numbers can be dragged into ‘Size’, hence the importance to clean the datasheet.

Now the tool generates the Sankey diagram. Users can adjust the width and height of the Sankey diagram, as well as the width of the nodes.
Additionally, you can change the colour of the different flows according to your preference. The final result can subsequently be downloaded as a .jpeg or .png file. It is also available as an html code, which allows you to embed it in a webpage.

When using RAWGraphs to create a Sankey diagram, the data is simply uploaded into the RAWGraphs website. The values influence the volume/thickness of the financial flows. However, the tool itself will not show the value nor the currency on the Sankey diagram. Therefore, if you would like to create a more detailed diagram (see Figure 19 below), you need to perform some extra actions before the datasheet can be uploaded into RAWGraphs.

If you want the numbers to appear in the Sankey diagram, they need to be added manually into the dataset. You need to complete the text of the nodes in the Excel sheet with the exact value of the total financial flow. For example, for the flow that moves from node Government budgets under dimension sources of finance to the dimension financial instruments, pivot 1 indicated the value of USDm 2 049. While the total flow for node Grant under dimension financial instruments amounts to USDm 3 186 USDm. The data in the datasheet can easily be filtered by dimension and node, and the value can be quickly added into the text line.
This action then needs to be repeated for every node.

When all nodes in all dimensions have been given their exact value, the updated datasheet (see Figure 21) can be uploaded into RAWGraphs and a Sankey diagram can be created by repeating the previous steps on how to make a Sankey with RAWGraphs.

More information is available at http://app.RAWGraphs.io
3. Creating a Sankey diagram using e!Sankey

This section will guide you in creating a Sankey diagram with the e!Sankey software using data from the Vietnam case study as example (EFI and CIEM, 2018).

e!Sankey is a software that you need to download on your computer. A free trial version is available, but a licence needs to be purchased for further use (see Module 7 for software characteristics).

Figure 22: Sankey diagram of the Vietnam case study created with elsankey
3.1 e!Sankey basics

After installing and opening e!Sankey, we recommend you watch the tutorial videos (in English) on the e!Sankey YouTube channel⁵,⁶. The videos are two-three minutes each and demonstrate the most important functions of the tool.

e!Sankey also features a detailed manual⁷ (in English) that describes the main steps to create a land-use finance Sankey diagram.

In the e!Sankey software, the main working area has several panels:

1. Drawing Area: where the Sankey diagrams are drawn. Several diagrams can be opened simultaneously.
2. Properties: allows to edit the properties of the network element marked in the drawing area.
3. Entries: lists the material or finance that are added as flows in the arrows of the Sankey diagram.
4. Controller: allows to scale the flows in the diagram and edit unit types.

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⁵ https://www.ifu.com/en/e-sankey/support/#c1090
⁶ https://www.youtube.com/channel/UCFFAWqNTti2u8-mlgXY9GZg/
Some of the main functionalities accessible from the working area toolbar include:

1. Create a diagram file: click on the button ‘New Document’ in the toolbar.
2. Open a diagram file: click on the button ‘Open Document’ in the toolbar.
3. Save a diagram file: click on the button ‘Save Document’ in the toolbar, or choose ‘Save As…’ from the file menu. e!Sankey diagram files feature the extension ‘.sankey’.
4. Undo: to undo (revert) an action that has been done in the software, click on the button ‘Undo’ in the main toolbar or use the menu entry ‘Undo’ in the ‘Edit’ menu.
5. Redo: to redo (revert undo) an action that has been undone, click on the button ‘Redo’ or use the menu entry ‘Redo’ in the ‘Edit’ menu.
6. Edit mode: click on the ‘Mouse’ button to select and edit elements.
7. Export a diagram file: click on the ‘Export…’ command in the ‘File’ menu, and select a file type. The following file types are available: PNG, JPG, GIF, BMP and EMF. The ‘Choose Export Quality’ dialogue allows you to adjust the quality and resolution of images in order to produce high-resolution image export files.
8. User interface language: the user interface language of e!Sankey can be English, German, French, Spanish or Portuguese. Access the ‘Options’ dialogue via the ‘Edit’ menu. In the ‘General’ tab choose the new language. You will have to restart the application for the change to take effect.
3.2 Creating a Sankey diagram

To create a Sankey diagram there are three basic steps:

1. Drawing nodes (referred to as ‘processes’ in the tool)
2. Drawing arrows between the nodes
3. Adding flows and values into the arrows

Step 1. Drawing nodes

To draw a node, click on the button ‘Process’ in the toolbar. Then click in the drawing area where you wish to place the process node and draw by moving the cursor.

Node Properties

By clicking on a process node in the diagram, the properties panel will show the ‘Process Property’ panel.
By default, a process node is drawn as a square or rectangle. But you can change the shape to a rounded rectangle, or ellipse/circle. You can also change its colour.

The ‘Arrows’ part in the process property dialogue relates to the way arrows are connected to the process (see below in the section ‘Arrow routing and connectivity’).

**Naming process nodes**

To change the name of a node from ‘Process’ to its corresponding node name, for example ‘National Budget’, select the node label and change the text of the node label in the properties panel. In this panel, you can also adapt the font and colour of the node label.

Next, you move the node label inside the process node by dragging the small blue point into the centre of the node. By dragging the small grey corners of the label, you can adjust its size.
Changing node size and shape

The size of the node can be changed by dragging its corners. To align its size and shape, 'Ctrl'-click on all the nodes that need to be changed. Then right-click on the process node you want to choose as template and click ‘Set Size to this Element’ (see Figure 29 below).

Aligning nodes or setting them at same distance

To align several nodes, select them all and go to the process node to which the other nodes should be aligned to. Right-click ‘Align to this Element’. From the dropdown menu, select one of the alignment possibilities (see Figure 29 above).

To set nodes at a same distance from each other, select them all and then right-click ‘Set at Same Distance’ (see Figure 29 above).
Step 2. Draw an arrow

Once all the nodes are created and designed, you can move to drawing the arrows between them by clicking on the ‘Arrow’ button in the toolbar.

Move the cursor to the centre of the process node (start node). The node will become dark grey and the cursor symbol turns into a hand. Left-click drag to the destination node.

The arrow at that stage is empty (‘<No Flows>’ is indicated). The arrow shows two red points where it connects to the nodes, and two yellow marker points where the curve of the arrow can be adjusted.
Arrow connectivity

The way an arrow is connected to a process node depends on the connectivity setting in the process property dialogue. The default setting is ‘Free’, meaning the connection direction is not restricted to a certain side, but depends on the angle of an imaginary line between process nodes. If you want to force the arrow to connect to a specific side of a process box, set the connectivity in the process property dialogue to one of the following options: Left to right, Right to left, Top to bottom, or Bottom to top.

Arrow properties

When clicking on an arrow line, the Arrow Properties box will appear on the left of the screen.
The options ‘Arrow Head’ and ‘Arrow Tail’ can be used to individually turn on or off the base (tail) or the head of each arrow. The figures below show examples of arrows with tails and head turned on and off.

The option ‘Rounded’ gives arrows that are drawn with rounded bends. The default setting is 30 degrees.

**Note:** in the section ‘Extra Step: Arrow layout’, more information is given on how to edit the layout of the arrow.
Step 3. Add a flow to an arrow

After having created all the arrow lines between nodes based on the information from the pivot tables, you now have to define ‘what’ flows through the arrows from one node to the next. Flows can be money, material, products, people, and so forth. In the case of a land-use finance Sankey, flows represent financial flows (volume of finance), which will be proportional to the arrow’s width.

Creating entries

To create a new entry or type of flow, click on ‘Add Entry’ in the ‘Entries’ panel at the bottom of the screen. Change the ‘New Entry’ placeholder with ‘Green finance’ or ‘Grey finance’ (or other flow categories) and select the unit type of this flow. Different types of flows can be given different colours.
Adding flows to an arrow

Once all entries (types of flows) have been created, select one entry (for example 'green finance') from the entries list and drag it directly onto the arrow line in the Sankey diagram. Based on the information from the pivot tables (see below on how to connect flows to quantitative data) a specific arrow line between two nodes is selected and allocated the corresponding flow type.

The Arrow Property dialogue box in the ‘Property’ panel on the left will appear and mentions for example the entry ‘Green finance’ in the flow list. You can manually enter the quantity of the specific flow in the ‘Quantity’ column; or the corresponding value can also be copied and pasted directly from the pivot table into the tool (see more detailed explanation in the section ‘Extra – Links to Excel’).
After entering the flow quantity, the width of the arrow line between the two nodes should now be proportional to the value, in our example: VND 1598.88 of ‘green finance’ that flows from the node ‘National Budget’ to the node ‘National Government’.

A flow can be removed from an arrow line by selecting it and then clicking on the button ‘Delete Flow’.

Creating unit types for the entry

It is important to note that for each entry (type of flow) in the ‘Entries’ panel, a unit type has to be selected. In eSankey, ‘Mass’ and ‘Energy’ are pre-defined and activated unit types. But for financial flows, the unit type ‘Money’ needs to be created for the first time.

Unit types are created in the ‘Edit Unit Types’ dialogue box by clicking the ‘Edit Unit Types’ button in the ‘Controller’ panel.
Click on the ‘+’ icon at the bottom of Unit Types. Add the name ‘Money’ for the new unit type in the field ‘Name’ and define a number format to display quantities in this unit type, for example ‘0.00’.

- 0.00: the number is shown with exactly two decimal places. The value will be rounded to two decimal places or filled with zeros if there are less. This is the common number format for currencies.
- 0,0: use a comma after the first zero to display thousand separators (for example, five million is shown as ‘5,000,000’).

You can also define a colour pallet for this unit type. In the Vietnam case study, we added the colours green and grey as we wanted to illustrate these two types of financial flows (see Figure 49).

Figure 48: Adding a new unit type ‘Money’

Figure 49: Defining the colour set for the new Unit type ‘Money’
For each unit type defined in the ‘Edit Unit Types’ dialogue box, at least a basic unit must be defined. For land-use finance Sankey, the basic unit for ‘Money’ is the chosen currency. To change an existing basic unit, just click on the first line of the units table in the ‘Name’ column and edit the unit name there. Note: changing a basic unit does not convert any flow quantities.

Now that flow types and values have been attributed to all arrows, you need to go through some further steps to improve the layout of the Sankey diagram (see Figure 51).
Extra Step. Arrow Layout

Thickness of the flow

The thickness of the arrows and their flows can be adjusted by moving the pixel bar of the Unit Type ‘Money’ in the ‘Controller’ panel. In the Vietnam case, we have applied 93 pixels to increase the flow thickness.

Other arrow properties

To further adapt the layout of the arrows, select all the arrows and make the changes in the ‘Arrows Property’ dialogue.
By using the options ‘Gradient from Source’ and/or ‘Gradient to Destination’ you can replace the default colour setting for a Sankey arrow. As a result, the arrow’s colour will gradually turn from one colour to another. The start colour is defined by the colour of the node and has to be set individually for each node in the ‘Process Properties’ panel (see Figures 54 and 55).

If you want to add a border line to an arrow, use ‘Draw Border’. Click on ‘Select Colour’ to set the border line’s colour, width and style. As mentioned above, in a Sankey diagram, the arrows’ widths are proportional to the magnitude of the flows. However, some flows are very thin compared to other flows and barely visible in the Sankey diagram. This setting can be very useful if you still want to highlight this flow in the Sankey, as the thickness of the flow can be adjusted slightly by adding a fine border in the same colour. Figure 56 illustrates this setting in the Vietnam case study.
Figure 57: How to draw a border on an arrow

Figure 58: Selecting the colour of the arrow’s border

Figure 59: Arrow with a border
Note: settings can be applied to multiple arrows. Right-click on ‘Use As Default’ from the context menu of the arrow to ‘lock’ the settings for the arrows you will draw next.

Arrow labels

The options in the 'Label' section of the arrow properties enables you to either show or hide arrow labels.

The arrow label is automatically created when a flow and a flow quantity are entered into the arrow. By default, it is placed near the middle of the arrow, but it can be positioned where it fits best and rotated. The specific information shown in the arrow label can be selected individually. To edit a label, click on an arrow label and the properties dialogue box will appear in the ‘property’ panel on the left of the screen.
The default display option for the arrow label is set to ‘Values’, so that the flow quantities are shown. The flow content label consists of the flow’s name, value and unit. The values are created automatically and cannot be edited directly, but you can individually select name, value and unit. Also, the ‘Alignment’, ‘Font’ and ‘Colour’ of the flow content label can be adapted in this dialogue box.

In the Vietnam case, we selected to show only the ‘Value’ and ‘Unit’.

**Figure 62: Different content types of arrow labels**

**Figure 63: Changing the route of an arrow by dragging its arrow points**

**Arrow routing**

The routing of an arrow between two nodes is done automatically when two nodes are connected with an arrow line. As mentioned earlier, this line has certain arrow points (red and yellow points) that determine the route and they become visible when the arrow is clicked. More points can be added if necessary, to change the route of the arrow.

**Figure 62: Different content types of arrow labels**

**Figure 63: Changing the route of an arrow by dragging its arrow points**

**Crossing arrows**

When there are many arrows crossing each other, you have to decide which should run on top of the other. Click on the arrow that is supposed to be on the top layer and select ‘Bring to Front’ from the context menu. Alternatively, click on the arrow underneath and choose ‘Send Backward.’ You may have to repeat these actions several times to move an arrow backward several layers. The commands for changing the element layer ‘Bring Forward’, ‘Send Backward’, ‘Bring to Front’ and ‘Send to Back’ are also available on the main toolbar.

**Note:** this is useful to bring smaller flows on the top/front layer of the Sankey diagram and increase their visibility.
Other diagram elements

Titles or text

To add additional text to a Sankey diagram, click on the ‘Add Text’ button on the toolbar. Alternatively, choose the command ‘Text’ from the ‘Draw’ menu. Then click on the position in the drawing area where the text element should be placed. You can also edit the alignment, font, and font size and colour in the text properties for one or more selected text element.

First, give a title to your Sankey and add another textbox indicating the currency and values used in the flows. Second, you need to create the different dimension titles.
Legend

A legend should be added in the diagram to identify the different flows in the Sankey diagram by their colour (green or grey finance). To add a legend, click on ‘Show Legend’ in the ‘Draw’ menu.

You can change the position of the legend by dragging it. The ‘Legend Property’ dialogue in the ‘Properties’ panel allows you to adjust the legend via two tabs. The ‘Graphical’ tab allows you to adjust lines, background colour, font and other graphical items of the legend. The ‘Content’ tab enables you to adjust the content and the order of the legend entries.
Other shapes

Additional graphical elements are available to improve a Sankey diagram layout. These are: rectangle, rounded rectangle, ellipse and line. These items are available in the ‘Shapes’ menu in the toolbar.

You can also add images to the Sankey diagram. In the Vietnam case study, we added the logos of the partners (see Figure 70).

Extra

Editing multiple elements

For editing the properties of multiple elements, select the elements you want to edit. Then choose the element type from the dropdown list ‘Edit Type’. The property settings you choose will be applied to all selected elements.
Grid
To properly align process nodes, it is helpful to turn on the grid. The button can be found in the editor toolbar.

Templates
With e!Sankey, diagrams can be saved as templates for creating new diagrams in the same styles, including Entries, Unit Types, Process and arrow properties, and Graphical elements (shapes, text elements and legend).

To store a diagram file as template file, use the ‘Save As...’ command from the ‘File’ menu. In the ‘Standard file save’ dialogue choose ‘e!Sankey Template (.santem)’ from the file type dropdown menu.

To create a new diagram file using a specific template, either click on the entry in the list in the ‘New Diagram’ section on the start page or choose the template by its description from the dropdown menu of the ‘New’ command in the ‘File’ menu.

Link to Excel
The Excel Live Link dynamically links the quantity value for a flow in an existing diagram file in e!Sankey with a cell in an Excel spreadsheet. When the user changes the value in the cell of the Excel sheet, the value in the Sankey diagram will be automatically updated and the arrow redrawn accordingly, so that its magnitude represents the new value.

A Live Link is created by copying a cell value in Excel (‘Ctrl-C’) and pasting it (‘Ctrl-V’) in the ‘Quantity’ field in the ‘Arrow properties’ panel. To have this panel visible, the arrow must be selected, before the cell content is pasted. The link has been established when a green arrow appears in the ‘LL’ field in the panel (see Figure 73).

Figure 72: Applying the grid

Figure 73: Live Link to Excel
Resources

RAW Graphs website: http://app.RAWGraphs.io/

RAW Graphs learning resources: https://RAWGraphs.io/learning/

RAW Graphs basic tutorial: https://www.youtube.com/watch?v=2TtYltv-M5g

e!Sankey website: https://www.ifu.com/en/e-sankey/support/#c1090

e!Sankey training videos Youtube: https://www.youtube.com/channel/UCFFAWqNTT2u8-mlgXY9GZg/