A CDIO PROJECT

RESFLOW: USER MANUAL

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1 Introduction

This user manual explains how to use ResFlow, a web based application developed by a CDIO project group at Linköpings University. This 3D visualization system displays import and export of resources on a global scale aim to help researchers' work in climate science.

In addition, indices such as GDP can be displayed using a choropleth map. A combined visualization that aims to further aid in the research when combined with resource flows.

The program can be found at www.resflow.se.

2 User Interface

Upon entering the page there is an animated circle indicating the program is loading all necessary files. When finished, all key features are instantly displayed, highlighted in figure 1 below.



Figure 1: ResFlow User Interface when first entering the page. Mouse hovering over Spain.

- **Globe:** Use mouse to interact. Click-drag to rotate or pan. Scroll to zoom. Hover to see country names. Click to select country.
- **Menu:** Selection of what to visualize. Can be hidden using the button to the top-right of the menu.

- **Resource:** All loaded resources. Select one or more to visualize. Each is assigned a unique color and displayed in the bottom-left corner.
- Country: Shows countries that contain import/export information about one or more of the selected resources. Click "select all" once to select all countries and twice to deselect all countries.
- Flow: Choose between import and export.
- Year: Choose the year for the resource.
- **Scaling:** Linear or logarithmic. Logarithmic can be used to enhance smaller resource values.
- Filter by amount: Slider to visualize e.g. only small values or only large values. If only one resource is selected, the amount is displayed just below.
- **Overlay index:** All loaded indices. Select one to visualize. This extends the menu with more options.
 - * Year: Choose the year for the index.
 - * **Range:** Displays the range for the chosen index value. Click to change the color scheme.
- **2D/3D-button:** Top-right. Can be clicked at any point to change the view between a 3D globe and a 2D map.
- **Info-box:** Bottom-right. Displays country name upon mouse hover. If only one resource is selected, total import/export is shown along with largest import/export country. Otherwise only country name is shown.

To reset all choices and start from scratch, simply reload the page. User example of the program with multiple choices made can be seen in figure 2.



Figure 2: 2D visualization example displaying from where Sweden import Soy the most in 2018, accomplished by using the 'Filter by amount' slider in logarithmic scale. Sweden import the most Soy from Brazil as seen in the bottom-right corner. This is combined with viewing the TCI index.

3 Uploading and Managing Data

In order for the program to read files correctly they have to formatted according to a chosen standard. Here are the steps that need to be followed to add new data:

- 1. Format Excel file. See section 3.1 on how to format trade files and section 3.2 for index files
- 2. Save Excel file as comma-separated value file (.csv)
- 3. Add .csv-file to 'data' folder
- 4. Add filename of the .csv-file to 'datafiles.txt' in the same folder so the program knows which files to read. Separate from other filenames with ENTER.

3.1 Formatting Trade File

Each file requires a separate header at the top where trade or index is specified, name of resource or index, unit if it was trade and lastly which year is concerned. For a trade file, add a header same as table 1. Important to separate them in column, e.g. 'Type:Trade' in one column and 'Name:Soy' in the next, no spaces.

 Table 1: Header used in a trade file.

Type:Trade Name:Soy Unit:Ton Year:2018

With the header along the first row, the second row should now contain ISO 3 codes of countries that import/consume the specified resource, countries that export this resource along the first column and the amounts in between. See figure 3 to compare non-formatted with a formatted trade file.

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	А	В	С	D	E	F	G	н	1	J	к		
1			AUS	NZL	RoOceania	CHN	HKG	JPN	KOR	MNG	TWN		
2			Australia	New Zealand	Rest of Ocea	China	Hong Kong	Japan	Republic of K	Mongolia	Taiwan		
3	Armenia	ARM	0	0	0	0	0	0	0	0	0		
4	Afghanistan	AFG	0	0	0	0	0	0	0	0	0		
5	Albania	ALB	0.55812	0.088951	0.03509	1.5757	0.40239	1.4251	0.87393	0.0074274	0.080693		
6	Algeria	DZA	0	0	0	0	0	0	0	0	0		
7	American Sar	ASM	0	0	0	0	0	0	0	0	0		
8	Andorra	AND	0	0	0	0	0	0	0	0	0		
9	Angola	AGO	7.8436	0.52418	0.59443	164.95	4.1061	10.51	5.1622	0.098013	7.6639		
10	Antigua and	ATG	0	0	0	0	0	0	0	0	0		
11	Argentina	ARG	4.95E+05	47347	17239	8.16E+06	1.92E+05	7.26E+05	8.80E+05	3014.9	2.22E+05		
12	Australia	AUS	17110	370.87	306.92	2635.5	309.09	1765.5	703.03	2.5046	232.01		
13	Austria	AUT	181.12	19.499	11.582	560.22	102.43	614.51	487.06	6.2806	45.042	-	
	() · · · · · · · · · · · · · · · · · ·	Trade 🕘					E 🔳					Þ	

A	A1 • : $\times \checkmark f_x$ Type:Trade •												
	А	В	с	D	E	F	G	н	I.	J	К		
1	Type:Trad	Name:Soy	Unit:Ton	Year:2018									
2		AUS	NZL	RoOceani	CHN	HKG	JPN	KOR	MNG	TWN	RoEAsia		
3	ARM	0	0	0	0	0	0	0	0	0	0		
4	AFG	0	0	0	0	0	0	0	0	0	0		
5	ALB	0,55812	0,088951	0,03509	1,5757	0,40239	1,4251	0,87393	0,0074274	0,080693	0,039343		
6	DZA	0	0	0	0	0	0	0	0	0	0		
7	ASM	0	0	0	0	0	0	0	0	0	0		
8	AND	0	0	0	0	0	0	0	0	0	0		
9	AGO	7,8436	0,52418	0,59443	164,95	4,1061	10,51	5,1622	0,098013	7,6639	0,80652		
10	ATG	0	0	0	0	0	0	0	0	0	0		
11	ARG	4,95E+05	47347	17239	8,16E+06	1,92E+05	7,26E+05	8,80E+05	3014,9	2,22E+05	17696		
12	AUS	17110	370,87	306,92	2635,5	309,09	1765,5	703,03	2,5046	232,01	6,8006		
13	AUT	181,12	19,499	11,582	560,22	102,43	614,51	487,06	6,2806	45,042	9,797	Ŧ	
		Trade	Soy	÷			: [•			•]	

(a) Non-formatted

(b) Formatted

Figure 3: Comparison between non-formatted and formatted trade file.

This example was achieved by doing the following:

- 1. Right-click on column with country names -> delete column
- 2. Right-click on row with country names -> delete row

- 3. Right-click on top-row -> insert row
- 4. Write the header, one item per column
- 5. Save as '.csv'
- 6. Add filename to 'datafiles.txt', separate with ENTER. For example, 'Trade_Soy.csv'

3.2 Formatting Index File

An index file with its header displayed in table 2 is followed by all ISO 3 codes in the first column and corresponding index values in the second column.

Table 2: Header used in an index file.

Type:Index | Name:GDP | Year:2018

A comparison between non-formatted and a formatted index file can be seen in figure 4. First row should include the header. Second row, first column should be all ISO 3 codes and second column all index values.

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	А	В	с	D	E	F			А	В	с	D	E	F	
1	isoab	gwcode	month	year	average_b	ase_ns		1	Type:Inde	Name:MC	Year:2021				
2	CPV	402	11	2021	0.012413			2	CPV	0.012413					
3	CIV	437	11	2021	0.193699			3	CIV	0.193699					
4	GHA	452	11	2021	0.055757			4	GHA	0.055757					
5	LBR	450	11	2021	0.027425			5	LBR	0.027425					
6	BFA	439	11	2021	0.420493			6	BFA	0.420493					
7	GIN	438	11	2021	0.144152			7	GIN	0.144152					
8	GNB	404	11	2021	0.010157			8	GNB	0.010157					
9	MLI	432	11	2021	0.788525			9	MLI	0.788525					
10	SEN	433	11	2021	0.121918			10	SEN	0.121918					
11	SLE	451	11	2021	0.018685			11	SLE	0.018685					
12	GMB	420	11	2021	0.010973			12	GMB	0.010973					
13	ILD	522	11	2021	0.118582			13	ILD	0.118582					
14	ERI	531	11	2021	0.020006			14	ERI	0.020006					
15	ETH	530	11	2021	0.824179			15	ETH	0.824179					
16	DZA	615	11	2021	0.305663			16	DZA	0.305663					
17	CMR	471	11	2021	0.572668			17	CMR	0.572668					
18	CAF	482	11	2021	0.620705			18	CAF	0.620705					
19	TUN	616	11	2021	0.339551			19	TUN	0.339551					
20	BEN	434	11	2021	0.032247		-	20	BEN	0.032247					-
	< →	. ViEWS	+						<	Index_	MCF	÷ :	4	•	·

(a) Non-formatted

(b) Formatted

Figure 4: Comparison between non-formatted and formatted index file.

This example was achieved by doing the following:

- 1. Mark and right-click on column B-D -> delete column
- 2. Write the index specific header, one item per column
- 3. Save as '.csv'
- 4. Add filename to 'datafiles.txt', separate with ENTER. For example, 'Index_MCE.csv'