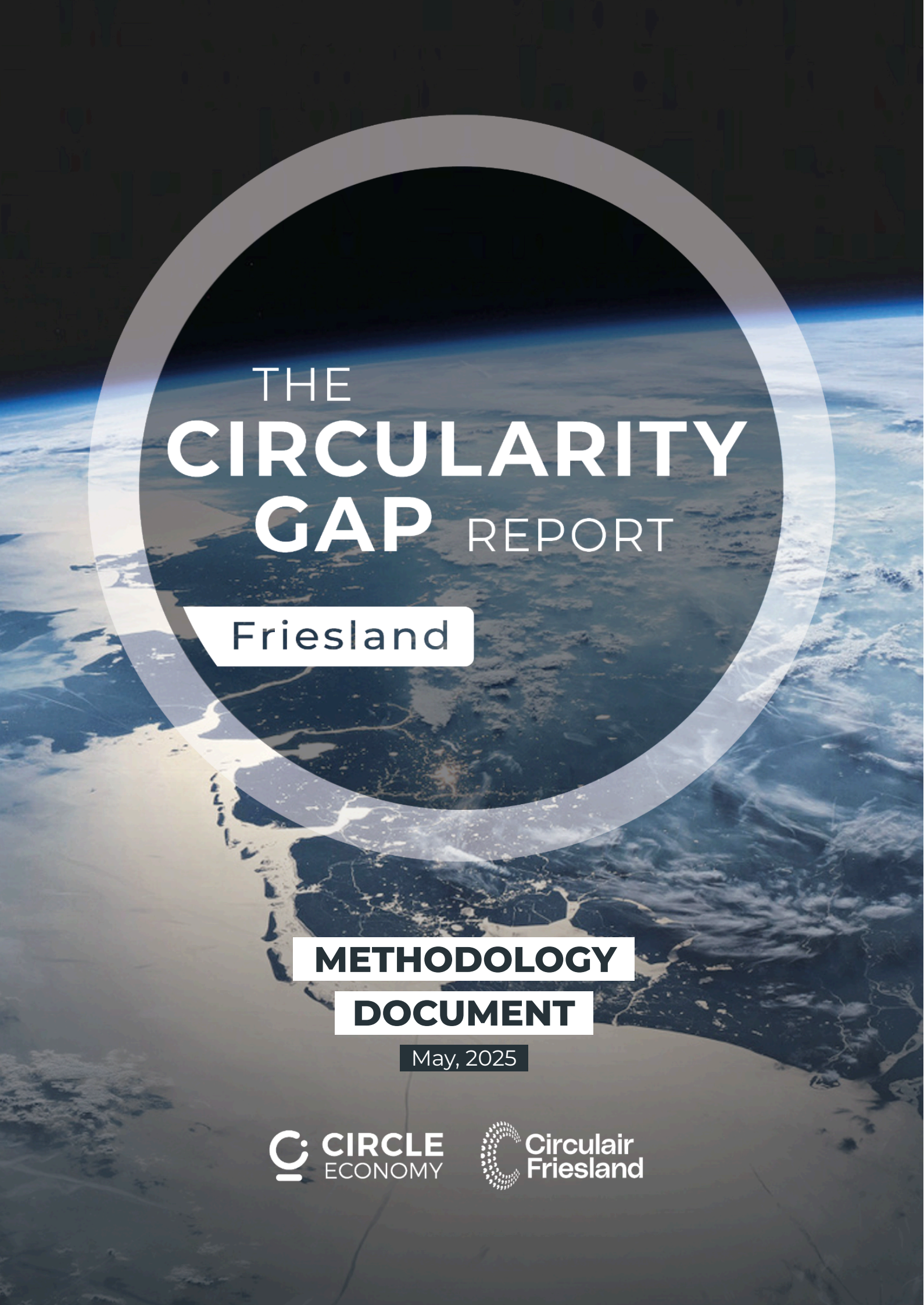

THE CIRCULARITY GAP REPORT

Friesland

METHODOLOGY DOCUMENT

May, 2025

CIRCLE ECONOMY

Circulair Friesland

CONTENTS

ABOUT CIRCLE ECONOMY

OUR MISSION IS TO EMPOWER BUSINESSES, CITIES AND NATIONS WITH DATA, TOOLS AND KNOWLEDGE TO PUT THE CIRCULAR ECONOMY INTO ACTION

We are an impact organisation, founded to create prosperity for all within the limits of our planet. We combine data, tools and digital knowledge for the greater good. With nature as our mentor, we support businesses, cities & nations to accelerate circularity with practical roadmaps for change.

We are an international team of passionate experts, based in Amsterdam.

1. INTRODUCTION

The aim of this methodology is to assess the circularity of the province of Friesland in 2025[1]. In order to assess it, the general methodology for national countries has to be adapted. For a comprehensive understanding, this document should be read in conjunction with the CGR Nations - General Methodology[2].

Environmentally-extended input-output analysis (EE-MRIOA) provides a simple and robust method for evaluating the linkages between economic consumption activities and environmental impacts, including the harvest and degradation of natural resources. EE-MRIOA is now widely used to evaluate the upstream, consumption-based drivers of downstream environmental impacts and to evaluate the environmental impacts embodied in goods and services that are traded between nations.

This methodology outlines the process of adjusting the Environmental Extension (EE) and Multi-Regional Input-Output (MRIO) system to the regional scale, detailing the data sources and methodological decisions involved, through to the sankey visualization and result reconciliation processes used to evaluate Friesland's circularity.

[1] The year of analysis is 2023, as data is often lagging one or two years behind the current year (2025). With a few exceptions, outlined where relevant, all data was collected and analysed for the year of 2023.
[2]https://reports.circularity-gap.world/general-methodology-doc-08db7cdd/CGR+Nations+-+General+methodology+document.pdf

A note on CGR Netherlands

Circle Economy continuously improves the methodologies, data sources, and quality assurances of our CGRs, and as such results may vary. The methodology used to calculate the technical cycling of the economy differs between the old approach outlined in the CGR Netherlands 2019 report and the methods applied in this analysis. While both approaches share a similar foundation, certain methodological choices have a significant impact on the results.

One key difference is the selection of the Multi-Regional Input-Output (MRIO) database, which can substantially affect the calculation of Raw Material Consumption (RMC). In the previous analysis, Exiobase was used, whereas this study relies on the FIGARO MRIO database. Because this study is subnational, we used a NUTS2 MRIO based on FIGARO to downscale the latest economic data. Additionally, the year of analysis of the previous Dutch assessment was based on 2016 data, while the current analysis is based on 2023 data. Additionally, all material extraction figures have been updated in the environmental extension to use a more globally aligned data source.

Beyond database selection, the inclusion of certain recycled and recovered waste streams as secondary materials also plays a crucial role. In the previous methodology, the reported waste included soils and dredging spoils. However, in this analysis, these materials are excluded, as they are considered waste from unused extraction and therefore not part of RMC calculations. Additionally, other biological waste flows—such as agricultural waste, food waste, and common sludges—are also excluded from the recycled content. These materials are included in the ecological cycling potential instead, and are as such not included in the technical cycling rate.

2. REGIONAL EE-MRIO

To have the coverage of the regional level of a province in the Netherlands, it is necessary to build the EE-MRIO with as much accurate data as possible, including downscaling national monetary tables (Z and Y) and environmental extension (F and FY).

The monetary tables Z and Y will be sourced from FIGARO,[3] downscaled using a regional input-output table for Europe.[4] For the environmental extension, EXIOBASE is used as the starting point with all the material and emissions updates carried on in the Weavebase database (see CGR Nations - General Methodology for more detail).

Main sources of provincial level data that are utilized in the extension are primary agricultural data, salt mining, natural gas extraction, and emissions.

2.1 Monetary tables

The Regional (NUTS2) MRIO, developed by PBL for the year 2010,[5] includes data for all EU27 countries. The dataset is constructed using FIGARO MRIO and downscaled using as much Eurostat regional data as possible for the domestic blocks. Consequently, the dataset is fully consistent with international trade flows between Member States and trade with the rest of the world.

These monetary tables include the interindustry flow matrix Z and the final demand matrix Y in monetary terms.

Regions were aggregated to the national level for all countries, except for the Netherlands, where Friesland and the rest of the Netherlands were kept separate. This separation enabled us to analyze the distribution of interregional trade flows between Friesland, the rest of the Netherlands (RNL), and other countries. By doing this, the result is a full MRIO with the resolution of all the countries included in the MRIO for the year 2010.

From this MRIO, coefficients representing Friesland's trade in relation to the rest of the Netherlands were calculated by dividing the MRIO, which includes Friesland and RNL, by a duplicated MRIO of the same dimensions representing the total Netherlands. This method makes it possible to distinguish the trade flows originating in Friesland from those coming from RNL.

In order to match the year of analysis, the interindustry and final demand matrices of the most recent FIGARO database were used. Friesland was downscaled from the Netherlands using the coefficients previously calculated.

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[3] Database - ESA supply, use and input-output tables. Eurostat (n.d.). Retrieved from: ec.europa.eu

[4] European Commission, Joint Research Centre (JRC) (2020): Regional Input-Output Data for Europe. European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/84356c3b-104d-4860-8ce3-075d2eab37ab

[5] European Commission, Joint Research Centre (JRC) (2020): Regional Input-Output Data for Europe. European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/84356c3b-104d-4860-8ce3-075d2eab37ab

2.1 Environmental extension

Our internally developed Weavebase model (see CGR Nations - General Methodology for more detail) utilises the high sectoral disaggregation of EXIOBASE's 163 sectors while keeping the high regional resolution of Eora.

For the utilization in the Friesland project, the matrices F and FY from the Satellite and Impacts accounts are used. The first step is to aggregate the regions and sectors to FIGARO NACE 64 and EXIOBASE (Mapping Table 1 in Annex). Even though the sector resolution of EXIOBASE is of 163 sectors, there are some sectors that are more detailed in the NACE 64 sector classification. To address this, the sectors that were more detailed in NACE 64 were grouped together for the environmental extension and for the monetary tables previously calculated (Mapping Table 2 in Annex).

After grouping the environmental extension, Friesland is downscaled from the Netherlands based on the total output per sector for Friesland and the Netherlands. For example: if the total output of "Mining and quarrying" in Friesland is 3% of the total in the Netherlands, the same share will be applied to all the stressors of that sector in the F matrices. In a similar way, FY matrices were downscaled based on the final demand of Friesland in relation to the Netherlands.

In order to have a more accurate representation of Friesland contribution on the environmental impacts, some bottom up corrections were carried out. Particularly related to domestic extraction of the most significant categories.

Domestic extraction is mostly focussed on agricultural activities and some minor extraction industries. The only non-agricultural material groups that are updated in the environmental extension are the extraction of sand, salt, and natural gas.

Agriculture

The agricultural account "agr_r_accts" dataset from Eurostat[6] contains the primary products in EUR with NUTS2 level of detail. The dataset was used to compare Friesland with the Netherlands, and apply the most significant agricultural output coefficients to the downscaled environmental extension.

From "agr_r_accts**"**, we select the most significant products to adjust in the domestically extracted materials of the F matrix. For reference, the initial downscaled EE based on total production is in the order of 3% for Friesland share over the total country. With this in mind, the most significant products are considered the ones with a share lower than 1% and higher than 5%.

For both Barley (5.73%) and potatoes (5.67%) the downscaled value is around 7% in the top-down extension, so given the relatively low difference, these products are not modified.

Grain maize, fodder maize, fodder root crops, other forage plants, and fresh fruits are modified using the total domestic extraction in the Netherlands and the share of Friesland according to the Mapping Table 3 (Annex).

[6] Economic accounts for agriculture by NUTS 2 region. Eurostat (n.d.). Retrieved from: ec.europa.eu

Table 1. Total production value in Million euros for the Netherlands and Friesland and the share of Friesland in the total.

Codes	Names	Netherlands	Friesland (NL)	Share Friesland / Netherlands
01000	Cereals (including seeds)	755.89	27.00	Subtotal
01100	Wheat and spelt	575.37	20.01	Subtotal
01110	Soft wheat and spelt	575.37	20.01	3.48%
01120	Durum wheat	0.00	0.00	-
01200	Rye and meslin	3.09	0.09	2.91%
01300	Barley	98.51	5.64	5.73%
01400	Oats and summer cereal mixtures	3.54	0.10	2.82%
01500	Grain maize	39.00	0.10	0.26%
01600	Rice	0.00	0.00	-
01900	Other cereals	36.37	1.07	2.94%
02000	Industrial crops	588.66	21.70	Subtotal
02100	Oil seeds and oleaginous fruits (including seeds)	10.00	0.10	Subtotal
02110	Rape and turnip rape seed	5.44	0.06	1.10%
02120	Sunflower	0.00	0.00	-
02130	Soya	0.00	0.00	-
02190	Other oleaginous products	4.56	0.05	1.10%
02200	Protein crops (including seeds)	17.00	0.80	4.71%
02300	Raw tobacco	0.00	0.00	-
02400	Sugar beet	546.00	20.57	3.77%
02900	Other industrial crops	15.66	0.23	1.47%
03000	Forage plants	1,936.44	309.07	Subtotal
03100	Fodder maize	494.44	30.49	6.17%
03200	Fodder root crops (including forage beet)	10.11	0.62	6.13%
03900	Other forage plants	1,431.89	277.96	19.41%
04000	Vegetables and horticultural products	12,119.42	119.18	Subtotal
04100	Fresh vegetables	3,617.62	72.42	2.00%
04200	Plants and flowers	8,501.80	46.76	0.55%
05000	Potatoes (including seeds)	2,081.92	118.14	5.67%
06000	Fruits	1,014.10	5.28	Subtotal
06100	Fresh fruit	1,014.10	5.28	0.52%
06200	Citrus fruits	0.00	0.00	-

06300	Tropical fruit	0.00	0.00	-
06400	Grapes	0.00	0.00	-
06500	Olives	0.00	0.00	-
07000	Wine	12.00	0.14	1.17%
08000	Olive oil	0.00	0.00	-
09000	Other crop products	754.17	18.17	2.41%
10000	Crop output	19,262.60	618.68	Subtotal

Extraction of sand

In the Netherlands extraction of sand predominantly happens in the North Sea. This means it is not strictly bound to provincial borders. Given that some extraction of sand has to happen somewhere in the Netherlands to account for the correct total,, the approach is a proportional scale for the provinces bordering the North Sea, weighted by the number of businesses related to the extraction of sand to downscale the national figure. This results in 10 businesses in the region vs 110 nationally[7], so consequently the 9.09% of the sand extraction is considered in Friesland.

Salt mining

Salt mining data is available on the "Nederlandse Olie- en Gasportaal" aka the Dutch Oil and Gas portal[8]. The share of salt extraction in Friesland is 20.89%, coefficient applied to the salt extraction in the EE.

Natural gas

Domestic extraction of natural gas is available at a regional level in the NLOG portal.[9][10] Natural gas extraction in Friesland is 11.03% of the total extracted in the Netherlands, including the extraction in the North Sea.

Oil

Oil was checked using the NLOG data as well, but no significant extraction was attributed to Friesland.

[7] Vestigingen van bedrijven; bedrijfstak, regio. (2023). CBS (n.d.). Retrieved from: opendata.cbs.nl
[8] Nlog. (n.d.). Nlog. Retrieved from: nlog.nl/datacenter/prodfigures/fields
[9] Nlog. (n.d.). Nlog. Retrieved from: nlog.nl/datacenter/prodfigures/fields
[10] Gas- en olie productiecijfers. (n.d.). Nam.nl. Retrieved from: nam.nl/gas-en-olie/gaswinning

3. WASTE

Waste data is needed for the calculation of the secondary materials cycled back to the economy. For the Technical Cycling rate indicator, recycling and backfilling of waste is included, (i.e., excluding energy recovery). While backfilling often involves low-value recycling applications and can arguably be considered as a circular flow, it should be noted that the exclusion of soils and dredging spoils prevents low-value backfilling.

Data on waste in the province of Frieland was received from the PCER project, and includes euralcode, treatment, treatment groups and volumes in (kg).

The high level treatment categories are classified as:

- A High-quality use immediately
- B Indirect high-quality use
- C Preparation for recycling
- D Microbiological processing
- E Soil cleaning
- F Incineration with yield
- G Burn
- H Deposit
- I Storage

In our analysis, the A, B and C classifications indicate waste recycled. However, to be consistent with our general methodology, codes included in Soils, Dredging spoil, Waste from Waste Treatment and Sludges and liquid wastes from waste treatment and Common sludges, were removed from the waste fractions.

The total waste volumes for each classification treatment are presented in Table 2. In Table 3 are shown the total volumes of the removed fractions that were counted as recycled (previously included in the classification A, B or C).[11]

Table 2. Total waste volumes (ktons) for each of the high level classification treatments.

Classification		Total volume (ktons)
A Direct hoogwaardig inzetten	A Direct High-quality use	143.94
B Indirect hoogwaardig inzetten	B Indirect high-quality use	32.84
C Voorbereiding voor recycling	C Preparation for recycling	1619.46
D Microbiologische verwerking	D Microbiological processing	509.67
E Grondreiniging	E Soil cleaning	51.97
F Verbranding met opbrengst	F Incineration with yield	316.95
G Verbranden	G Incineration	99.30
H Storten	H Landfill	34.91

[11] Official Journal of the European Union. (2010). Annex I - Generation of waste. Retrieved from: eur-lex.europa.eu

I Opslag	I Stock	1156.39
Total		**3965.44**

Table 3. Total volumes (ktons) excluded from the recycled waste treatment (classifications A, B and C).

	euralcode	description	Value (ktons)
Sludges and liquid wastes from waste treatment			
	190206	Sludges from physico/chemical treatment other than those mentioned in 190205	1.38
	190404	Aqueous liquid wastes from vitrified waste tempering	0
	190603	Liquor from anaerobic treatment of municipal waste	0
	190604	Digestate from anaerobic treatment of municipal waste	0
	190605	Liquor from anaerobic treatment of animal and vegetable waste	0
	190606	Digestate from anaerobic treatment of animal and vegetable waste	0
	190703	Landfill leachate other than those mentioned in 190702	0
non haz	191106	Sludges from on-site effluent treatment other than those mentioned in 191105	0
	190205	Sludges from physico/chemical treatment containing dangerous substances	0
	190208	Liquid combustible wastes containing dangerous substances	0
	190211	Other wastes containing dangerous substances	0
	190702	Landfill leachate containing dangerous substances	0
haz	191105	Sludges from on-site effluent treatment containing dangerous substances	0
Sub total (ktons)			**1.38**
Soils			
	170504	Soil and stones other than those mentioned in 170503	12.62
	200202	Soil and stones	0.13
	50105	Oil spills	0
	170503	Soil and stones containing dangerous substances	0
Sub total (ktons)			**12.76**
Dredging spoil			
	170506	dredging spoil other than those mentioned in 17 05 05	17.80
	170505	dredging spoil containing dangerous substances	0
Sub total (ktons)			**17.80**

Waste from waste treatment			
	190112	Bottom ash and slag other than those mentioned in 190111	38.98
	190114	Fly ash other than those mentioned in 190113	0
	190116	Boiler dust other than those mentioned in 190115	0
	190118	Pyrolysis wastes other than those mentioned in 190117	0
	190119	Sands from fluidised beds	0
	191209	Minerals (for example sand, stones)	17.48
	190105	Filter cake from gas treatment	0
	190106	Aqueous liquid wastes from gas treatment and other aqueous liquid wastes	0
	190107	Solid wastes from gas treatment	0
	190111	Bottom ash and slag containing dangerous substances	0
	190113	Fly ash containing dangerous substances	0
	190115	Boiler dust containing dangerous substances	0
	190117	Pyrolysis wastes containing dangerous substances	0
	190402	Fly ash and other flue-gas treatment wastes	0
	191107	Wastes from flue-gas cleaning	0
Sub total (ktons)			**56.46**
Common sludges			
	190805	Sludges from treatment of urban waste water	261.84
	20204	Sludges from on-site effluent treatment	0.02
	20305	Sludges from on-site effluent treatment	1.22
	20403	Sludges from on-site effluent treatment	0
	20502	Sludges from on-site effluent treatment	0
	20603	Sludges from on-site effluent treatment	0
	20705	Sludges from on-site effluent treatment	0
	30311	Sludges from on-site effluent treatment other than those mentioned in 03 03 10	0
	50113	Boiler feedwater sludges	0
	190902	Sludges from water clarification	0
	200304	Septic tank sludge	0.24
	200306	Waste from sewage cleaning	2.25
Sub total (ktons)			**265.58**
Solidified, stabilised or vitrified waste			

	190305	Stabilised wastes other than those mentioned in 19 03 04	0
	190307	Solidified wastes other than those mentioned in 19 03 06	0
	190304	Wastes marked as hazardous, partly stabilised	0
	190306	Wastes marked as hazardous, solidified	0
	190401	Vitrified waste	0
Sub total (ktons)			**0**
Total (ktons)			**353.98**

As a result, the total Secondary Materials (SM) are estimated as:

$$SM = 143.94 + 32.84 + 1619.46 - 353.98 = 1442.26\ ktons$$

4. INDICATORS

4.1 Footprints

EE-MRIOA represents a macroeconomic tool that allows for the calculation of a broad range of footprints (such as material and emissions) for all products and industries, including those with very complex global supply chains and following a top-down approach, MRIOA avoids double counting, and as a result, the global system is always consistent.

An MRIO approach complements traditional territorial and production-based perspectives by looking at direct environmental flows (or direct material flows) with a consumption-based and life-cycle perspective. This enables practitioners to understand these activities in terms of impacts along and across global supply chains, including indirect environmental flows.

4.2 Technical Cycling

The Technical Cycling rate measures the contribution of Secondary Materials (SM) to Processed Materials (PM). In this analysis, secondary materials originate from discarded material stocks only. The outflows from the dissipative use of materials and combusted materials (energy use) can, by definition, not be recycled. This assumption may lead to a minor underestimation of downcycled materials when solid wastes from the combustion of fossil materials are used in construction. Energy recovery (electricity, district heat) from the incineration of fossil or biomass waste is not considered recycling since it does not generate secondary materials.

$$TCr = SM/(RMC + SM) = SM/PM$$
$$TCr = 1442.26/(12135.71 + 1442.26) = 10.6\%$$

4.3 Domestic Processed Output

Domestic Processed Output (DPO) is composed of 5 material classes: emissions to air, waste disposal to the environment, emissions to water, dissipative use of products, and dissipative losses. DPO represents only the material flows from the economy to the environment, excluding those that occur within the economy.

4.3.1 Emissions to air

Data on emissions to air is available at a provincial level in the Emission Registration data portal.[12] The most recent year (2022) was selected, Friesland province, emissions of GHGs in kg CO2-eq to air. We assume that biogenic CO2 is included in this data[13].

Total air emissions in Friesland are 6.19 Mtons CO2-eq.

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[12] Emission registration, data series 1990-2022 Final. (n.d.). Emissieregistratie. Retrieved from: data.emissieregistratie.nl/export

[13] It appears to be included for the combustion of waste, and thus we assume its included elsewhere too (ttps://www.emissieregistratie.nl/sites/default/files/2024-04/2024%20(RIVM)%20Methodology%20report%20Energy%20Industry%20and%20Waste%20ER%201990-2022.pdf#page=83&zoom=100,148,873)

4.3.2 Waste disposal to the environment

In our methodology waste disposal to the environment constitutes all the waste landfilled (controlled or uncontrolled) and dumping of waste to the environment.

For Friesland the categories classified as H-Landfill and I-Stock will be considered as waste disposal to the environment (Table 2). The total waste volume reported under these categories is 1191.3 ktons, however, 241.2 ktons reported under I-Stock are waste fractions excluded from the analysis (Soils, Dredging spoil, Waste from Waste Treatment, Sludges and liquid wastes from waste treatment, and Common sludges).

Consequently, the total waste disposal to the environment is 950.1 ktons.

4.3.3 Emissions to water

Data on emissions to air is available at a provincial level in the Emission Registration data portal.[14] The most recent year (2022) was selected, Friesland province, emissions to sewers and surface water of all the water substances and metals was selected.

Total emissions to water in Friesland are 62.4 ktons.

4.3.4 Dissipative use of products

Dissipative use of products refers to material flows from the economy to the environment resulting from product application. Examples include fertilizers like manure, compost, or sewage sludge applied to land. This analysis includes organic fertilizers and sewage sludge, as they are the primary contributors.

Organic fertiliser (manure)
Manure is commonly used as a soil amendment and fertilizer. However, its application on agricultural land is often underreported or missing from agricultural statistics, requiring estimation. This can be calculated by multiplying the number of livestock by type with the annual manure production per animal, adjusted using a coefficient to account for dry matter content.[15]

Animal heads are extracted from CSB data[16] and presented in the Table .

Table 4. Total animals and manure production.

	Manure production per animal per day in kg	Dry matter of manure	Animals (heads)	Manure production (ktons/year)
Dairy Cows	70.00	0.09	482243	1108.9
Calves (incl. heifers)	17.00	0.05	45473	14.1

[14] Emission registration, data series 1990-2022 Final. (n.d.). Emissieregistratie. Retrieved from: data.emissieregistratie.nl/export
[15] Eurostat. (2018). Economy-wide material flow accounts. (n.d.). Retrieved from: /ec.europa.eu
[16] Agriculture; crops, livestock and land use by general farm type, region. (2022). Retrieved from: opendata.cbs.nl

Other bovine (e.g. bulls)	28.00	0.09	16495	15.2
Pigs for slaughtering	7.00	0.07	54353	9.7
Pigs for breeding (e.g. gilts, sows)	26.00	0.03	13538	3.9
Other pigs (e.g. boars)	8.00	0.07	67624	13.8
Poultry (total)	0.20	0.15	6215591	68.1
Sheep	7.00	0.07	133219	23.8
Horses	7.00	0.07	10249	1.8
Goats	2.9[17]	0.30[18]	29201	9.3
Rabbits	0.5[19]	0.31[20]	5685	0.3
Total	**-**	**-**	**-**	**1268.9**

Sewage sludge
From the waste data received, the sludge from urban wastewater treatment sent to recycle accounts for 261.8 ktons.

Total DPO is the sum of all the previously calculated components, resulting in **8733.2 ktons.**

4.4 Balancing Items

Certain material inputs and outputs within DMI and DPO are not fully balanced on the opposite side of the material equation. For instance, when an energy carrier is burned, its carbon content is released as CO_2 on the output side. To maintain balance, the corresponding O_2 used in combustion must be added to the input side. Similarly, energy carriers often contain water, which is released as water vapor during combustion. This water must be accounted for on the output side to ensure a correct material balance.

4.4.1 Input side

Oxygen for combustion processes can be calculated stoichiometrically from respective data for emissions of CO2 , CO, SO2 , N2O and NO2 from combustion.

Table 5. Oxygen weight included in emissions

	Oxygen weight (ktons)
CO2	2393.8

[17] Miller, R. (n.d.). How much manure will my animals produce? Utah State University. Retrieved from usu.edu
[18] Miller, R. (n.d.). How much manure will my animals produce? Utah State University. Retrieved from usu.edu
[19] Miller, R. (n.d.). How much manure will my animals produce? Utah State University. Retrieved from usu.edu
[20] Miller, R. (n.d.). How much manure will my animals produce? Utah State University. Retrieved from usu.edu

N2O	1.1
CO	8.0
NO2	7.9
SO2	0.1
Total	**2410.9**

Oxygen is required for oxidising the hydrogen intrinsically incorporated in the combusted material, with the resulting emission being water vapour.

National data was used in this calculation and downscaled based on population. This assumes the same emission relevant usage in energy carriers in Friesland and the Netherlands.

Data on Physical Energy Flow Accounts from Eurostat[21] was used following the calculation methods explained in the Economy-wide material flow accounts handbook[22].

The total oxygen needed to oxidize hydrogen in the combustion of fossil fuels in the Netherlands is estimated in 96427 ktons, consequently, Friesland contribution is 3596.7 ktons.

A small share of the oxygen used is already present in the fossil fuels, so it needs to be subtracted from the total amount of oxygen input. This constitutes 3736 ktons in the Netherlands and estimated at 139.4 ktons in Friesland.

Oxygen for respiration of human and livestock needs to be added in the input side since the emissions of carbon dioxide as a result of the respiration processes are accounted for in the output side.

Table 6. Oxygen demands for respiration

Oxygen demand for respiration	t O2 per capita and per year
Humans	0.25
Cattle	2.45
Sheep	0.20
Horses	1.84
Pigs	0.25
Poultry	0.01

Using the total amount of livestock and population in Friesland, the oxygen for respiration is estimated in 1638 ktons. Bacterial respiration from solid waste and wastewater was calculated for the Netherlands as 2552 ktons, resulting in 95.2 ktons for Friesland.

[21] Energy supply and use by NACE Rev. 2 activity. Eurostat. (n.d.). Retrieved from: ec.europa.eu/
[22] Eurostat. (2018). Economy-wide material flow accounts. (n.d.). Retrieved from: /ec.europa.eu

Total estimated input = 2410.9 + 3596.7 - 139.4 + 1638 + 95.2 = **7601.4**

4.4.2 Output side

The output side of the balancing items correspond with the input side.

Water vapour from moisture content of fuels in the Netherlands is estimated at 4426 ktons based on the Physical Energy Flow Accounts from Eurostat[23], consequently Friesland estimated at 165.1 ktons. Similarly, water vapour from the oxidised hydrogen components of fuels is estimated at 108601 ktons for the Netherlands and 4050.8 ktons for Friesland.

Next, gases from respiration of humans and livestock are also accounted for the output side but using CO2 and H20. These result in: Carbon dioxide (CO2) 1942, and Water vapour (H2O) 2711.

Total estimated output = 165.1 + 4050.8 + 1942 + 2711 = 8868.9

BI = 8868.9 - 7601.4 = 1267.5

4.5 Net Addition to Stock

Net Additions to Stock (NAS) represents the physical expansion of an economy. Each year, materials such as buildings, infrastructure, and durable goods are added to the material stock . At the same time, old materials are removed, buildings are demolished and durable goods are discarded.

In theory, NAS is calculated as the difference between gross additions and removals. However, due to limited data on these components, measuring NAS directly is challenging. Instead, it can be estimated using the formula below:

$$NAS = DMC + BI - DPO$$

Where DMC refers to Domestic Material Consumption, BI to Balancing Items and DPO to Domestic Processed Output.

Given the limited data available for DMC, it will be approximated using Raw Material Consumption (RMC).

$$NAS = 12155.4 + 1267.5 - 8733.2 = 4689.7\ ktons$$

[23] Energy supply and use by NACE Rev. 2 activity. Eurostat. (n.d.). Retrieved from: ec.europa.eu/

5. QUALITY ASSURANCE

In order to validate the results, several indicators were analyzed to compare Friesland with the Netherlands at a national level. Friesland accounts for 3.05% of the national income[24]. The population of Friesland is 651435, making up 3.73% of the national population of 17.5 million[25]. Additionally, investments in Friesland are 2.97% of the national figure[26]. These indicators help assess whether the results are within the same order of magnitude.

Regarding the IOT for Friesland in comparison to the Netherlands, most sectors in Friesland's inter-industry matrix (Z) represent between 2% and 4% of the supply in the same sectors at the national level. The highest share is observed in the "Manufacture of food products; beverages and tobacco products" sector, accounting for nearly 12%, followed by agricultural sectors at around 6-7%.

Regarding the final demand matrix (Y) for Friesland in comparison to the Netherlands, most sectors represent between 2% and 4% of the national demand for the same sectors. The highest share is observed in "Forestry and logging" at 7.3%, followed closely by "Manufacture of food products; beverages and tobacco products" at nearly 7%, with other agricultural sectors around 6%.

This reflects the region's economic profile, which is characterized by its focus on agri-food production.[27] The total material footprint in Friesland resulted in 12155 ktons, representing 3.8% of the total 315901 ktons in the Netherlands.

On the other hand, carbon footprint in Friesland resulted in 7073 ktons, representing 3.7% of the total 191619 ktons in the Netherlands.

Total waste data for Friesland is 3965.4 ktons, which represents 3.24% of the total of the reported in the Netherlands (122504.9 ktons)[28].

[24] Vermogen van huishoudens; huishoudenskenmerken, regio (indeling 2023). CBS Statline. (n.d.). Cbs.nl. Retrieved from: opendata.cbs.nl
[25] Bevolking; geslacht, leeftijd, nationaliteit en regio, 1 januari. CBS Statline. (n.d.). Cbs.nl. Retrieved from: opendata.cbs.nl
[26] Investeringen in vaste activa; type en regio, nr, 1995-2021. CBS Statline. (n.d.). Cbs.nl. Retrieved from: opendata.cbs.nl
[27] Portrait of the Regions - NETHERLANDS - FRIESLAND - Economy. Eurostat. (n.d.). Retrieved from: circabc.europa.eu
[28] Treatment of waste by waste category, hazardousness and waste management operations. Eurostat. (n.d.). Retrieved from: ec.europa.eu

ANNEX

Mapping table 1- Sector mapping between EXIOBASE and NACE and the societal need classification.

Exiobase sector	NACE code	NACE description	Societal needs
Cultivation of paddy rice	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of wheat	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of cereal grains nec	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of vegetables, fruit, nuts	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of oil seeds	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of sugar cane, sugar beet	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of plant-based fibers	A01	Crop and animal production, hunting and related service activities	Nutrition
Cultivation of crops nec	A01	Crop and animal production, hunting and related service activities	Nutrition
Cattle farming	A01	Crop and animal production, hunting and related service activities	Nutrition
Pigs farming	A01	Crop and animal production, hunting and related service activities	Nutrition
Poultry farming	A01	Crop and animal production, hunting and related service activities	Nutrition
Meat animals nec	A01	Crop and animal production, hunting and related service activities	Nutrition
Animal products nec	A01	Crop and animal production, hunting and related service activities	Nutrition
Raw milk	A01	Crop and animal production, hunting and related service activities	Nutrition
Wool, silk-worm cocoons	A01	Crop and animal production, hunting and related service activities	Nutrition
Manure treatment (conventional), storage and land application	A01	Crop and animal production, hunting and related service activities	Nutrition
Manure treatment (biogas), storage and land application	A01	Crop and animal production, hunting and related service activities	Nutrition
Forestry, logging and related service activities (02)	A02	Forestry and logging	Shelter
Fishing, operating of fish hatcheries and fish farms; service activities incidental to fishing (05)	A03	Fishing and aquaculture	Nutrition
Mining of coal and lignite; extraction of peat (10)	B	Mining and quarrying	Shelter

Extraction of crude petroleum and services related to crude oil extraction, excluding surveying	B	Mining and quarrying	Shelter
Extraction of natural gas and services related to natural gas extraction, excluding surveying	B	Mining and quarrying	Shelter
Extraction, liquefaction, and regasification of other petroleum and gaseous materials	B	Mining and quarrying	Shelter
Mining of uranium and thorium ores (12)	B	Mining and quarrying	Shelter
Mining of iron ores	B	Mining and quarrying	Shelter
Mining of copper ores and concentrates	B	Mining and quarrying	Shelter
Mining of nickel ores and concentrates	B	Mining and quarrying	Shelter
Mining of aluminium ores and concentrates	B	Mining and quarrying	Shelter
Mining of precious metal ores and concentrates	B	Mining and quarrying	Shelter
Mining of lead, zinc and tin ores and concentrates	B	Mining and quarrying	Shelter
Mining of other non-ferrous metal ores and concentrates	B	Mining and quarrying	Shelter
Quarrying of stone	B	Mining and quarrying	Shelter
Quarrying of sand and clay	B	Mining and quarrying	Shelter
Mining of chemical and fertilizer minerals, production of salt, other mining and quarrying n.e.c.	B	Mining and quarrying	Shelter
Processing of meat cattle	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Processing of meat pigs	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Processing of meat poultry	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Production of meat products nec	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Processing vegetable oils and fats	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Processing of dairy products	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Processed rice	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Sugar refining	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition

Processing of Food products nec	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Manufacture of beverages	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Manufacture of fish products	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Manufacture of tobacco products (16)	C10T12	Manufacture of food products; beverages and tobacco products	Nutrition
Manufacture of textiles (17)	C13T15	Manufacture of textiles, wearing apparel, leather and related products	Manufactured goods
Manufacture of wearing apparel; dressing and dyeing of fur (18)	C13T15	Manufacture of textiles, wearing apparel, leather and related products	Manufactured goods
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear (19)	C13T15	Manufacture of textiles, wearing apparel, leather and related products	Manufactured goods
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (20)	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Shelter
Re-processing of secondary wood material into new wood material	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Shelter
Pulp	C17	Manufacture of paper and paper products	Communication
Re-processing of secondary paper into new pulp	C17	Manufacture of paper and paper products	Communication
Paper	C17	Manufacture of paper and paper products	Communication
Publishing, printing and reproduction of recorded media (22)	C18	Printing and reproduction of recorded media	Communication
Manufacture of coke oven products	C19	Manufacture of coke and refined petroleum products	Mobility
Petroleum Refinery	C19	Manufacture of coke and refined petroleum products	Mobility
Processing of nuclear fuel	C19	Manufacture of coke and refined petroleum products	Mobility
Plastics, basic	C20	Manufacture of chemicals and chemical products	Manufactured goods
Re-processing of secondary plastic into new plastic	C20	Manufacture of chemicals and chemical products	Manufactured goods
N-fertiliser	C20	Manufacture of chemicals and chemical products	Manufactured goods
P- and other fertiliser	C20	Manufacture of chemicals and chemical products	Manufactured goods

Chemicals nec	C20	Manufacture of chemicals and chemical products	Manufactured goods
Manufacture of rubber and plastic products (25)	C22	Manufacture of rubber and plastic products	Manufactured goods
Manufacture of glass and glass products	C23	Manufacture of other non-metallic mineral products	Shelter
Re-processing of secondary glass into new glass	C23	Manufacture of other non-metallic mineral products	Shelter
Manufacture of ceramic goods	C23	Manufacture of other non-metallic mineral products	Shelter
Manufacture of bricks, tiles and construction products, in baked clay	C23	Manufacture of other non-metallic mineral products	Shelter
Manufacture of cement, lime and plaster	C23	Manufacture of other non-metallic mineral products	Shelter
Re-processing of ash into clinker	C23	Manufacture of other non-metallic mineral products	Shelter
Manufacture of other non-metallic mineral products n.e.c.	C23	Manufacture of other non-metallic mineral products	Shelter
Manufacture of basic iron and steel and of ferro-alloys and first products thereof	C24	Manufacture of basic metals	Shelter
Re-processing of secondary steel into new steel	C24	Manufacture of basic metals	Shelter
Precious metals production	C24	Manufacture of basic metals	Shelter
Re-processing of secondary preciuos metals into new preciuos metals	C24	Manufacture of basic metals	Shelter
Aluminium production	C24	Manufacture of basic metals	Shelter
Re-processing of secondary aluminium into new aluminium	C24	Manufacture of basic metals	Shelter
Lead, zinc and tin production	C24	Manufacture of basic metals	Shelter
Re-processing of secondary lead into new lead, zinc and tin	C24	Manufacture of basic metals	Shelter
Copper production	C24	Manufacture of basic metals	Shelter
Re-processing of secondary copper into new copper	C24	Manufacture of basic metals	Shelter
Other non-ferrous metal production	C24	Manufacture of basic metals	Shelter
Re-processing of secondary other non-ferrous metals into new other non-ferrous metals	C24	Manufacture of basic metals	Shelter
Casting of metals	C24	Manufacture of basic metals	Shelter
Manufacture of fabricated metal products, except machinery and equipment (28)	C25	Manufacture of fabricated metal products, except machinery and equipment	Manufactured goods

Manufacture of machinery and equipment n.e.c. (29)	C28	Manufacture of machinery and equipment n.e.c.	Manufactured goods
Manufacture of office machinery and computers (30)	C26	Manufacture of computer, electronic and optical products	Manufactured goods
Manufacture of electrical machinery and apparatus n.e.c. (31)	C27	Manufacture of electrical equipment	Manufactured goods
Manufacture of radio, television and communication equipment and apparatus (32)	C26	Manufacture of computer, electronic and optical products	Manufactured goods
Manufacture of medical, precision and optical instruments, watches and clocks (33)	C26	Manufacture of computer, electronic and optical products	Manufactured goods
Manufacture of motor vehicles, trailers and semi-trailers (34)	C29	Manufacture of motor vehicles, trailers and semi-trailers	Mobility
Manufacture of other transport equipment (35)	C30	Manufacture of other transport equipment	Mobility
Manufacture of furniture; manufacturing n.e.c. (36)	C31_32	Manufacture of furniture; other manufacturing	Manufactured goods
Recycling of waste and scrap	E37T39	Sewerage, waste management, remediation activities	Other Services
Recycling of bottles by direct reuse	E37T39	Sewerage, waste management, remediation activities	Other Services
Production of electricity by coal	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by gas	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by nuclear	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by hydro	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by wind	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by petroleum and other oil derivatives	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by biomass and waste	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by solar photovoltaic	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by solar thermal	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by tide, wave, ocean	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity by Geothermal	D35	Electricity, gas, steam and air conditioning supply	Shelter
Production of electricity nec	D35	Electricity, gas, steam and air conditioning supply	Shelter

Transmission of electricity	D35	Electricity, gas, steam and air conditioning supply	Shelter
Distribution and trade of electricity	D35	Electricity, gas, steam and air conditioning supply	Shelter
Manufacture of gas; distribution of gaseous fuels through mains	D35	Electricity, gas, steam and air conditioning supply	Shelter
Steam and hot water supply	D35	Electricity, gas, steam and air conditioning supply	Shelter
Collection, purification and distribution of water (41)	E36	Water collection, treatment and supply	Other Services
Construction (45)	F	Construction	Shelter
Re-processing of secondary construction material into aggregates	F	Construction	Shelter
Sale, maintenance, repair of motor vehicles, motor vehicles parts, motorcycles, motor cycles parts and accessoiries	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Mobility
Retail sale of automotive fuel	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Mobility
Wholesale trade and commission trade, except of motor vehicles and motorcycles (51)	G46	Wholesale trade, except of motor vehicles and motorcycles	Other Services
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods (52)	G47	Retail trade, except of motor vehicles and motorcycles	Other Services
Hotels and restaurants (55)	I	Accommodation and food service activities	Other Services
Transport via railways	H49	Land transport and transport via pipelines	Mobility
Other land transport	H49	Land transport and transport via pipelines	Mobility
Transport via pipelines	H49	Land transport and transport via pipelines	Mobility
Sea and coastal water transport	H50	Water transport	Mobility
Inland water transport	H50	Water transport	Mobility
Air transport (62)	H51	Air transport	Mobility
Supporting and auxiliary transport activities; activities of travel agencies (63)	H52	Warehousing and support activities for transportation	Mobility
Post and telecommunications (64)	H53	Postal and courier activities	Communication
Financial intermediation, except insurance and pension funding (65)	K64	Financial service activities, except insurance and pension funding	Other Services
Insurance and pension funding, except compulsory social security (66)	K65	Insurance, reinsurance and pension funding, except compulsory social security	Other Services

Activities auxiliary to financial intermediation (67)	K66	Activities auxiliary to financial services and insurance activities	Other Services
Real estate activities (70)	L	Real estate activities	Shelter
Renting of machinery and equipment without operator and of personal and household goods (71)	N77	Rental and leasing activities	Other Services
Computer and related activities (72)	J62_63	Computer programming, consultancy, and information service activities	Other Services
Research and development (73)	M72	Scientific research and development	Other Services
Other business activities (74)	M69_70	Legal and accounting activities; activities of head offices; management consultancy activities	Other Services
Public administration and defence; compulsory social security (75)	O84	Public administration and defence; compulsory social security	Other Services
Education (80)	P85	Education	Healthcare & Education
Health and social work (85)	Q86	Human health activities	Healthcare & Education
Incineration of waste: Food	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Paper	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Plastic	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Metals and Inert materials	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Textiles	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Wood	E37T39	Sewerage, waste management, remediation activities	Other Services
Incineration of waste: Oil/Hazardous waste	E37T39	Sewerage, waste management, remediation activities	Other Services
Biogasification of food waste, incl. land application	E37T39	Sewerage, waste management, remediation activities	Other Services
Biogasification of paper, incl. land application	E37T39	Sewerage, waste management, remediation activities	Other Services
Biogasification of sewage slugde, incl. land application	E37T39	Sewerage, waste management, remediation activities	Other Services
Composting of food waste, incl. land application	E37T39	Sewerage, waste management, remediation activities	Other Services
Composting of paper and wood, incl. land application	E37T39	Sewerage, waste management, remediation activities	Other Services
Waste water treatment, food	E37T39	Sewerage, waste management, remediation activities	Other Services

Waste water treatment, other	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Food	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Paper	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Plastic	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Inert/metal/hazardous	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Textiles	E37T39	Sewerage, waste management, remediation activities	Other Services
Landfill of waste: Wood	E37T39	Sewerage, waste management, remediation activities	Other Services
Activities of membership organisation n.e.c. (91)	S94	Activities of membership organisations	Other Services
Recreational, cultural and sporting activities (92)	R90-R92	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities	Healthcare & Education
Other service activities (93)	S96	Other personal service activities	Other Services
Private households with employed persons (95)	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	Other Services
Extra-territorial organizations and bodies	U	Activities of extraterritorial organisations and bodies	Other Services

Mapping Table 2- Extra sectors classification in NACE.

Exiobase sector	NACE code	NACE description	Mapped NACE code
Other business activities (74)	N80T82	Security and investigation activities; Services to buildings and landscape activities; Office administrative, office support and other business support activities	M69_70
Health and social work (85)	Q87_88	Residential care activities; Social work activities without accommodation	Q86
Recreational, cultural and sporting activities (92)	R93	Activities of sport clubs	R90-R92
Other service activities (93)	S95	Repair of computers and personal and household goods	S96

Chemicals nec	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	C20
Manufacture of electrical machinery and apparatus n.e.c. (31)	C33	Repair and installation of machinery and equipment	C27
Publishing, printing and reproduction of recorded media (22)	J58	Publishing activities	C18
Publishing, printing and reproduction of recorded media (22)	J59_60	Motion picture, video and television programme production, sound recording and music publishing activities; Programming and broadcasting activities	C18
Post and telecommunications (64)	J61	Telecommunications	H53
Other business activities (74)	M71	Architectural and engineering activities; technical testing and analysis	M69_70
Other business activities (74)	M73	Advertising and market research	M69_70
Other business activities (74)	M74_75	Other professional, scientific and technical activities; Veterinary activities	M69_70
Other business activities (74)	N78	Employment activities	M69_70
Other business activities (74)	N79	Travel agency, tour operator and other reservation service and related activities	M69_70

Mapping Table 3 - Exiobase stressors from the Environmental Extension (F and FY matrices) mapped to the agricultural products modified with calculated Friesland share.

Stressor- Domestic Extraction Used -	Agriculture product	Friesland share
Primary Crops - Apples	Fruits	0.52%
Primary Crops - Apricots	Fruits	0.52%
Primary Crops - Avocados	Fruits	0.52%
Primary Crops - Bananas	Fruits	0.52%
Primary Crops - Berries nec	Fruits	0.52%
Primary Crops - Blueberries	Fruits	0.52%
Primary Crops - Cashewapple	Fruits	0.52%
Primary Crops - Cherries	Fruits	0.52%
Primary Crops - Citrus Fruit nec	Fruits	0.52%
Primary Crops - Cranberries	Fruits	0.52%
Primary Crops - Currants	Fruits	0.52%
Primary Crops - Dates	Fruits	0.52%
Primary Crops - Figs	Fruits	0.52%
Primary Crops - Fruit Fresh Nes	Fruits	0.52%
Primary Crops - Fruit, tropical fresh nes	Fruits	0.52%

Primary Crops - Gooseberries	Fruits	0.52%
Primary Crops - Grapefruit and Pomelos	Fruits	0.52%
Primary Crops - Grapes	Fruits	0.52%
Primary Crops - Kiwi Fruit	Fruits	0.52%
Primary Crops - Lemons and Limes	Fruits	0.52%
Primary Crops - Mangoes, mangosteens, guavas	Fruits	0.52%
Primary Crops - Melonseed	Fruits	0.52%
Primary Crops - Oil Palm Fruit	Fruits	0.52%
Primary Crops - Olives	Fruits	0.52%
Primary Crops - Oranges	Fruits	0.52%
Primary Crops - Other melons	Fruits	0.52%
Primary Crops - Papayas	Fruits	0.52%
Primary Crops - Peaches and Nectarines	Fruits	0.52%
Primary Crops - Pears	Fruits	0.52%
Primary Crops - Persimmons	Fruits	0.52%
Primary Crops - Pineapples	Fruits	0.52%
Primary Crops - Plantains	Fruits	0.52%
Primary Crops - Plums	Fruits	0.52%
Primary Crops - Pome fruit, nes	Fruits	0.52%
Primary Crops - Quinces	Fruits	0.52%
Primary Crops - Raspberries	Fruits	0.52%
Primary Crops - Sour Cherries	Fruits	0.52%
Primary Crops - Stone Fruit nec	Fruits	0.52%
Primary Crops - Strawberries	Fruits	0.52%
Primary Crops - Tang. Mand Clement. Satsma	Fruits	0.52%
Primary Crops - Watermelons	Fruits	0.52%
Primary Crops - Maize	Grain maize	0.26%
Primary Crops - Maize, green	Grain maize	0.26%
Fodder crops - Maize for Forage and Silage	Fodder maize	6.17%
Fodder crops - Beets for Fodder	Fodder root crops	6.13%
Fodder crops - Cabbage for Fodder	Fodder root crops	6.13%
Fodder crops - Carrots for Fodder	Fodder root crops	6.13%
Fodder crops - Swedes for Fodder	Fodder root crops	6.13%

Fodder crops - Turnips for Fodder	Fodder root crops	6.13%
Fodder crops - Vegetables and Roots, Fodder	Fodder root crops	6.13%
Fodder crops - Alfalfa for Forage and Silage	Other forage plants	19.41%
Fodder crops - Clover for Forage and Silage	Other forage plants	19.41%
Fodder crops - Forage Products nec	Other forage plants	19.41%
Fodder crops - Grasses nec for Forage and Silage	Other forage plants	19.41%
Fodder crops - Green Oilseeds for Fodder	Other forage plants	19.41%
Fodder crops - Leguminous nec for forage and Silage	Other forage plants	19.41%
Fodder crops - Other grasses	Other forage plants	19.41%
Fodder crops - Rye Grass, Forage and Silage	Other forage plants	19.41%
Fodder crops - Sorghum for Forage and Silage	Other forage plants	19.41%

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