Swedish Environmental
Research Institute

Swedish National Nitrogen Budget

Waste

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Summary

In this report, pool five 'Waste' (WS) of the Swedish National Nitrogen Budget (NNB) is presented. The Waste pool of the NNB is one of eight pools defined by the Task Force of Reactive Nitrogen (TFRN) which together represent a total national nitrogen budget capturing all major flows of all forms of reactive nitrogen (Nr) within a country and across the country borders. The methodology to calculate NNB has been provided by the Expert Panel on Nitrogen Budgets (EPNB) in the Annexes to the ECE/EB.AIR/119 – "Guidance document on national nitrogen budgets". The final description of the methodology for the WS pool is (February 2025) still missing in the above Guidance document, but an advanced draft of the Waste chapter has been made available to us during this work.

The WS pool includes two sub-pools: Solid waste and Wastewater. The major flows of Nr to and from these sub-pools were calculated for the year 2015 when data were available. Otherwise, data for adjacent years were used. The most important source of data was Statistics Sweden, which is the Swedish agency responsible for the official national statistics.

The inflows of Nr consisted of industrial waste, (58.1 kt N, combined from all industries), municipal wastewater (41.2 kt N), household waste (31.9 kt N) and imported waste (22.5 kt N). The largest directly quantifiable outflows of reactive nitrogen from the Waste pool were residual product from anaerobic digestion of biological waste used for soil amendments (19.8 kt N), and discharge of treated wastewater (15.6 kt N). These are followed by material recycling, waste export, sludge used as a fertilizer, use of compost for gardening and Nr emissions to the atmosphere, these five flows together amounting to 17.2 kt N. Thus, the directly quantifiable outflows of Nr were 52.6 kt N. However, the dominant outflows of N were emissions of non-reactive N_2 from waste and sludge incineration to the atmosphere (76.3 kt N) and denitrification (21.7 kt N), both of these flows were quantified in part as a residual post in the mass balance calculations.

The total input of Nr was 153.6 kt N, of which 10.0 kt N accumulates in landfills and in materials used for backfilling. The total Nr output from Waste was 150.6 kt N.

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Abbreviations

The abbreviations used in this report.

Abbreviation	Explanation
AG	Agriculture (Pool)
AT	Atmosphere (Pool)
CEIP	Centre on Emission Inventories and Projections
CLRTAP	Convention on Long-Range Transboundary Air Pollution
EPA	Environmental Protection Agency
EPNB	The Expert Panel on Nitrogen Budgets
FS	Forest and Semi-natural grasslands (Pool)
HS	Humans and Settlements (Pool)
HY	Hydrosphere (Pool)
MP	Materials and Products (Pool)
NNB	National Nitrogen Budget
Nr	Reactive Nitrogen
RW	Rest of the World (Pool)
TFRN	Task Force on Reactive Nitrogen
WGSR	Working Group on Strategies and Review
WS	Waste (Pool)
WS.SO	Waste – Solid Waste (Sub-pool)
WS.WW	Waste – Wastewater (Sub-pool)

1 Introduction

The Task Force on Reactive Nitrogen (TFRN) was established under the Working Group on Strategies and Review (WGSR) by the Executive Body of CLRTAP at its twenty-fifth session in December 2007. The purpose of TFRN has been defined as: "The Task Force will develop in the long-term technical and scientific information and options which can be used for strategy development across the UNECE to encourage coordination of air pollution policies on nitrogen in the context of the nitrogen cycle and which may be used by other bodies outside the Convention in consideration of other control measures." For the full terms of reference of the Task Force, see the Executive Body decision 2007/11. At the first meeting in Wageningen, 2008, TFRN agreed to define reactive nitrogen (Nr) as all biologically active, photochemically reactive and radiatively active N compounds in the biosphere and atmosphere. This meant, in practice, all N except N_2 gas; for example, nitric oxide (NO), nitrogen dioxide (NO_2), nitrate (NO_3^-), organic N compounds, nitrous oxide (N_2O), ammonia (NH_3) and ammonium (NH_4^+). At the same meeting it was proposed that an expert panel could help in preparing for the reporting of national budgets, by exploring methodologies and providing a reference template and guidance for the compilation. The Expert Panel on Nitrogen Budgets (EPNB) was established (first as an ad-hoc group) and commenced work on "Guidance Document on National Nitrogen Budgets". The document was presented and approved at the 31st meeting of the Executive Body of the CLRTAP in December 2012. The document can be downloaded from http://www.clrtap-tfrn.org/sites/clrtaptfrn.org/files/documents/EPNB_new/ECE_EB.AIR_119_ENG.pdf. After that, the work of EPNB continued to provide detailed guidelines for each of the eight main parts of the National Nitrogen Budget (NNB) summarised in Annexes to the ECE/EB.AIR/119 – "Guidance document on national nitrogen budgets". Currently the version dated 02.03.2021 is available at http://www.clrtap-tfrn.org/sites/clrtaptfrn.org/files/documents/EPNB_new/EPNB_annex_20210302_public.pdf and it provides description of seven out of the eight pools (Figure 1). Annex 5 Waste is still under development. However, an advanced draft of Annex 5 has been made available to us in September 2024 (Schäppi et al., in prep). The new, more complete, thoroughly revised, and harmonized Guidance document, including completion of Annex 5 and revision of all existing annexes is expected to be published in spring 2025. Due to generous support and openness of colleagues in the EPNB who are preparing the Annex 5 and who shared their ideas and the draft Annex 5 with us, we are confident that the methodology applied in this report are in line with the upcoming Annex 5.

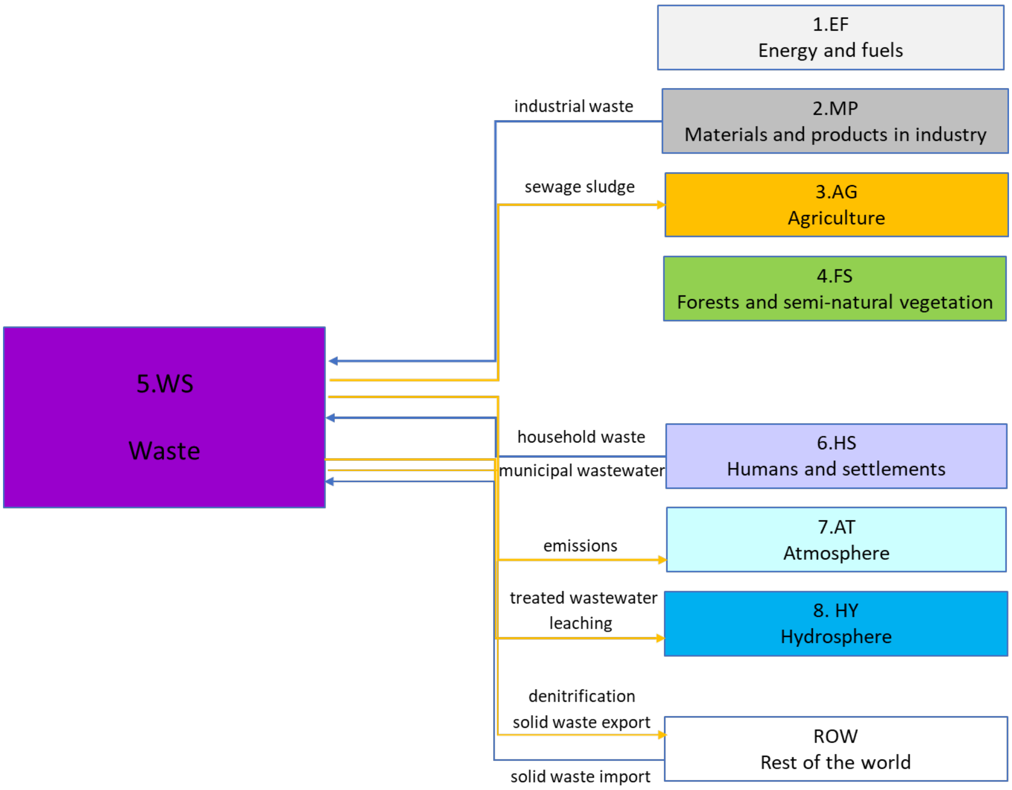

Figure 1. Flows connecting neighboring pools with Waste. Modified after Schäppi et al., (in prep).

2 Methodology and results

Pool 5, Waste, is divided into two sub-pools called Solid Waste (WS.SO) and Wastewater (WS.WW). The method for calculating the flows is based on Schäppi et al., (in prep) Annex 5. The data sources used are Statistics Sweden and the previous NNB reports (Stadmark et al., 2019, Stadmark et al., 2020, Moldan et al., 2022, Jutterström et al., 2025 and Ljunggren et al., 2025, all available on www.ivl.se). The calculated N flows are presented in Figure 2.

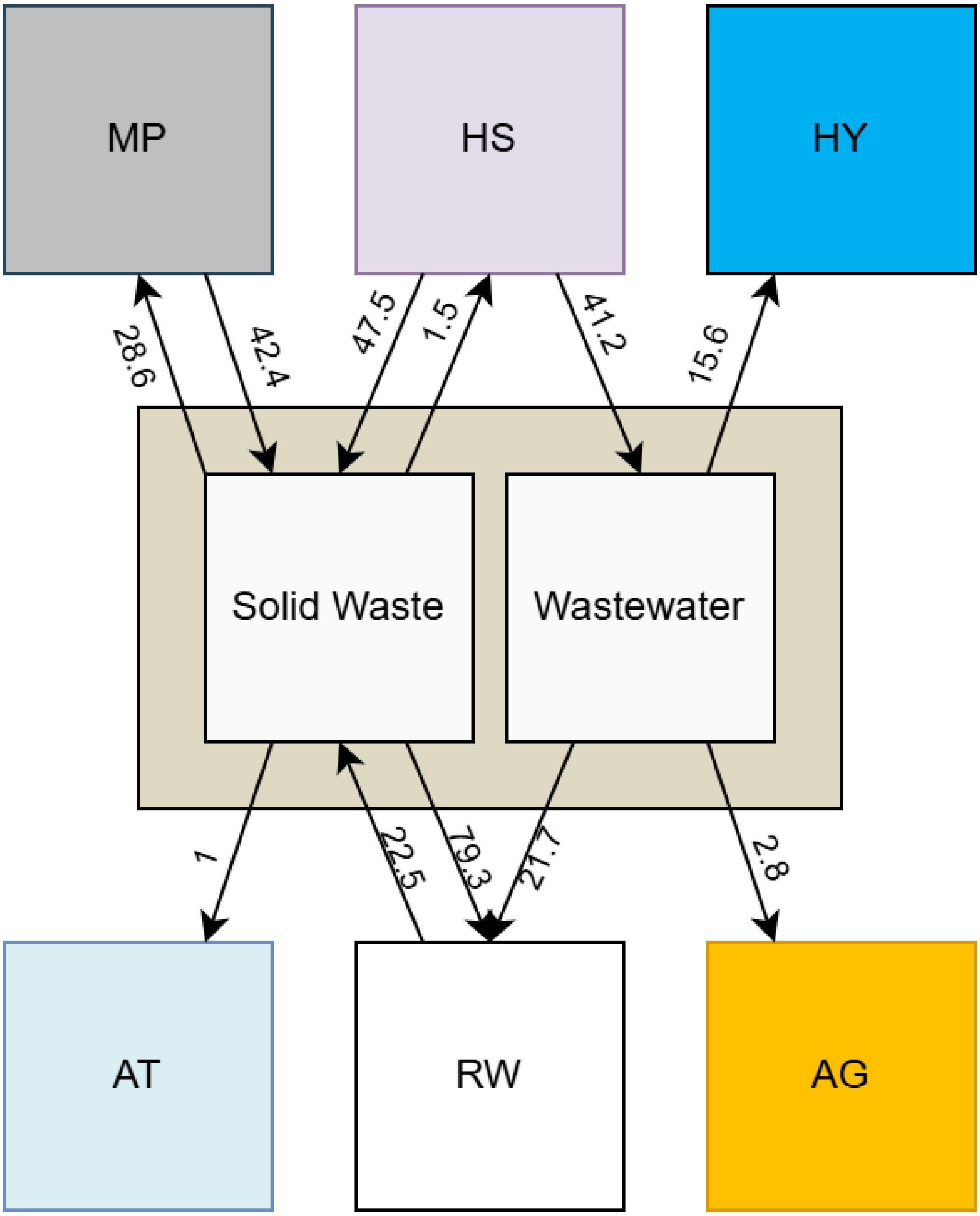

Figure 2. The flows of N between WS and other pools (kt N, year 2015).

2.1 Solid waste WS.SO

2.1.1 Inputs

2.1.1.1 Industrial waste

Data for waste, divided into type of waste and type of industry, were gathered from Statistics Sweden[1]. An average of 2014 and 2016 were used as data for 2015 were not available. EPNB provided the N content of different types of waste which was adjusted slightly to fit the categories of the Statistics Sweden waste data (see Table A1, Appendix A). The industry categories *Waste management; Recycling* and *Trade with waste and scrap* were excluded as they are internal flows within the WS pool. The waste type categories *Mineral wastes from waste treatment and stabilized wastes* and *Sludges and liquid wastes from waste treatment* was excluded for the same reason and *Soils* and *Dredging spoils* were excluded as they don't change pools either. Finally, the waste type *Animal faeces, urine and manure* from the waste producer category *Agriculture, forestry, hunting and fishing* was excluded as it was covered in the AG report (Stadmark et al., 2019).

The remaining data was divided based on the NNB-pool they belonged to. The categories *Mining of minerals; Food, beverage and tobacco manufacturing; Textile, clothing, and leather manufacturing; Wood and wood products manufacturing; Paper and paper product manufacturing, graphic industry; Industry for coal and refined petroleum products; Chemical, pharmaceutical, rubber, and plastic manufacturing; Manufacturing of other non-metallic mineral products; Steel and metal production, metal product manufacturing; Manufacturing of computers, electronics, optics, electrical equipment, other machinery, motor vehicles and other transport equipment; Furniture manufacturing, other manufacturing, repair and installation of machinery and equipment*; and *Construction;* were assumed to come from the MP-pool. The N flow in industrial waste from MP was calculated to 42.4 kt N.

Industrial waste MP-WS.SO: 42.4 kt N

The remaining waste producer categories were *Service providers, Agriculture, forestry, hunting and fishing* and *Supply of electricity, gas, heat and cold*. These categories were attributed to the HS pool. The waste type *Household and similar*

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[1] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0305/MI0305T01C/

wastes was attributed to the HS pool as well, regardless of the industry that discarded it. The N flow in industrial waste from HS was calculated to 15.6 kt N. The N content per industry is presented in Table 1.

Industrial waste HS-WS.SO: 15.6 kt N

Table 1. N content in waste per industry.

Industry	N content in waste (kt)
Service providers	13.4
Paper and paper product manufacturing; graphic industry	12.6
Food, beverage and tobacco manufacturing	10.7
Construction	8.0
Steel and metal production; metal product manufacturing	3.3
Chemical, pharmaceutical, rubber, and plastic manufacturing	3.1
Manufacturing of computers, electronics, optics, electrical equipment, other machinery, motor vehicles and other transport equipment	2.6
Agriculture, forestry, hunting and fishing	1.2
Supply of electricity, gas, heat and cold	0.8
Wood and wood products manufacturing	0.8
Manufacturing of other non-metallic mineral products	0.6
Furniture manufacturing; other manufacturing; repair and installation of machinery and equipment	0.4
Mining of minerals	0.3
Industry for coal and refined petroleum products	0.2
Textile, clothing, and leather manufacturing	0.2

2.1.1.2 Household waste

The waste data from Statistics Sweden[2] also contained N content from Household waste. It was calculated using the same N content percentages as industrial waste (see Table A1, Appendix A) to 31.9 kt N.

[2] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0305/MI0305T01C/

Household waste HS – WS.SO: 31.9 kt N.

2.1.1.3 Imported waste

Imported waste data from Statistics Sweden[3] was multiplied by N content for different waste types (Table A1, Appendix A) to calculate the imported N in waste. The import of N in waste was calculated to 22.5 kt N.

Solid waste import RW – WS.SO: 22.5 kt N

2.1.2 Outputs

2.1.2.1 Waste treatment

Statistics of treated waste per treatment category and waste category were downloaded from Statistics Sweden[4] for 2014 and 2016. The mean of 2014 and 2016 for each waste category was multiplied by their N content (Table A1, Appendix A) and then summed by waste treatment category. The result of these calculations is shown in Table 2.

Table 2. N content (kt) of waste for different treatment types.

Waste treatment type	Size (kt N)
Material recycling	8.8
Biological recovery	21.3
Backfilling	0.1
Other recovery	8.6
Incineration with energy recovery	75.9
Incineration without energy recovery	1.3
Landfilling	9.1
Other disposal	<0.1
Pre-treatment and sorting	33.1

Pre-treatment and sorting will not be included as a flow in this report since the associated Nr stays in the WS pool. Backfilling (filling voids, trenches, or excavated

[3] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0308/MI0308T06/
[4] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0305/MI0305T003/

areas with material such as soil, gravel, or suitable waste) and Landfilling waste will not enter any other pools either and the associated flow of 0.1+9.1 kt N could be seen as an annual accumulation in the WS pool. Other recovery and Other disposal are not specified in enough detail to assign them as flows to another pools. Apart from those exceptions, the remaining categories are included in flows represented in the following sections.

2.1.2.2 Material recycling

The waste in material recycling consists of paper and cardboard waste (2.4 kt N) metallic waste (2.0 kt N), plastic waste (1.7 kt N), acidic, alkaline or saline waste (1.5 kt N) and several other smaller recycled waste categories. This is assumed to go to industries and therefore the flow goes to MP.

Material recycling WS.SO - MP: 8.8 kt N

2.1.2.3 Biological recovery

In the HS pool (Ljunggren et al., 2025), Compost from the WS-pool was quantified to 1.5 kt N.

Compost for use in gardens WS.SO – HS.OW: 1.5 kt N

The rest of the waste in the category Biological recovery is treated with anaerobic digestion which produces biofuel and soil amendment[5] [6]. We have set this flow to MP as most of the N will end up in soil amendment which will flow through MP to AG, HS or RW if exported.

Soil amendment WS.SO - MP: 19.8 kt N

2.1.2.4 Incineration and emissions to atmosphere

Emissions to atmosphere WS – AT were calculated in Moldan et al., (2022), based on the Swedish emissions reported to the Centre on Emission Inventories and Projections (CEIP) under the Air convention (CLRTAP). The emissions were not separated as originating from WS.SO or from WS.WW. The total WS – AT emissions of NH_3 and NO_x were in the year 2015 1.0 kt N. For the simplicity we include the total emissions from WS to atmosphere as from WS.SO, and set the

[5] https://www.scb.se/contentassets/55d5999531bc43ff8c48546b3ef16138/mi0305_2014a01_br_mi0305br1601.pdf
[6] https://www.scb.se/contentassets/842cdb4c880247b28fad6fef853a0526/mi0305_2016a01_br_misambr1801.pdf

WS.WW – AT flow to zero. The rest of the Nr in the incinerated waste is assumed to be emitted as N_2 and therefore it was assigned as a flow to RW.

Emissions to atmosphere WS.SO – AT: 1.0 kt N

N_2 to the atmosphere WS.SO – RW: 76.3 kt N

2.1.2.5 Exported waste

Exported waste data from Statistics Sweden[7] was multiplied by N content for different waste types (Table A1, Appendix A) to calculate the exported N in waste. The export of N in waste was calculated to 3.0 kt N.

Solid waste export WS.SO - RW: 3.0 kt N

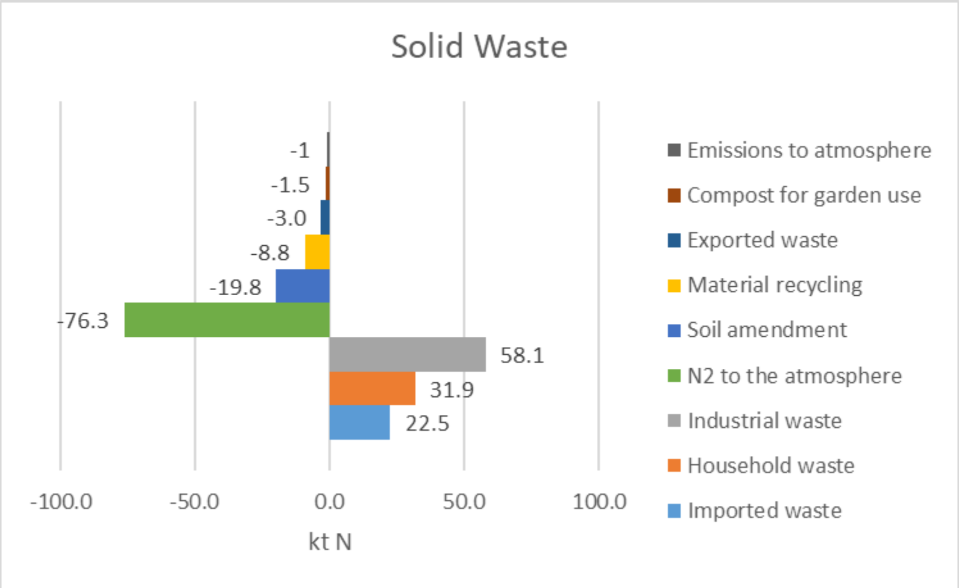

Figure 3. Inflows and outflows of nitrogen for WS.SO.

[7] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0308/MI0308T05/

2.2 Wastewater WS.WW

2.2.1 Inputs

2.2.1.1 Municipal wastewater

The incoming total N content to municipal wastewater treatment plants was 41.3 kt N in 2014 and 41.1 kt in 2016 according to Statistics Sweden[8]. No statistics are available for 2015, but a reasonable assumption is that it is 41.2kt N, the average of 2014 and 2016.

Municipal wastewater HS – WS.WW: 41.2 kt N

2.2.2 Outputs

2.2.2.1 Treated wastewater discharge

Statistics for the total amount of N in outgoing treated wastewater were taken from Statistics Sweden[9]. As the data for 2015 weren't available an average of 2014 and 2016 was used instead. This was calculated to 15.6 kt N.

Treated wastewater discharge WS.WW – HY: 15.6 kt N.

2.2.2.2 Sewage sludge used as a fertilizer

Sewage sludge used as a fertilizer on agricultural soils (pool AG, subpool Soil management) was quantified by Stadmark et al., (2019) as 2.8 kt N based on data reported to UNFCCC.

Statistics Sweden provided statistics of sludge use[10]. This was multiplied by the N content of sludge in Table A1, Appendix A. This resulted in a total sludge use of 2.8 kt N where only 1.6 kt N goes to AG as either plant soil or fertilizer. As we consider the UNFCCC data as more reliable than the N content data from the Annex, we used the value from the AG report here as well. Apart from the sludge that goes to agricultural soil, 0.7 goes to landfill cover or landfill, 0.2 goes to storage and 0.2 to

[8] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0106/MI0106T07/
[9] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0106/MI0106T07/
[10] https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI0106/MI0106T03/

other unspecified uses. This sludge cannot be attributed to a flow to any other pool, hence it will be counted as an accumulation in the WS pool.

Sewage sludge used as fertilizer WS.WW – AG.SM 2.8 kt N

2.2.2.3 Atmospheric emissions

Atmospheric emissions from wastewater WS.WW – AT were set to zero as these are included in the total flow of Nr from WS as a flow WS.SO.

2.2.2.4 Denitrification

The difference between the input of municipal wastewater and the outputs of wastewater discharge and sewage sludge is assumed to be emitted to the air during denitrification process. For simplicity and due to lack of data on N_2O emissions during denitrification we assumed that all nitrogen was emitted as N_2.

Wastewater denitrification: WS.WW - RW: 21.7 kt N

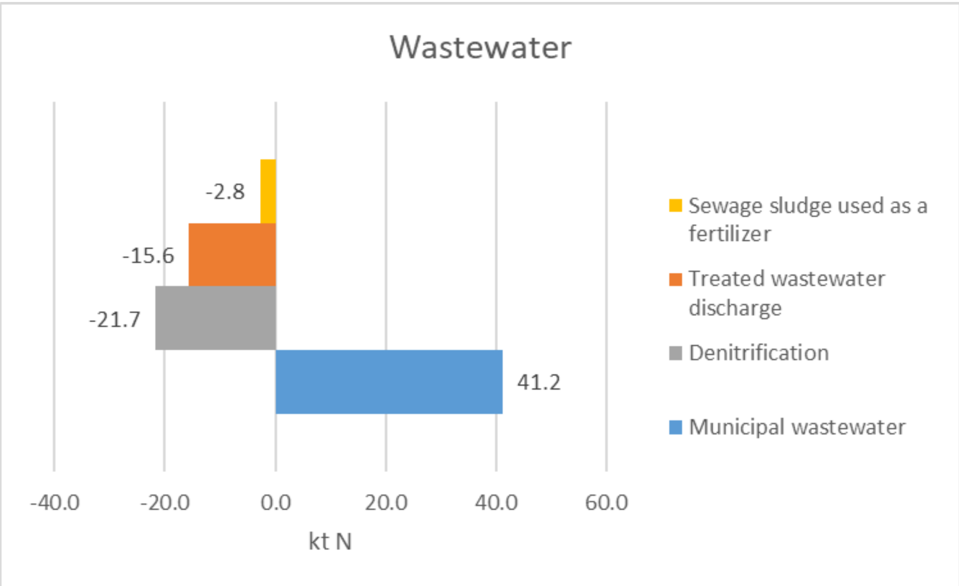

Figure 4. Inflows and outflows of nitrogen for WS.WW.

3 Discussion

The Waste pool is linked to the five pools: Materials and Products (MP), Agriculture (AG), Humans and settlements (HS), Atmosphere (AT) and

Hydrosphere (HY), and to the Rest of the world (outside Sweden), since there are several Nr flows associated with waste handling that cross the national borders. The current NNB methodology deals with reactive nitrogen. Flows of Nr that are converted to non-reactive N_2 gas (in catalytic conversion at the incinerator plants or by denitrification) are also seen as flows to the Rest of the world, since the Atmosphere pool of NNB does not consider the total amount of N_2 in the atmosphere. The EPNB methodology does not consider any flows of Nr between the NNB pool Waste and neither the pool Energy and fuels (EF), nor the pool Forests and semi-natural vegetation (FS). This is because incineration of household (and other) waste does not enter the EF pool, the associated Nr flows are directed from WS to AT without passing EF as this type of waste is not primarily seen as a fuel. For the FS pool, forest harvesting rests such as branches and tops are collected from the forests as a fuel (and not as a waste) for generating energy and therefore the associated Nr flows are between FS and EF.

There are some differences in the size of N flows in this report compared to the calculations reported previously (Jutterström et al., 2025, Ljunggren et al., 2025). These differences stem from the fact that flows are calculated from different perspectives with different data. Quantitatively important differences are outlined below.

The flow of Nr in rest product from anaerobic digestion used for soil amendment (19.8 kt N), from WS to MP, was not included in the NNB MP report (Jutterström et al., 2025). It is not self-evident what the fate of this material is once it has been generated, in what products it is converted and how these are used. Further work will be needed on tracking this Nr flow in future revisions of the MP pool.

The total N content in solid waste from HS to WS was calculated to 47.5 kt N in this report. When using the data from the HS report (Ljunggren et al., 2025), the flow is calculated to 77.4 kt N, i.e., 29.9 kt N higher. Table 3 shows the division of waste into four different categories using both the WS data and HS data. These differences are mainly caused by differences in the categories Wood & Paper and Products thereof, and Textiles and Other. Textiles waste seems to be underrepresented in the Sweden statistics data. There are 0 t textile waste in 2014, which is unlikely. The differences in waste from the category Other could be caused by an overestimation of the products flowing from MP to HS. This uncertainty is addressed in the MP-report. The large difference in wood can partly be caused by the fact that not all wood and paper waste is described as wood waste in the waste statistics. Toilet paper will for example end up in in WS.WW, household paper is often sorted with food waste and some wood and paper waste will end up in mixed waste or household waste. The difference could also be caused by errors in the statistics or in calculations of the flows.

Table 3. The flows from HS to WS based on the calculation in the HS-report and WS-report. All values are in kt N.

Waste origin	HS	WS
Wood & Paper and Products thereof	16.6	2.9
Food and Garden	12.8	15.5
Textiles	5.1	0.01
Other	42.9	29.1
Sum	**77.4**	**47.5**

In the NNB HS report (Ljunggren et al., 2025) the N content of human excrement to the sewage system was calculated to 51.5 kt N. Liquid food waste flushed down the sink was also calculated in the work with HS, to 0,5 kt N, though it was only presented there as part of the total food waste. The total N in municipal wastewater from human excrement and liquid food waste should therefore be 52 kt N according to the calculations in the HS report. The N in municipal wastewater presented in this report is 41.2kt N which is 18% lower than what was calculated in the HS pool. This difference is probably caused by using uncertain values when calculating the N content in food, as addressed in the HS report. A small part could also be explained by excreta not ending up in municipal wastewater but rather to outhouses or in nature. This was not considered in the HS report.

4 Conclusions

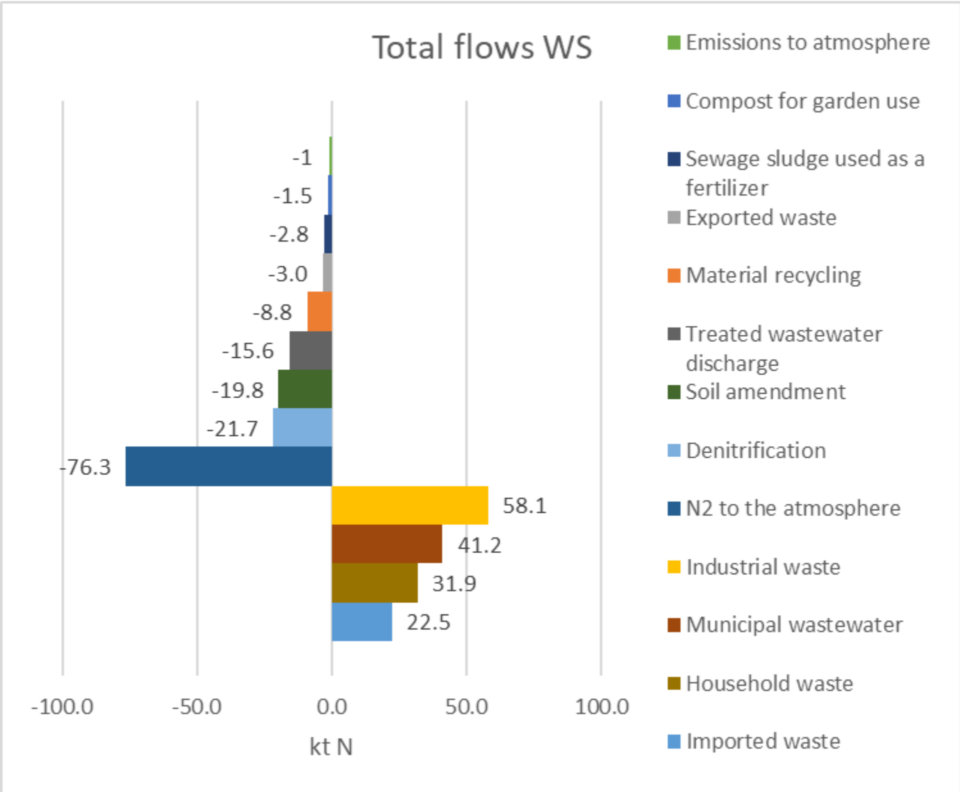

Figure 5. Inflows and outflows of nitrogen for WS.

In this report, the flows of Nr associated with production, destruction, recycling, import and export of waste have been surveyed (Figure 5). The inflows of Nr to the Waste pool were industrial waste, (58.1 kt N, combined from all industries), municipal wastewater (41.2 kt N), household waste (31.9 kt N) and imported waste (22.5 kt N). The dominant outflows were emissions of N_2 from waste and sludge incineration to the atmosphere (76.3 kt N) and denitrification (21.7 kt N). Both of these flows are partially quantified as residual components in the mass balance calculations. The remaining outflows were soil amendments created through biological recovery, treated wastewater discharge, material recycling, exported waste, sewage sludge, compost and Nr emissions to atmosphere, together 52.6 kt N. The total input of Nr was 153.6 kt N, of which 10.0 kt N accumulates in landfills and in materials used for backfilling. The total Nr output from Waste was 150.6 kt N.

While there are high quality statistical data available on many aspects of waste handling included in this report, the approximate balance between inputs and outputs of Nr to the Waste pool is to an extent dependent on assumptions made on the Nr output side of the balance. The two largest outputs, N_2 emissions to atmosphere during incineration and during denitrification, are also the two flows that are difficult to measure directly and therefore to quantify independently. In case of waste incineration, this is less of a problem since the inputs and outputs of Nr in all other ways (the amount of waste to be incinerated, N content, emissions of Nr to atmosphere etc.) are reasonably well covered. An assumption that the remaining N is converted to N_2 is not unreasonable. Denitrification as a part of wastewater treatment is also calculated as a difference between Nr input in wastewater and Nr output through the release of treated wastewater and sludge production, both relatively well quantified.

The EPNB methodology to quantify the Nr flows in the Waste pool was not yet fully developed at the time of writing this report. However, due to informal communication with the EPNB colleagues at EPNB, we are confident that the presented calculations are to a large extent in line with the updated version of the Guidance document that is expected to be published during 2025.

5 Acknowledgements

This study was conducted within the Swedish EPA (Naturvårdsverket) project "Sveriges nationella kvävebudget – delområde 5 Waste", grant nr 252-22-002, NV-06382-22. The provided support is gratefully acknowledged. We thank the Swedish EPA officials involved in the work of CLRTAP in general and in this project in particular, Stina Ausmeel, Anna Engleryd and Petra Hagström. We would also like to thank colleagues at UNECE CLRTAP TFRN Expert Panel on Nitrogen Budget for the comprehensive guidelines on how to construct NNB.

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7 Appendix A – N content of waste

Table A1. N content of the different waste types included in the industrial and household waste data. The N content was mainly provided by EPNB through the sources ABANDA[11], Knappe et al. (2012)[12], Fehrenbach et al. (2008)[13] and Obernosterer, Reiner (2003)[14]. As all these sources referenced to by EPNB was in German the values are taken directly from the EPNB-report as a secondary source.

Waste type	N content (%)	Datasource	Comment
Spent solvents	0.1%	ABANDA	
Acid, alkaline or salt wastes	1.8%	ABANDA	
Used oils	1.6%	ABANDA	
Chemical wastes	1%	ABANDA	
Industrial effluent sludges	1.4%	ABANDA	
Sludges and liquid wastes from waste treatment	1.4%	ABANDA	No N-value was provided by EPND, we used the value for Industrial effluent sludges.
Health care and biological waste	1.65%	ABANDA	No N-value was provided by EPND, we used the value for Organic waste from households.
Metallic wastes, ferrous	0.1%	ABANDA	
Metallic wastes, non-ferrous	0.1%	ABANDA	

[11] https://www.abfallbewertung.org/?content=ABANDA
[12] Knappe, F., Vogt, R., Lazar, S., Höke. S. (2012): Optimierung der Verwertung organischer Abfälle; ed.: Umweltbundesamt; Texte 31/2012; https://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/4310.pdf
[13] Fehrenbach, H., Giegrich, J., Mahmood, S. (2008): Beispielhafte Darstellung einer vollständigen, hochwertigen Verwertung in einer MVA unter besonderer Berücksichtigung der Klimarelevanz; de.: Umweltbundesamt, Texte 16/08; https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3445.pdf
[14] Obernosterer, R., Reiner, I. (2003) : „Stickstoffbilanz Österreich". Beitrag der Abfallwirtschaft zum Stickstoffhaushalt Österreichs

Metallic wastes, mixed ferrous and non-ferrous	0.1%	ABANDA	
Glass waste	0%	ABANDA	
Paper and cardboard waste	0.2%	Winiwarter & Expert Panel on Nitrogen Budgets	The new annex suggested values 10 times higher than the old one. We chose to use the same values as before to avoid inconsistencies
Rubber wastes	1.5%	MP-report	No N-value was provided by EPND, we used the same as the MP-report.
Plastic wastes	2.1%	ABANDA	
Wood wastes	0.25%	ABANDA	
Textile wastes	1%	ABANDA	
Wastes containing PCB	1.2%	ABANDA	
Discarded equipment	0.1%	ABANDA	No N-value was provided by EPND, we used the value for Metallic wastes.
Discarded vehicles	0.1%	ABANDA	No N-value was provided by EPND, we used the value for Metallic wastes.
Batteries and accumulators wastes	0.1%	ABANDA	No N-value was provided by EPND, we used the value for Metallic wastes.
Animal and mixed food waste	1.65%	Knappe et al. (2012)	Value for Organic waste from households was used as the value provided for Animal and mixed food waste was significantly higher than the N content in

			food calculated in the HS report.
Vegetal wastes	1.3%	ABANDA	
Animal faeces, urine and manure	2.7%	MP-report	No N-value was provided by EPND, we used the same as the MP-report.
Household and similar wastes	0.9%	Fehrenbach et al. (2008); Obernosterer, Reiner (2003)	
Mixed and undifferentiated materials	1.2%	ABANDA	
Sorting residues	1.2%	ABANDA	
Common sludges	1.4%	ABANDA	No N-value was provided by EPND, we used the value for Industrial effluent sludges.
Mineral waste from construction and demolition	0.28%	ABANDA	
Other mineral wastes	0%	MP-report	In MP it was assessed that a vast majority of this category was rock and sand with 0 N content. We use the same assumption.
Combustion wastes	0.03%	ABANDA	
Soils	0.25%	ABANDA	
Dredging spoils	0.26%	ABANDA	

Mineral wastes from waste treatment and stabilised wastes	0.61%	ABANDA	

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This report has been reviewed and approved in accordance with IVL's audit and approval management system.