Republic of Mauritius

National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change

Draft Report

Ministry of Environment, Solid Waste Management and Climate Change

December 2024






Preface

The National Inventory Report (NIR) was compiled by the Department of Climate Change, Ministry of Environment, Solid waste Management and Climate Change (Environment and Climate Change Division) as part as the First Biennial Transparency Report (BTR1) for the Republic of Mauritius.

The NIR has been prepared in accordance with the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories and it's 2019 refinement and the reporting guidelines of national communication for Parties not included in Annex 1 of the United Nations Framework Convention on Climate Change (UNFCCC).

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Acknowledgement

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List of Acronyms

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use (2006 IPCC Guidelines)
AR2	Assessment Report 2
AR5	Assessment report 5
BAU	Business As Usual
BOD	Biological Oxygen Demand
BTR	Biennial Transparency Report
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
COP	Conference of Parties
FAREI	Food and Agricultural Research and Extension Institute
FOD	First Order Decay
Gg	Gigagram
GHG	Greenhouse Gas
GVA	Gross Value Added
GWP	Global Warming Potential
IPCC	Inter-Governmental panel for Climate Change
MCAI	Mauritius Cane Industry Authority
NCV	Net Calorific Value
NLTA	National land Transport Authority
QA	Quality Assurance
QC	Quality Control
RoM	Republic of Mauritius
SIDS	Small Island Developing States
WWTP	Waste Water Treatment Plant

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Executive Summary

The Republic of Mauritius (RoM) submitted its first inventory of Greenhouse Gas (GHG) as part of its Initial National Communication in April 1999. An improved national GHG inventory was developed by RoM during the preparation of the Second and Third National Communications.

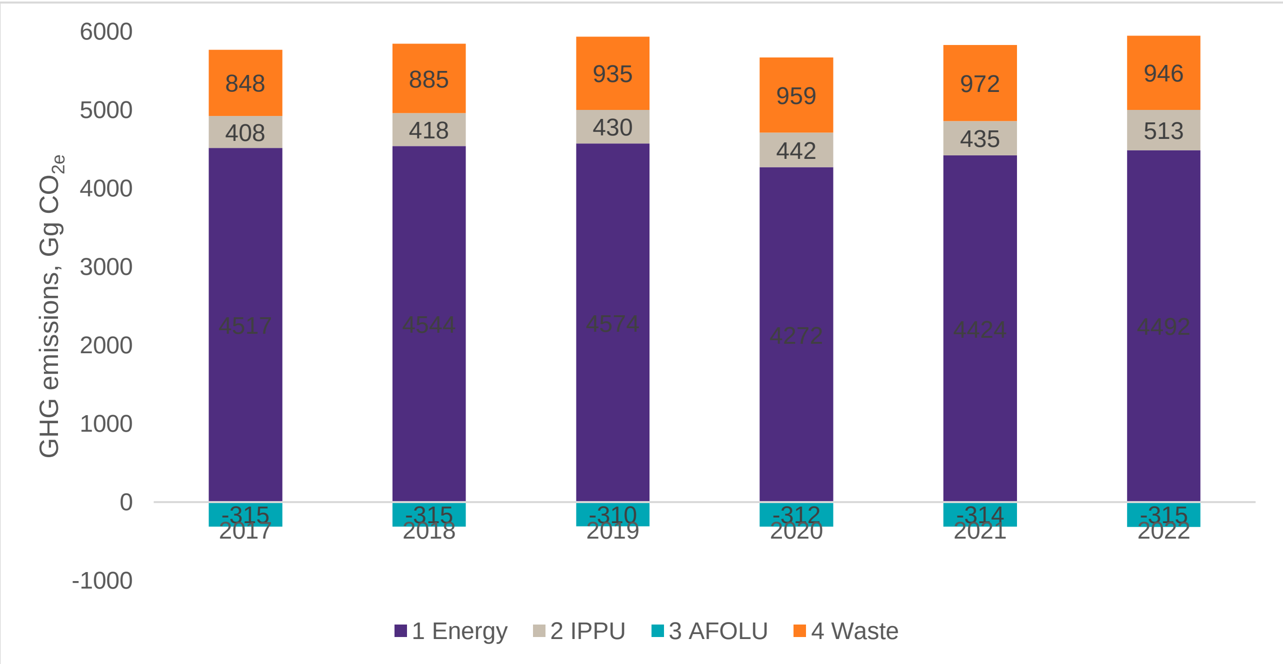
The Republic of Mauritius has obligation to submit its national inventory of Green House Gases emissions for the period 2017 to 2022 and its First Biennial Transparency Report (BTR) to the UNFCCC Secretariat. As SIDS RoM can submit the National Inventory and BTR at its own pace, however, RoM intended to submit the BTR by 31st December 2024.

To meet the United Nations Framework Convention on Climate Change (UNFCCC) reporting requirements, the GHG national inventory is divided into 4 main sectors, namely, Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU) and Waste (Solid and Liquid); each of which are further subdivided into sub-categories.

The methodology followed for the development of the national inventory is recommended by Intergovernmental Panel on Climate Change (IPCC) in their 2006 Guidelines for National Greenhouse Gas Inventories as well as the Good Practices Guidance.

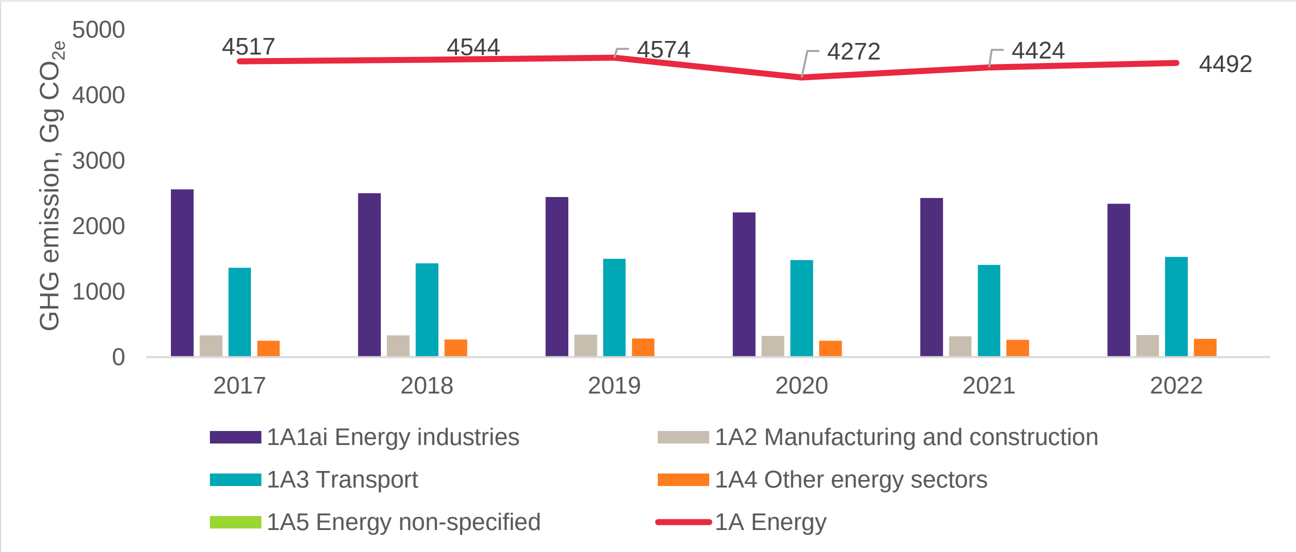
The National GHG Emission Inventory has been developed for the time period 2017 – 2022. The trend of the carbon dioxide equivalent (CO2eq) emissions has remained almost constant for the last 6 years, from 2017 to 2022. Considering the total emissions excluding LULUCF sector, the biggest emitter is the ***Energy sector***, which represents the **74.4%** of the total emissions of the country in 2022 [**4,492** Gigagram carbon dioxide equivalent (**Gg CO_{2e}**)], followed by the ***Waste sector*** with **15.7% (946 Gg CO_{2e})** of the emissions, the ***IPPU sector*** with the **8.5% (513 Gg CO_{2e})** of the total emissions and the ***Agriculture Sector*** with the **1.4%** of total emissions in 2022 (**85.6 Gg CO_{2e}**).
The ***total amount of GHG*** emissions (excluding the LULUCF sector) increased by **3%** from 2017 to 2022 (**5860 Gg CO_{2e}** to **6036 Gg CO_{2e}**) and the amount of ***net GHG emissions*** increased in **3.2%** from 2017 to 2022 (**5458 Gg CO_{2e}** to **5635 Gg CO_{2e}**).

The GHG emission trend of RoM from 2017 to 2022 is shown in figure below:



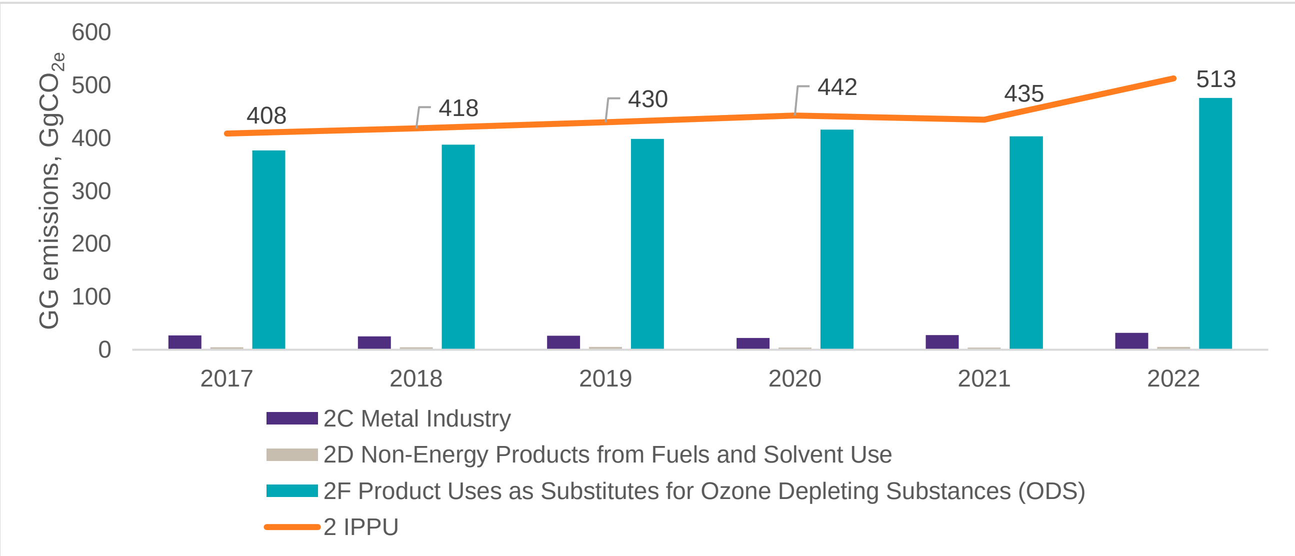
The trend of the CO_{2e} emissions from the energy sector is almost constant from 2017 to 2022. The biggest emitter of the sector are the energy industries, which represent the 52.2% (2,343 Gg CO_{2e}) of the total emissions of the sector in 2022, followed by the transport sector, led by road transport representing 31.9% (1,431 Gg CO_{2e}). Manufacturing industries and construction, and "Other sectors", represent the 7.5% (334 Gg CO_{2e}) and the 6.2% (280 Gg CO_{2e}) of the total emissions of the sector in 2022 respectively.

The GHG emissions from energy sector is shown below:



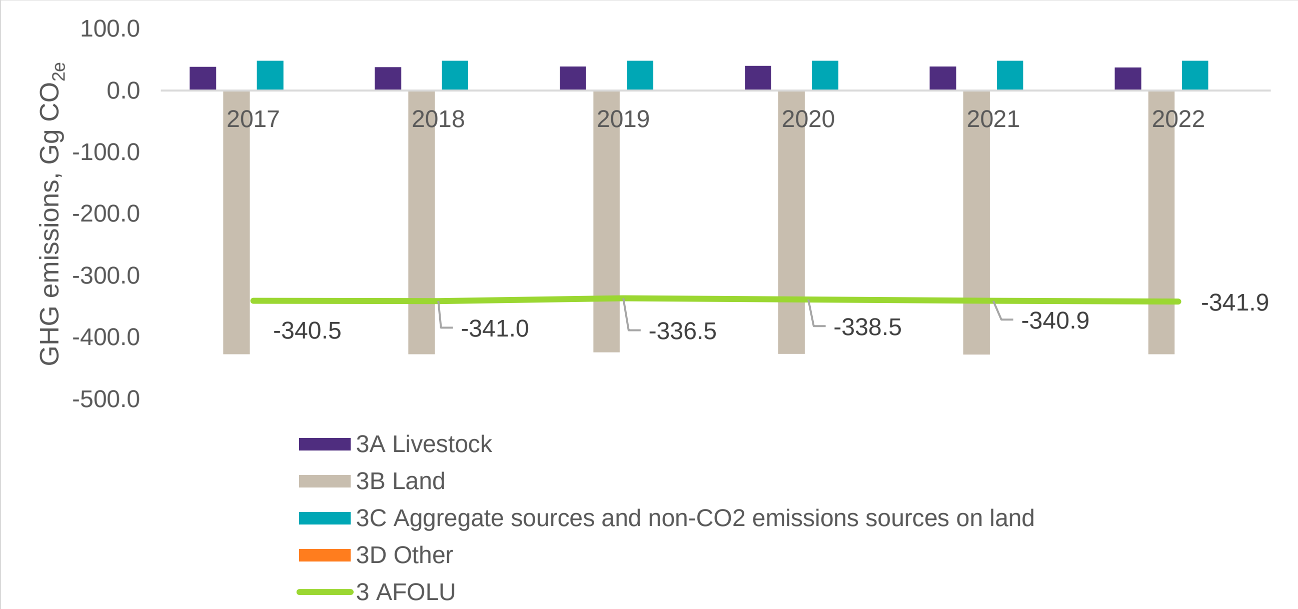
The GHG emissions from the IPPU Sector have experienced 25.5% increase along the time series from 2017 to 2022 (408 $GgCO_{2e}$ to 513 $GgCO_{2e}$). The most significant category, in terms of GHG emissions, in the IPPU sector is the Product Use as Substitutes of Ozone Depleting Substances (ODS), represented by stationary refrigerant and air conditioning and mobile air conditioning. This category represents 92.8% of total emissions in IPPU sector. GHG emissions of this sector have increased 26.3% from 2017 to 2022.

The GHG emissions from IPPU sector is shown below:



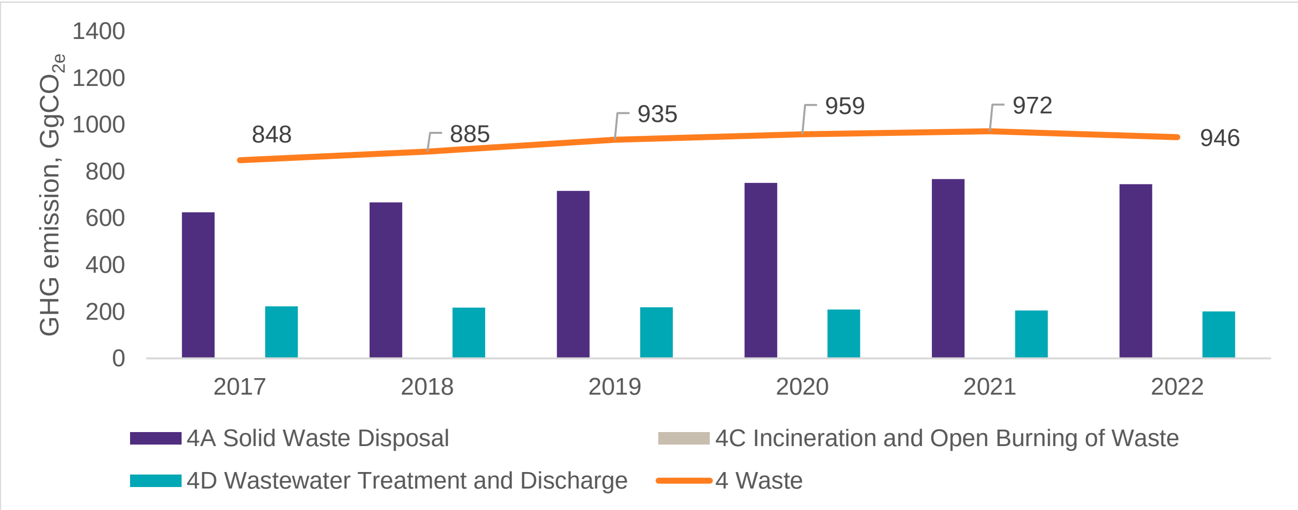
The AFOLU sector of RoM is a net sink. The net removals (emissions – removals) in Mauritius have remain unchanged during the period from 2017 to 2022. GHG emissions from agriculture (categories 3.A and 3.C1) show a decrease of 2% from 2017 to 2022 (38.5 Gg CO_{2e} to 37.7 Gg CO_{2e})). On the other hand, GHG removals from LULUCF (categories 3.B and 3.D) have remained almost constant at 427 Gg CO_{2e} from 2017 to 2022.

The emission trend for AFOLU sector is shown below.



The GHG emissions from the Waste Sector increased 12% from 2017 to 2022 (from 848 $GgCO_{2e}$ in 2017 to 946 $GgCO_{2e}$ in 2022). The most significant category, in terms of GHG emissions, for this sector is the solid waste disposal category, which represents 78.7% of the total GHG emissions of this sector in 2022. The second category that contributes most to the emissions in this sector is the wastewater treatment and discharge representing 21.3% of the total GHG emissions in the sector in the year 2022.

The emission trend for waste sector is shown below:



Chapter 1: Introduction

1.1. National Circumstances

The Republic of Mauritius (RoM), a Small Island Developing State (SIDS), is in the southwest of the Indian ocean. The Republic of Mauritius consists of the Islands of Mauritius (1,868.4 km^2), Rodrigues (110.1 km^2), Agalega, Tromelin, Cargados Carajos (28.7 km^2) and the Chagos Archipelago, including Diego Garcia and any other island comprised in the State of Mauritius. The Republic of Mauritius has an Exclusive Economic Zone (EEZ) of approximately 2.3 million km^2.

The mainland consists of a central plateau surrounded by mountain ranges and plains. The plateau rises to a maximum elevation of about 600 m (above mean sea level, amsl) in the south of the island and has a mean elevation of about 300-400 m (amsl), the highest peak being 828 m (amsl) (Walker and Nicolayson, 1954). The coastline of Mauritius extends over 322 km and the coastal areas, apart from their aesthetic importance, support a number of activities, including tourism, recreation, fishery, trade, and industry. The Island of Mauritius is formed of basaltic rocks and is surrounded by 150 km of fringing reef which encloses an area of about 243 km^2. About 20% of the population resides in the coastal areas.

Rodrigues is approximately 600 km to the north-east of Mauritius, located between latitudes 19°40’ and 19°48’ south and longitudes 63°17’ and 63°31’ east. It is also of volcanic origin and occupies an area of 108 km^2 (excluding the surrounding islets). Rodrigues has a lagoon area of 240 km^2 with the ten Marine Protected Areas (MPAs) namely five fisheries reserved areas, four marine reserves and one multiple-use marine protected area and the total sea area covered by the MPAs is 59 km^2.

Apart from Mauritius and Rodrigues, the other islands/ islets are relatively less populated. Agalega is approximately 1,000 km north of Mauritius, located between latitudes 10°20’ and 10°30’ south and longitudes 56°35’ and 56°43’ east. It consists of two islets - the islands of North and South - connected by a sandy strip during low tide. Its total area is about 9,653 m^2. The island’s strategic location in the Indian Ocean has attracted attention, and it is now witnessing accelerated infrastructural development, with the construction of a state-of-the-art airport and seaport.

1.2. Commitment under UNFCCC for GHG Reporting

RoM submitted its first inventory of GHG as part of its Initial National Communication in April 1999. Then, an improved standalone National GHG Inventory Report was developed by RoM during the preparation of the Second and Third National Communications. RoM submitted the National Inventory Report (NIR) along with the first Biennial Update Report (BUR) to UNFCCC in December 2021.

The Republic of Mauritius has obligation to submit its national inventory of Green House Gases emissions for the period 2017 to 2022 and its First Biennial Transparency Report (BTR) to the UNFCCC Secretariat. As SIDS RoM can submit the National Inventory and BTR at its own pace, however, RoM intended to submit the BTR by 31st December 2024.

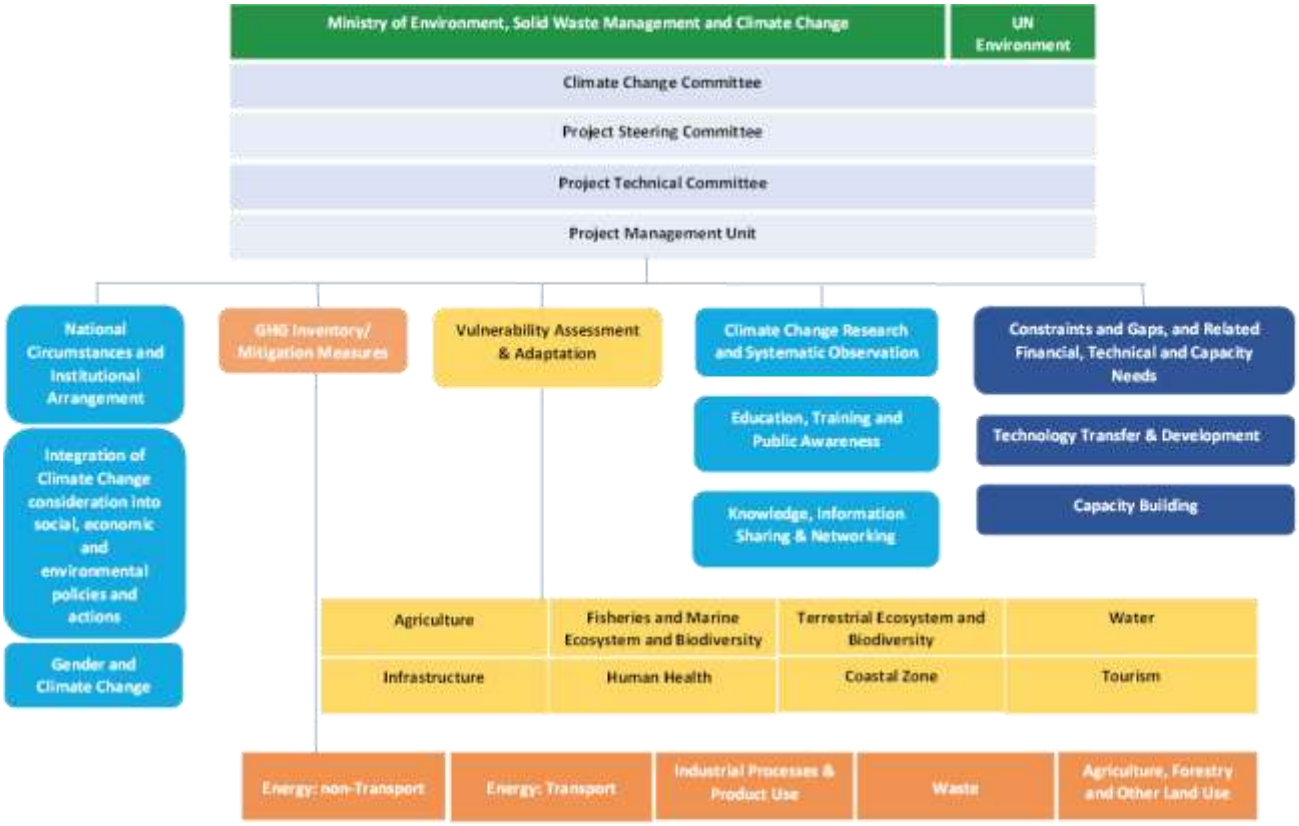
1.3. Involvement and Participation of Stakeholders

For the preparation of the Third National Communication (TNC), a process of participatory stakeholder consultations by various consultants and technical teams was adopted. Different Technical Working Groups (TWGs) were set up and relevant institutions involved in climate change related activities were officially identified to form part of each of these groups. A Chair was also nominated for each of the working groups. These TWGs were established to oversee the technical implementation in terms of data/information collection and quality control of climate change activities in the various key sectors. Therefore, a more formalized Institutional

Arrangement was used. A similar approach was also adopted for the preparation of the First Biennial Update Report (BUR1).

In line with the above, the same formalized Institutional Arrangement was used for the preparation of the Fourth National Communication (NC4) and the BTR (**Figure 1**). A Project Steering Committee under the chair of the Permanent Secretary of the Ministry of Environment, Solid Waste Management and Climate Change (Environment and Sustainable Development Division) has been set up to provide guidance in terms of the process leading to political and stakeholder acceptance of BTR outcomes and to provide overall quality assurance for the final deliverables of the project, namely the BTR and NIR reports.

Figure 1: Institutional Arrangement for BTR



A Project Technical Committee under the chair of the Director of Climate Change was set up to provide leadership to the BTR process and to deal principally with all technical aspects of the BTR/NIR and to support the work of the different Technical Working Groups (TWGs).

Five TWGs are established to oversee the implementation of climate change activities in the various key sectors, namely, National Circumstances and Institutional Arrangement/Integration of Climate Change consideration into social, economic and environmental policies and actions/ Gender and Climate Change, GHG Inventory/Mitigation Measures, Vulnerability Assessment and Adaptation, Climate Change Research and Systematic Observation/Education, Training and Public Awareness/Knowledge, Information Sharing and Networking and Constraints and Gaps, and Related Financial, Technical and Capacity Needs / Technology Transfer & Development (TT&D) / Capacity Building.

The institutional arrangements used for the elaboration of the GHG emission inventory for the first BTR are in line with the institutional arrangements used for the NIR under the Third National Communication (TNC). Five sub-technical working groups formed by assigned experts have been established to oversee the technical implementation of data collection, quality control and GHG Inventory. Presently, the Department of Climate

Change (DCC) is responsible for coordinating data collection. Input of the data into the 2006 IPCC Inventory Software is undertaken by consultants (Grant Thornton Bharat LLP).

1.4. Inventory Preparation

1.4.1. Brief Description of Methodology

The GHG national inventory is divided into four main sectors i.e. Energy, IPPU, AFOLU and Waste. Further each sector is subdivided into sub-categories. The methodology followed for the development of the national inventory is recommended by Intergovernmental Panel on Climate Change (IPCC) in their 2006 Guidelines for National Greenhouse Gas Inventories, it's 2019 refinement and Good Practices Guidance.

The typical methodology adopted for GHG emissions estimation consists of multiplying activity data (AD) by the relevant appropriate emission factor (EF).

Emissions (E) = Activity Data (AD) x Emission Factor (EF)

The methodology approach used for each of the sectors are outlined below, but 3 general levels of complexity and detail of methods are defined in IPCC 2006 Guidelines and it's 2019 refinement.

- **Tier 1**: the simplest approach and uses IPCC default values. This method is defined to be used where limited activity data is available.
- **Tier 2**: involves the simple methods but include the use of country specific emission factors
- **Tier 3**: the most complex and cover the use of models or plant specific data to generate accurate GHG emission estimates.

The specific methodology used for GHG emission estimation is detailed in each sectorial Chapters 2 to 5 of the 2006 IPCC Guidelines and it's 2019 refinement, and in the sections below.

To use a common unit for GHG emissions, the IPCC recommends the use of Global Warming Potentials (GWP) to convert GHG emissions other than CO_2 to the latter equivalent, CO_2 equivalent (CO_{2e}). The GWP values used in the current inventory are those adopted from the Fifth Assessment Report as collected in the following table for each GHG reported in the National Inventory.

Table 1: GWP values for 100-year time horizon according to the Fifth Assessment Report of IPCC

Common Name	Chemical Name	GWP (5th AR)
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265
HFC-23	CHF_3	12,400
HFC-32	CH_2F_2	677
HFC-125	CHF_2CF_3	3,170
HFC-134a	CH_2FCF_3	1,300
HFC-143a	CH_3CF_3	4,800
HFC-227ea	CF_3CHFCF_3	3,350

1.4.2. Methodology for Key Category Analysis and Trend Assessment

According to the Good Practice Guidance and Uncertainty Management in National GHG Inventories, key categories are those which contribute 95% of the cumulative emissions (Level Assessment) or contribute to significantly increasing or decreasing trends (Trend Assessment) (IPCC, 2000). It is considered a good practice to identify key categories, as it helps to prioritize efforts and improve the overall quality of the national inventory.

The category analysis was made using the equation for level 1 approach reported in the 2006 IPCC guidelines (Volume 1, Chapter 4).

Source Category Level Assessment = Source Category Estimate / Total Estimate

$$L_{x.t} = E_{x.t} / E_t$$

The total contribution, which is the sum of the absolute values of emissions and removals in year t, calculated using the aggregation level chosen by the country for key category analysis. Because both emissions and removals are entered with positive signs, the total contribution/level can be larger than a country's total emissions less removal.

The key category analysis was conducted using 2006 IPCC Inventory Software. The results from the software were interpreted as follows:

- The categories totalising the emission contribution thresholds of 95 are compared with the most recent key category analysis with the assessment for three or more previous years
- If a category has been key for all or most previous years according to the either level or trend assessments or both (two assessments should be considered separately), they should be identified as key in the latest year estimate except in cases where a clear explanation can be provided why a category may no longer be key in any future years.

The trend was assessed to identify categories that, although not large enough to be identified by the level assessment, their trend may be significantly increasing or decreasing to require particular attention, checking and possible improvement of methods. The trend assessment was calculated according to equation 4.2 of Volume 1, Chapter 4 of 2006 IPCC Guidelines (IPCC, 2006).

$$T_{x,t} = \frac{|E_{x,0}|}{\sum_y |E_{y,0}|} \bullet \left| \left[\frac{(E_{x,t} - E_{x,0})}{|E_{x,0}|} \right] - \frac{\left(\sum_y E_{y,t} - \sum_y E_{y,0} \right)}{\left| \sum_y E_{y,0} \right|} \right|$$

Where:

$T_{x,t}$	=	trend assessment of source or sink category x in year t as compared to the base year
$\lvert E_{x,t} \rvert$	=	absolute value of emission or removal estimate of source or sink category x in base year
$E_{x,t}$ and $E_{x,0}$	=	real values of estimates of source or sink category x in year t and base year, respectively
$\Sigma_y E_{y.t}$ and $\Sigma_y E_{y.0}$	=	total inventory estimates in year t and base year, respectively

The results of this analysis are reported in the Appendix 1: Key Category Analysis.

1.4.3. Quality Assurance and Quality Control (QA/QC)

The 2006 IPCC Guidelines and it's 2019 refinement recommend that quality control be exercised by comparing emission results using alternative approaches, comparing results and investigating anomalies. They also recommend that controls include review of emission factors, verification of activity data to ascertain source of data, and distinction in use where applicable, and to ensure avoidance of double counting.

All the data used were reviewed during meetings with stakeholders. All calculations made during the exercise used approved standardised procedures for emissions calculations, measurements and documentations as per 2006 IPCC Guidelines and it's 2019 refinement where applicable.

Regarding the Quality Assurance (QA), the Republic of Mauritius is onboarding a consultant to perform the Quality Assurance review of the national inventory.

1.4.4. Uncertainty assessment

The 2006 IPCC Guidelines consider the Uncertainty Analysis as an essential part of the GHG emission inventory. This Uncertainty Analysis should be considered to prioritize national efforts aimed to increase the accuracy and precision of future inventories and to guide decisions on the methodology selected.

Chapter 3, Volume 1 of the 2006 IPCC Guidelines defines uncertainty as the lack of knowledge of the true value of a variable by defining the possible range within a confidence level the value could be. Uncertainties are used to highlight where the real emissions/removals have the potential to be significantly different to estimate.

The uncertainty of the national GHG emissions inventory of the Republic of Mauritius has been estimated for emission factors and activity data, and the method used for the calculation has been the Approach 1: Propagation of error. The uncertainty of each category is weighted by the emissions or removals in that category to obtain the contribution to the total combined uncertainty.

The results of the complete Uncertainty Assessment are available in each sector in chapter 3, 4, 5 and 6.

1.4.5. Completeness assessment

The following table provides the completeness of the inventory.

Table 2: Completeness of the 2017-2022 National GHG Emission Inventory

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
1. Energy								
1.A. Fuel combustion								
1.A.1. Energy industries	X	X	X					
1.A.2. Manufacturing industries and construction	X	X	X					
1.A.3. Transport	X	X	X					
1.A.4. Other sectors	X	X	X					
1.A.5. Other	X	X	X					
1.B. Fugitive emissions from fuels								
1.B.1. Solid fuels	NO	NO	NO					
1.B.2. Oil and natural gas and other emissions from energy production	NO	NO	NO					
1.C. CO_2 transport and storage	NO							
2. Industrial processes and product use								
2.A. Mineral industry								

2.A.1 - Cement production	NO							
2.A.2 - Lime production	NO							
2.A.3 - Glass production	NO							
2.A.4 - Other process uses of carbonates	NO							
2.A.5 - Other	NO							
2.B. Chemical industry								
2.B.1 - Ammonia production	NO	NO	NO					
2.B.2 - Nitric Acid production			NO					
2.B.3 - Adipic Acid production	NO		NO					
2.B.4 - Caprolactam. glyoxal and glyoxylic acid production	NO		NO					
2.B.6 - titanium dioxide production	NO							
2.B.7 - Soda ash production	NO							
2.B.8 - Petrochemical and carbon black production	NO	NO						
2.B.9 - Fluorochemical production				NO	NO	NO	NO	NO
2.B.10 - Other	NO	NO	NO	NO	NO	NO	NO	NO
2.C. Metal industry			NO	NO	NO	NO	NO	NO
2.C.1 - Iron and steel production	X	NO						
2.C.2 - Ferroalloys production	NO	NO						
2.C.3 - Aluminium production	NO				NO			
2.C.4 - Magnesium production	NO			NO	NO	NO		
2.C.5 - Lead production	NO							
2.C.6 - Zinc production	NO							
2.C.7 - Other	NO	NO	NO	NO	NO	NO	NO	NO
2.D. Non-energy products from fuels and solvent use								
2.D.1 - Lubricant Use	X	NO	NO					
2.D.2 - Paraffin Wax Use	NO	NO	NO					
2.D.3 - Solvent Use	X	NO	NO					
2.D.4 - Other	NO	NO	NO					
2.E. Electronic Industry								
2.E.1 - Integrated Circuit or Semiconductor				NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display				NO	NO	NO	NO	NO
2.E.3 - Photovoltaics				NO	NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid				NO	NO	NO	NO	NO
2.E.5 - Other				NO	NO	NO	NO	NO
2.F. Product uses as ODS substitutes								
2.F.1 - Refrigeration and Air Conditioning				X	NO	NO	NO	NO

2.F.1 - Foam Blowing Agents				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				NO	NO	NO	NO	NO
2.F.4 - Aerosols				NO	NO	NO	NO	NO
2.F.5 - Solvents				NO	NO	NO	NO	NO
2.F.6 - Other				NO	NO	NO	NO	NO
2.G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO
2.H. Other	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture								
3.A. Enteric fermentation		X						
3.B. Manure management		X	X					
3.C. Rice cultivation		NO						
3.D. Agricultural soils		NE	NE					
3.E. Prescribed burning of savannahs		NO	NO					
3.F. Field burning of agricultural residues		NO	NO					
3.G. Liming	NE							
3.H. Urea application	NE							
3.I. Other carbon-containing fertilizers	NE							
3.J. Other	NO	NO	NO					
4. Land use, land-use change and forestry (1)								
4.A. Forest land	X	NO	NO					
4.B. Cropland	X	NO	NO					
4.C. Grassland	X	NO	NO					
4.D. Wetlands	X	NO	NO					
4.E. Settlements	X	NO	NO					
4.F. Other land	NO	NO	NO					
4.G. Harvested wood products	NE							
4.H. Other	NO	NO	NO					
5. Waste								
5.A. Solid waste disposal		X						
5.B. Biological treatment of solid waste		NO	NO					
5.C. Incineration and open burning of waste	X	NO	NO					
5.D. Waste water treatment and discharge		X	X					
5.E. Other	NO	NO	NO					

Chapter 2: Trends of Greenhouse Gas (GHG) Emissions

This chapter summarises the emission trends from 2017 to 2022.The current inventory is based on the methodology contained in the 2006 IPCC Guidelines of National Greenhouse Gas Inventories and the 2019 Refinement of the 2006 IPCC Guidelines.

2.1 Emission trend by sector

The sector wise GHG emission trends from 2017-2022 are tabulated in Table 3 and Figure 2 presents the emission share for each sector.

Figure 2: GHG emission trend of RoM from 2017 to 2022

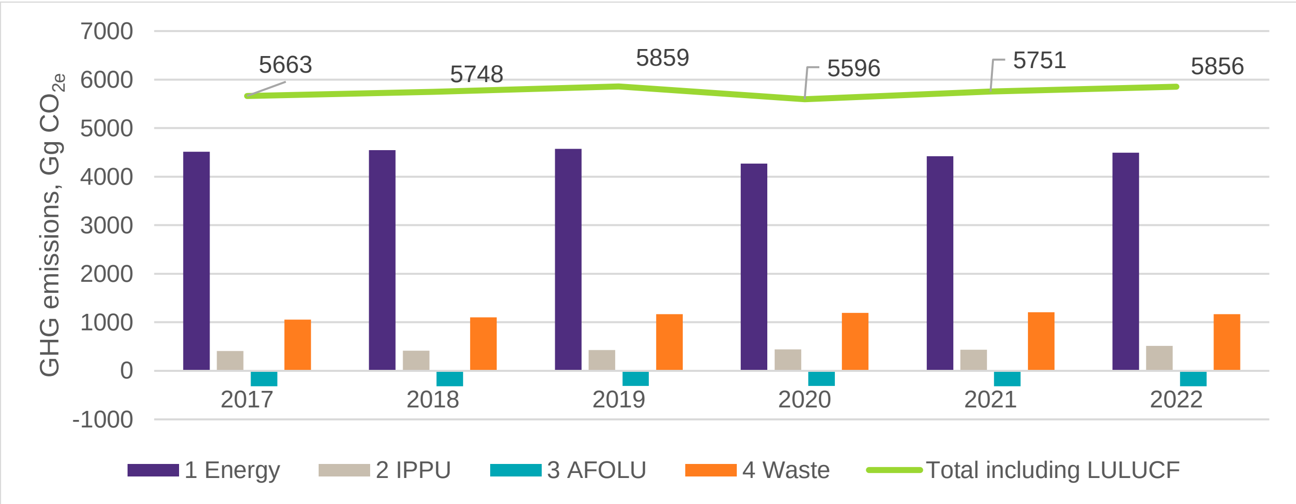


Table 3: Category wise GHG emission and removals for RoM from 2017 to 2022

Category	2017	2018	2019	2020	2021	2022
1 Energy	4517	4544	4574	4272	4424	4492
2 IPPU	408	418	430	442	435	513
3 AFOLU	-315	-315	-310	-312	-314	-315
4 Waste	1053	1101	1165	1194	1207	1167
Total excluding LULUCG	**6065**	**6149**	**6257**	**5997**	**6153**	**6257**
Total including LULUCF	**5663**	**5748**	**5859**	**5596**	**5751**	**5856**
Annual change		2%	2%	-4%	3%	2%

2.1.1 Energy Sector

The trend of the CO_{2e} emissions is almost constant from 2017 to 2022. The biggest emitter of the sector are the energy industries, which represent the 52.2% (2,343 Gg CO_{2e}) of the total emissions of the sector in 2022, followed by the transport sector, leaded by the road transport representing the 31.9% (1,431 Gg CO_{2e}). Manufacturing industries and construction, and "Other sectors", represent the 7.5% (334 Gg CO_{2e}) and the 6.2% (280 Gg CO_{2e}) of the total emissions of the sector in 2022 respectively.

The total amount of GHG emissions in energy sector reduced 0.6% from 2017 to 2022 (from 4,515 Gg CO_{2e} to 4,490 Gg CO_{2e}). Energy industries show a reduction in CO2e emissions from 2017 to 2022, due to the reduction in electricity generation from coal, which is compensated by an increase in electricity generation from fuel oil.

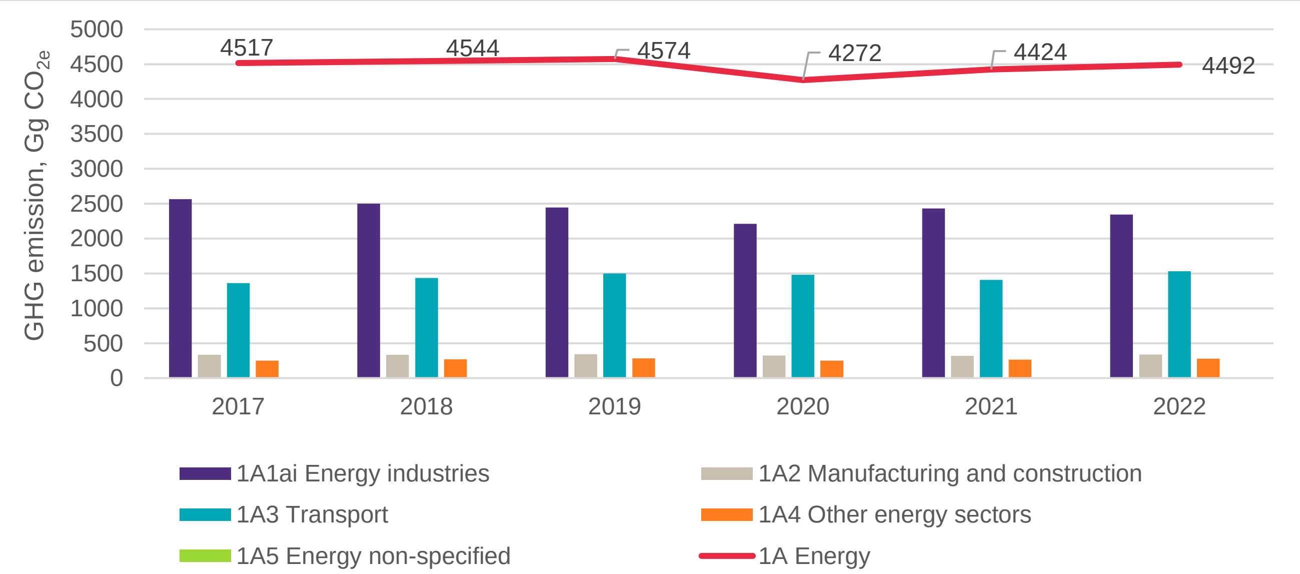
In terms of electricity generation by energy industries, the fuel that generates the highest amounts of electricity is the fuel oil, corresponding 41% of GHG emissions in energy industries, followed by coal which is responsible for 58% of the emissions of the sector. The third fuel that generates highest amounts of electricity is the bagasse, which is a renewable resource and so CO_2 emission have not been accounted as it is a biogenic emissions source.

The transport category represents the second biggest emitter of the energy sector. This category is divided into civil aviation, road transport, and water-borne navigation. In 2022, transport represented 31.9% of the total emissions of the energy sector (1,431 Gg CO_{2e}), and 93.5% (1,431 Gg CO_{2e}) of those emissions corresponds to the road transport category, while water-borne navigation represents 5.8% of the category's emissions (88 Gg CO_{2e}) and the civil aviation the remaining 0.7% (9.4 Gg CO_{2e}). This category has experienced 12% increase in terms of emissions over the time analysed.

The emissions from manufacturing industries and construction remained almost constant from 2017 to 2022. In 2016, Manufacturing industries and construction represented 7.5% of the total emission of the energy sector (337 CO_{2e}).

The GHG emission trend of the energy sector for RoM from 2017 till 2022 is shown in Figure 3.

Figure 3: GHG emission trend of energy sector of RoM from 2017 to 2022



The sub-category wise emissions from the energy sector are given in Table 4.

Table 4: GHG emissions of energy sector from 2017 to 2022, Gg CO2e

Category	2017	2018	2019	2020	2021	2022
1A1ai Energy industries	2564.4	2502.8	2447.2	2212.3	2431.2	2343.4
1A2 Manufacturing and construction	335.7	335.0	341.8	325.0	319.5	337.3
1A3 Transport	1363.1	1435.6	1500.9	1482.2	1408.5	1530.4
1A4 Other energy sectors	252.8	269.6	283.4	251.8	264.3	279.8
1A5 Energy non-specified	0.9	0.9	0.9	0.9	0.9	0.9
1A Energy	4516.9	4544.0	4574.3	4272.1	4424.4	4491.7

2.1.2 Industrial Process and Product Use Sector

The GHG emissions from the IPPU Sector have experienced 25.5% increase along the time series from 2017 to 2022 (408 $GgCO_{2e}$ to 513 $GgCO_{2e}$).

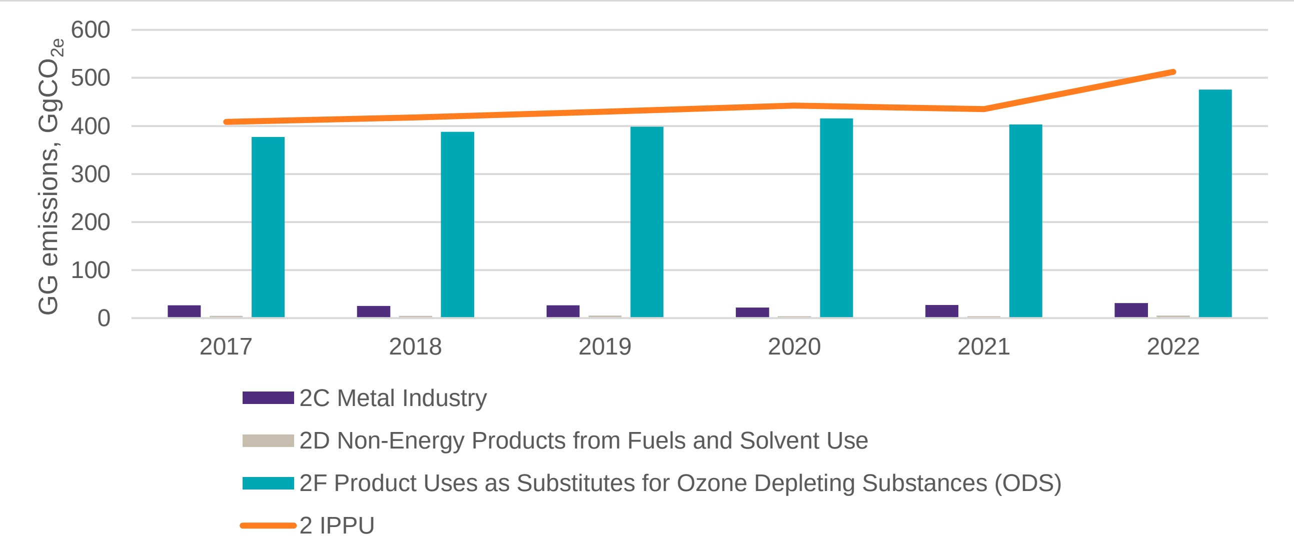
The most significant category, in terms of GHG emissions, in the IPPU sector is the Product Use as Substitutes of Ozone Depleting Substances (ODS), represented by stationary refrigerant and air conditioning and mobile air conditioning. This category represents 92.8% of total emissions in IPPU sector. GHG emissions of this sector have increased 26.3% from 2017 to 2022. The stationary refrigerant and air conditioning sector represents 97.8% of the emissions from this category (466 $GgCO_{2e}$ in 2022) and remaining 2.2% (10 $GgCO_{2e}$ in 2022) is from mobile air conditioning.

In stationary air conditioning and refrigeration sub-category, the most used substances are HFC-125, HFC-134a, HFC-143a, HFC-32 and HFC-23. For the mobile air conditioning sub-category, the only HFC substance used corresponds to HFC-134a.

The Metal Industry, represented by the Iron and Steel Production Industries, contributed to 6.2% of the total GHG emissions of the IPPU sector in 2022. Emissions from the iron and steel sub sector have increased by 15% from 26.8 $GgCO_{2e}$ to 31.8 $GgCO_{2e}$.

RoM also has emissions due to the use of lubricants in the industrial sector, as non-energy products. The emissions from this category represent 1% of the total emissions of IPPU sector. The GHG emission trend of the IPPU sector for RoM from 2017 till 2022 is shown in Figure 4.

Figure 4: GHG emission trend of IPPU sector from 2017 to 2022



The sub-category wise emissions from the IPPU sector are given in Table 5.

Table 5: Sub-category wise emissions from IPPU sector from 2017 to 2022, $GgCO_{2e}$

Category	2017	2018	2019	2020	2021	2022
2C Metal Industry	27	25	26	22	28	32
2D Non-Energy Products from Fuels and Solvent Use	5	5	5	4	4	5
2F Product Uses as Substitutes for Ozone Depleting Substances (ODS)	377	388	398	416	403	476
2 IPPU	408	418	430	442	435	513

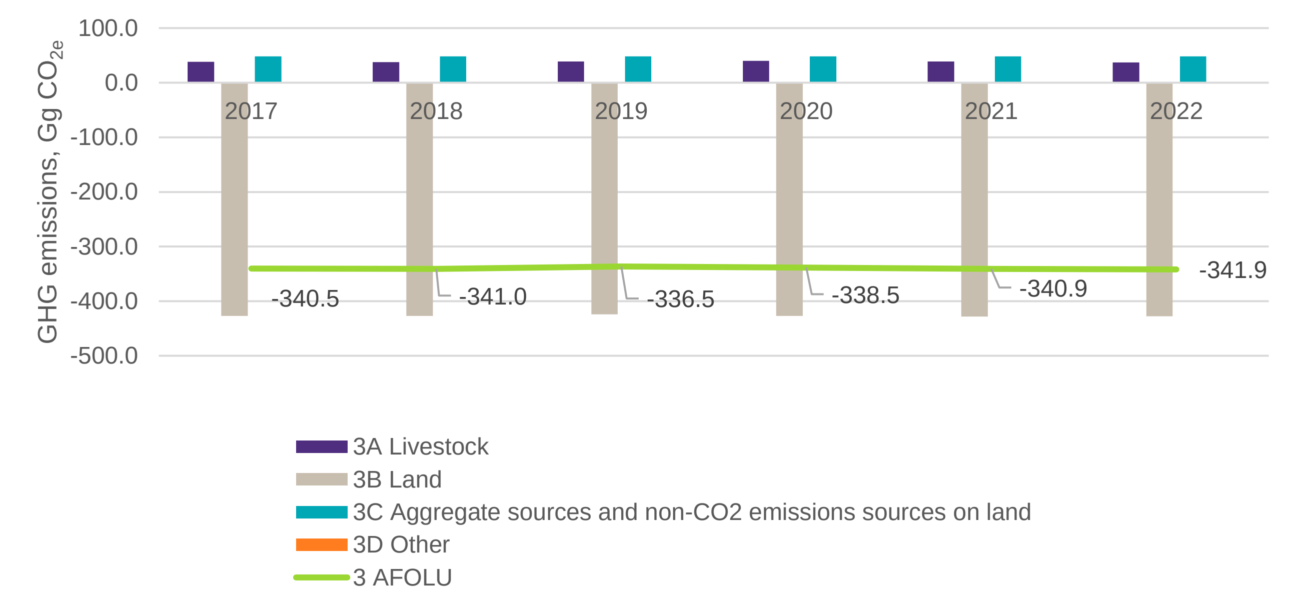
2.1.3 Agriculture, Forestry and Land Use Sector

The AFOLU sector of RoM is a net sink. The net removals (emissions – removals) in Mauritius have remain unchanged during the period from 2017 to 2022. GHG emissions from agriculture (categories 3.A and 3.C1) show a decrease of 2% from 2017 to 2022 (from 38.5 Gg CO_{2e} to 37.7 Gg CO_{2e})). On the other hand, GHG removals from LULUCF (categories 3.B and 3.D) have remained almost constant at 427 Gg CO_{2e} from 2017 to 2022.

In 2022, the most important category in terms of removals is Forest Land (3.B.1) with -401 Gg CO_{2e}.

Livestock (3.A) emissions decreased from 38.2 Gg CO_{2e} in the year 2017 to 37.3 Gg CO_{2e} in 2022, which resulted in a decrease of 2%. The GHG emission trend of the AFOLU sector for RoM from 2017 till 2022 is shown in Figure 5.

Figure 5: GHG emission trend of AFOLU sector from 2017 to 2022



The sub-category wise emission and removals from the AFOLU sector are shown in Table 6.

Table 6: Sub-category wise emissions and removals from AFOLU sector

Category	2017	2018	2019	2020	2021	2022
3A Livestock	38.2	37.7	39.1	39.9	38.9	37.3
3B Land	-427.1	-427.1	-424.1	-426.8	-428.0	-427.5
3C Aggregate sources and non-CO2 emissions sources on land	48.4	48.4	48.5	48.5	48.2	48.3
3D Other	0.0	0.0	0.0	0.0	0.0	0.0
3 AFOLU	-340.5	-341.0	-336.5	-338.5	-340.9	-341.9

2.1.4 Waste Sector

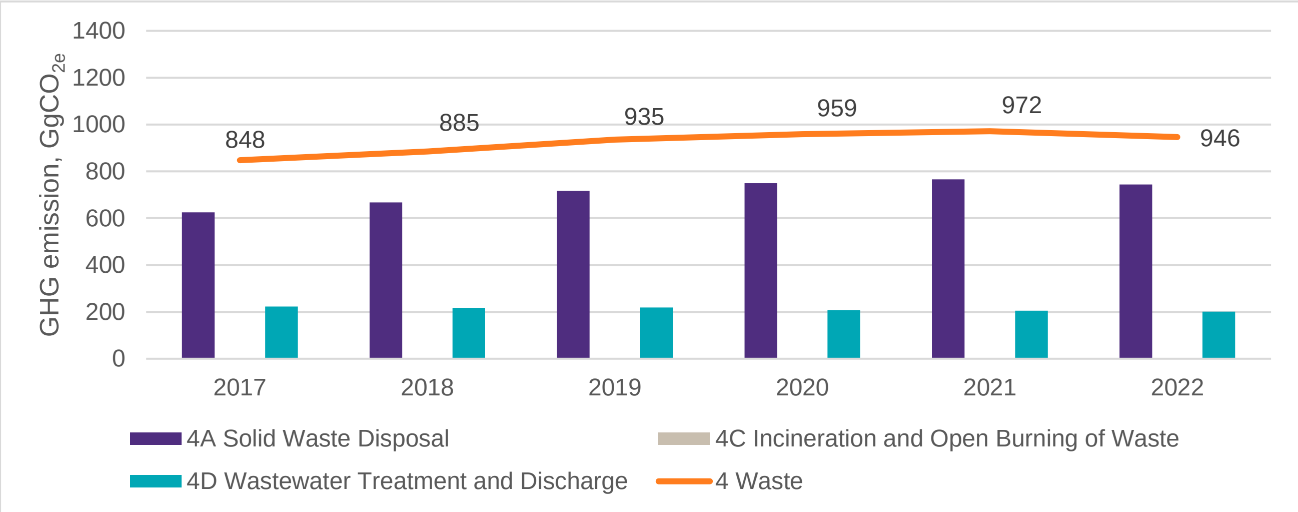
The GHG emissions from the Waste Sector increased 12% from 2017 to 2022 (from 848 $GgCO_{2e}$ in 2017 to 946 $GgCO_{2e}$ in 2022).

The most significant category, in terms of GHG emissions, for this sector is the solid waste disposal category, which represents 78.7% of the total GHG emissions of this sector in 2022.

The second category that contributes most to the emissions in this sector is the wastewater treatment and discharge representing 21.3% of the total GHG emissions in the sector in the year 2022. The emissions in this subcategory have experienced 9.7% decrease from 2017 to 2022, from the 223 Gg CO_{2e} to 201 Gg CO_{2e}.

There were no emissions from biological treatment of solid waste from 2017 to 2022 as the equipment was not in operation. Incineration represented 0.01% of the emissions from waste sector in 2022. The GHG emission trend of the IPPU sector for RoM from 2017 till 2022 is shown in Figure 6.

Figure 6: GHG emission trend from waste sector of RoM from 2017 to 2022



The sub-category wise emissions from waste sector are given in Table 7.

Table 7: Subcategory wise GHG emissions from waste sector

Category	2017	2018	2019	2020	2021	2022
4A Solid Waste Disposal	790	843	905	946	963	923
4C Incineration and Open Burning of Waste	0.12	0.13	0.10	0.02	0.01	0.12
4D Wastewater Treatment and Discharge	263	258	260	248	244	243
4 Waste	1053	1101	1165	1194	1207	1167

2.2 Summary of GHG emission trend per gas

2.2.1 Carbon Dioxide (CO_2)

In the figure below, the trend of CO_2 emissions is represented for each of the sectors. As seen in the graph, the sector that contributes most to these emissions is the energy sector, which represents the 99.3% of the total CO_2 emissions in the country (excluding removals from LULUCF). CO_2 emissions from energy sector showed considerable fluctuation due to the impact of Covid19 pandemic, but other sectors remained constant.

Figure 7: Sector wise CO_2 emission trend

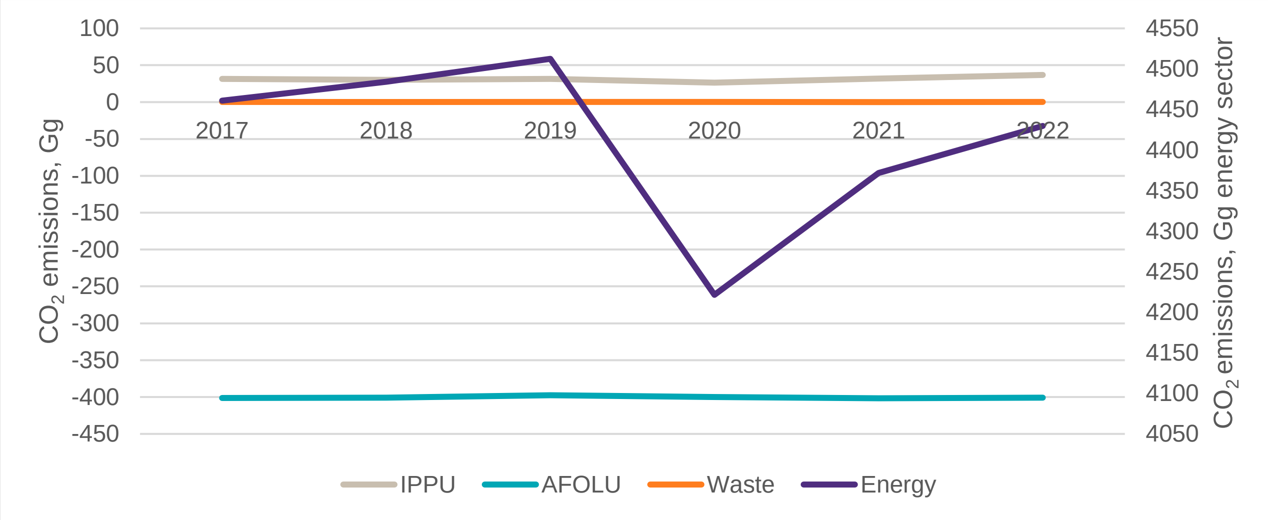


Table 8: Sector wise CO_2 emissions from 2017 to 2022 (Gg CO_2)

Sector	Gas	2017	2018	2019	2020	2021	2022
Energy	CO_2	4461	4484	4512	4221	4372	4430
IPPU	CO_2	32	30	32	26	32	37
AFOLU	CO_2	-401	-401	-398	-400	-402	-401
Waste	CO_2	0.12	0.13	0.10	0.02	0.01	0.12
Total	CO_2	4493	4515	4544	4248	4404	4467
Inter annual variation			0.5%	0.7%	-6.5%	3.7%	1.4%

2.2.2 Methane (CH_4)

Methane emissions from various sectors is shown in figure below. Waste sector has the highest contribution to methane emissions, representing the 96.3% of the total methane emissions in the country. In general, the methane emissions from each of the sectors do not vary much over the inventory period, where the AFOLU sector shows the greatest inter-annual variations.

Figure 8: Methane emission trend for all sectors from 2017 to 2022, Gg CH_4

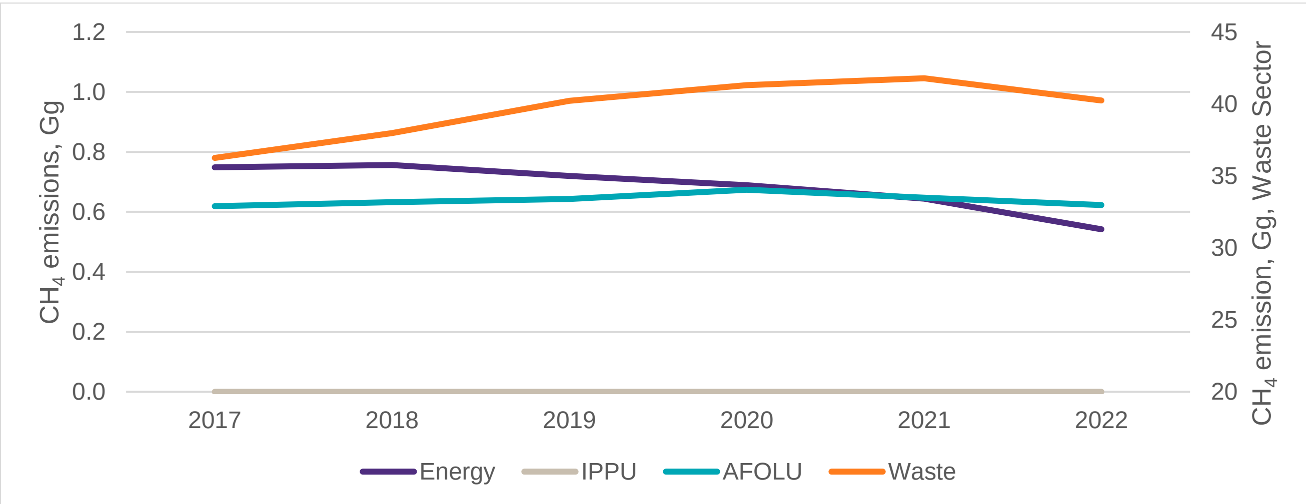


Table 9: Sector wise methane emissions from 2017 to 2022, Gg of CH_4

Sector	Gas	2017	2018	2019	2020	2021	2022
Energy	CH_4	0.75	0.76	0.72	0.69	0.64	0.54
IPPU	CH_4	0.00	0.00	0.00	0.00	0.00	0.00
AFOLU	CH_4	0.62	0.63	0.64	0.67	0.65	0.62
Waste	CH_4	36.25	37.97	40.22	41.31	41.78	40.25
Total	CH_4	37.62	39.35	41.58	42.68	43.07	41.41
Inter annual variation			4.6%	5.7%	2.6%	0.9%	-3.9%

2.2.3 Nitrous Oxide (N_2O)

In the figure below, the trend of N_2O emissions is represented for each of the sectors. As seen in the figure, the sector that contributes most to these emissions is the AFOLU sector, which represents the 86% of the total N_2O emissions in the country. Within AFOLU sector, direct N_2O emissions from managed soil represent the largest quantity of emissions followed by manure management. Around 10% variation in N_2O emissions in the country was observed from 2017 to 2022.

Figure 9: N_2O emission trend for all sectors from 2017 to 2022, Gg

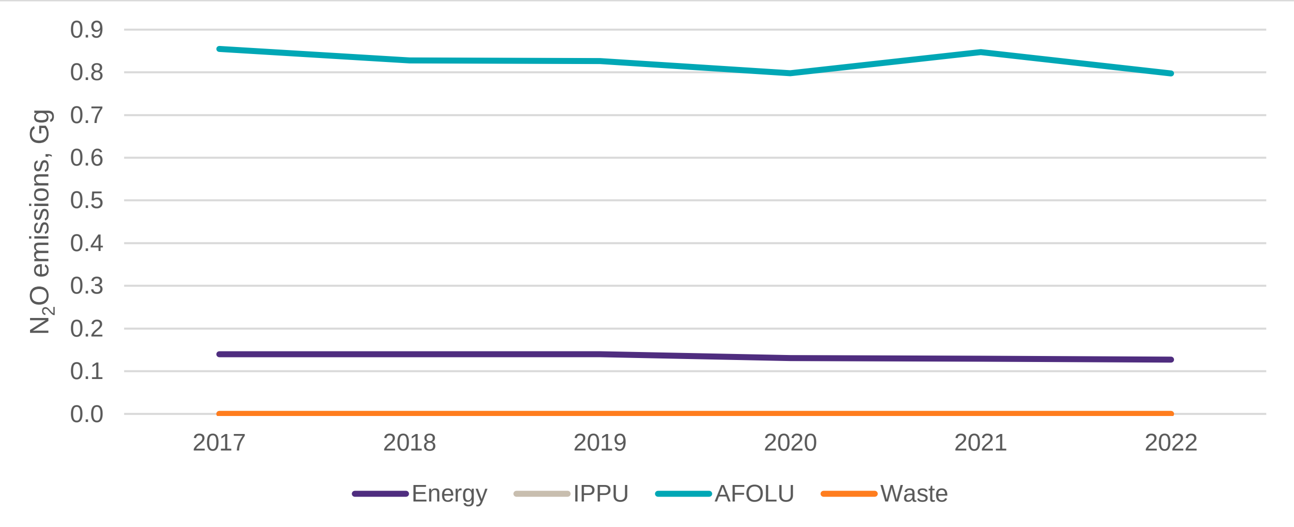


Table 10: Sector wise N_2O emissions from 2017 to 2022, Gg

Nitrous Oxide	Gas	2017	2018	2019	2020	2021	2022
Energy	N_2O	0.14	0.14	0.14	0.13	0.13	0.13
IPPU	N_2O	0.00	0.00	0.00	0.00	0.00	0.00
AFOLU	N_2O	0.85	0.83	0.83	0.80	0.85	0.80
Waste	N_2O	0.00	0.00	0.00	0.00	0.00	0.00
Total	N_2O	0.99	0.97	0.97	0.93	0.98	0.92
Inter annual variation			-2.7%	-0.1%	-3.9%	5.1%	-5.3%

2.2.3 Hydroflurocarbons (HFC)

The hydrofluorocarbons are emitted mainly from refrigerants and air conditioning in the IPPU sector. The emissions from all HFCs used in stationary and mobile air conditioning are represented in the figure below as CO_{2e} emissions. The trend of the emissions represents an increase of 26% from 2017 to 2022.

Figure 10: HFC emission trend from 2017 to 2022, Gg of CO_{2e}

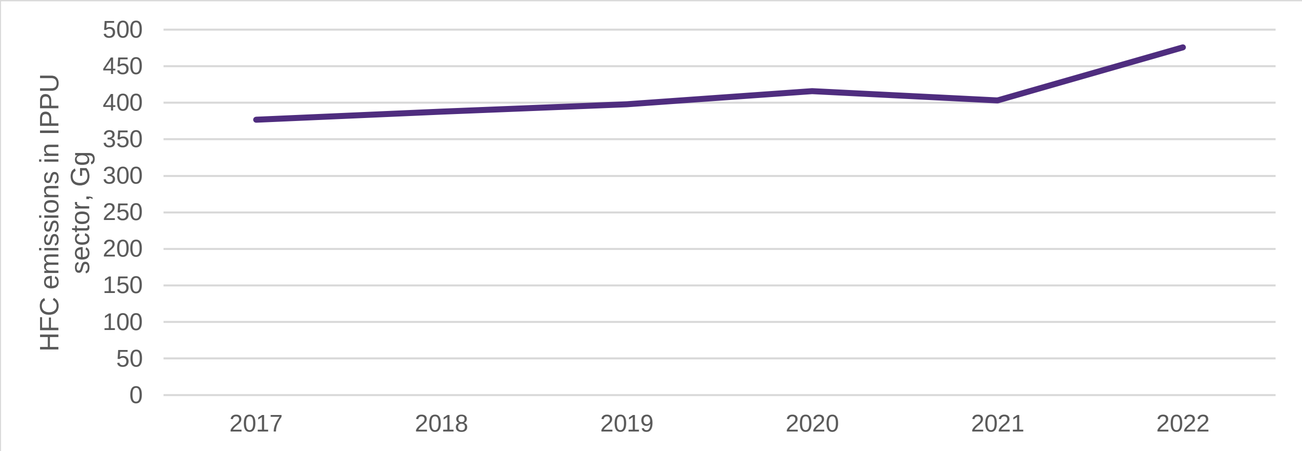


Table 11: HFC emission trend from 2017 to 2022, Gg CO_{2e}

Sector	Gas	2017	2018	2019	2020	2021	2022
IPPU	HFC	376.74	387.73	398.07	416.00	403.00	475.76
Inter annual variation			2.9%	2.7%	4.5%	-3.1%	18.1%

2.3 Key category analysis

A Key Category Analysis (KCA) (refer to Table 12 and Table 13) was carried out to determine the categories, fuels and GHGs that are important (cumulatively make up more than 95% of the absolute emissions or have significant upward or downward trends) in the inventory and that needs more focus for accurate calculations.

The level and trend assessment for the period 2000-2016 resulted in the following gases and sectors as key sources/sinks of GHGs. The whole analysis is shown in the Appendix 1: Key Category Analysis:

Table 12: Key category analysis – Level Assessment

Category	Activity data	Gases	Eq CO_2	Modulus	Lx,t	Cumulative
1.A.3.b. Road transport	Liquid Fuel	CO_2	1402.38	1402.38	1402.38	0.21
1.A.1.a.i. Electricity generation	Solid Fuel	CO_2	1358.19	1358.19	1358.19	0.21
1.A.1.a.i. Electricity generation	Liquid Fuel	CO_2	966.04	966.04	966.04	0.15
4.A Solid waste management		CH_4	26.59	744.52	744.52	0.11
2.F.1.a. Refrigeration and stationary air conditioning	HFCs	CO_2	465.50	465.50	465.50	0.07
3.B.1 Forest land	All	CO_2	-427.46	-427.46	427.46	0.06
1.A.4 Energy others	Gaseous Fuel	CO_2	235.28	235.28	235.28	0.04
4.D Wastewater treatment		CH_4	7.19	201.32	201.32	0.03

Category	Activity data	Gases	Eq CO_2	Modulus	Lx,t	Cumulative
3.C.4 Direct N_2O from managed soils		N_2O	0.57	152.29	152.29	0.02
1.A.2.l. Textile and leather	Liquid Fuel	CO_2	138.47	138.47	138.47	0.02
1.A.3.d.ii Water-borne navigation	Liquid Fuel	CO_2	81.69	81.69	81.69	0.01
3.C.6 Indirect N_2O from manure management		N_2O	0.18	47.86	47.86	0.01
1.A.2.e. Food processing, beverages and tobacco	Liquid Fuel	CO_2	41.25	41.25	41.25	0.01

Table 13: Key category analysis – Trend Assessment

Category	Activity data	Gases	2000, Gg CO_{2e}	2022, Gg CO_{2e}	Trend Assessment, Tx,t	% Contribution	Cumulative
1.A.3.b. Road transport	Liquid Fuel	CO_2	528.44	1402.38	0.12	0.16	0.16
3.B.1 Forest land		CO_2	-458.89	-427.46	0.10	0.14	0.30
2.F.1.a. Refrigeration and stationary air conditioning	HFCs	HFC	54.97	465.49	0.10	0.14	0.44
1.A.1.a.i. Electricity generation	Solid Fuel	CO_2	561.54	1358.19	0.09	0.12	0.55
4.D Wastewater treatment		CH_4	250.88	201.32	0.08	0.10	0.65
1.A.2.l. Textile and leather	Liquid Fuel	CO_2	166.03	138.47	0.05	0.07	0.72
1.A.1.a.i. Electricity generation	Liquid Fuel	CO_2	597.72	966.04	0.04	0.06	0.78
1.A.4 Energy others	Liquid Fuel	CO_2	70.88	40.42	0.03	0.04	0.81
4.A Solid waste management		CH_4	351.12	744.52	0.02	0.03	0.85
1.A.2.e. Food processing, beverages and tobacco	Liquid Fuel	CO_2	46.53	41.25	0.01	0.02	0.86
3.C.6 Indirect N2O from manure management		N_2O	5.04	47.86	0.01	0.01	0.88
3.C.5 Indirect N2O from managed soils		N_2O	20.49	4.19	0.01	0.01	0.89
3.A.1 Enteric fermentation		CH_4	25.94	16.24	0.01	0.01	0.90
3.C.4 Direct N2O from managed soils		N_2O	64.24	152.29	0.01	0.01	0.92
1.A.2.k. Construction	Liquid Fuel	CO_2	0.13	25.98	0.01	0.01	0.93
1.A.3.d.ii Water-borne navigation	Liquid Fuel	CO_2	30.49	81.69	0.01	0.01	0.93
1.A.2.m. Other	Liquid Fuel	CO_2	27.18	26.89	0.01	0.01	0.94
1.A.2.l. Textile and leather	Solid Fuel	CO_2	25.76	27.99	0.01	0.01	0.95

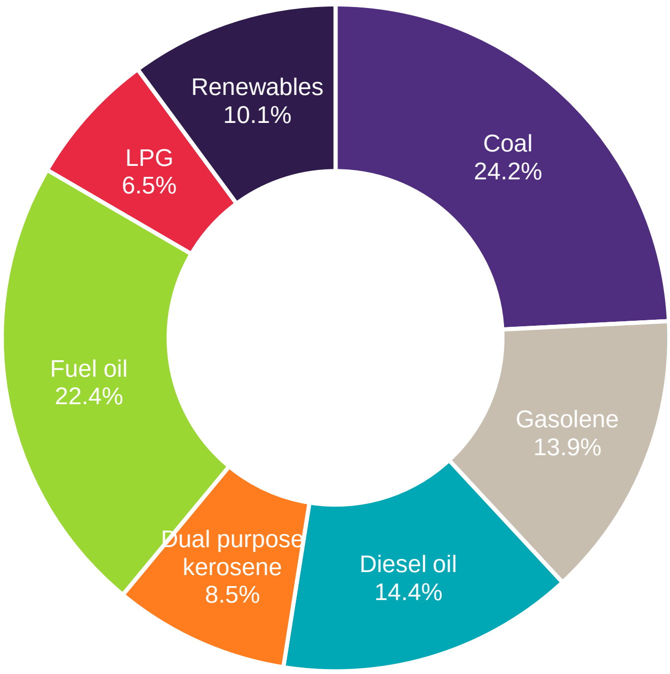
Chapter 3: Energy Sector

3.1. Overview

Energy sector in the RoM corresponds to the highest GHG emissions in the country. The industries for energy production are responsible for the 52.2% of the total amount of GHG emissions generated in the Energy sector in 2022 and is dominated by fuel combustion activities.

In 2022, the primary energy supply in the country is led by imported fossil fuels which represent the 89.9% of the supply in the country, and the remaining 10.1% corresponding to local renewable sources such as hydro, wind, landfill gas, photovoltaic energy, bagasse and wood. Nevertheless, the country does not have any fossil fuel extraction sources, and for this reason, all the fossil fuels consumed in the country are imported. In the case of coal, this fuel is imported mainly from South Africa; gasoline, diesel, fuel oil and kerosene mainly from India; and Liquified Petroleum Gases (LPG) from different places such us United Arab Emirates, Singapore and/or Bahrain, among others. The total primary energy requirement in the Republic of Mauritius for the year 2022 is presented in Figure 11.

Figure 11: Total Primary Energy Requirement in the RoM, 2022



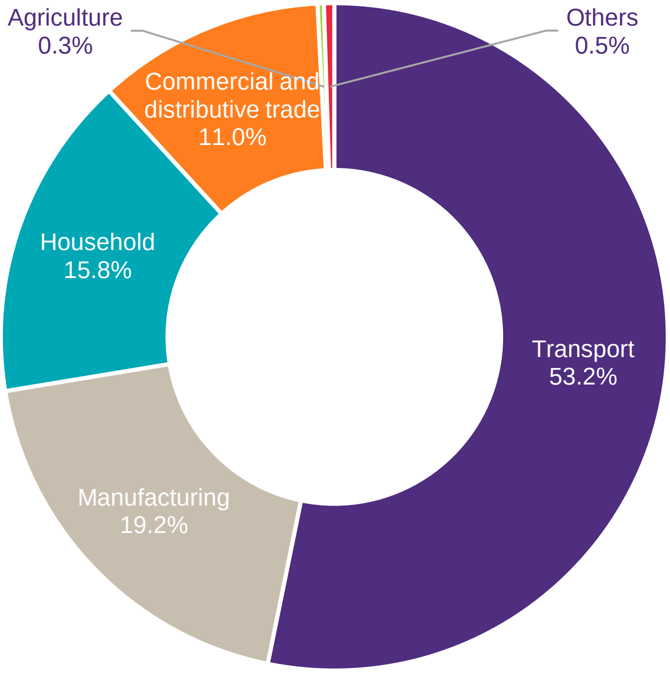
***Source**: Statistics Mauritius, Digest of Energy and Water Statistics, 2022*

The high dependence on the supply of fossil fuels has been a major concern for Mauritius due to the uncertainty in the price and supply of fossil fuels in the world market.

In 2022, the final energy consumption in the RoM was reported 958.3 ktoe. As shown in Figure 12, the main energy-consuming sector was transport (53.2%), followed by the manufacturing and household sectors, accounting respectively, for 19.2% and 15.8% of final energy consumed. The commercial and distributive trade sector and the agricultural sector represented 11.0% and 0.3% of final consumption, respectively.

Final energy consumption increased by around 19.1% from 804,824 toe in 2021 to 958,285 toe in 2022. Energy consumed by the transport sector, which represented 53.2% of the total final energy consumption went up by 34.7% from 378,758 toe in 2021 to 510,262 toe in 2022.

Figure 12: Final energy consumption by sector, 2022



***Source**: Statistics Mauritius, Digest of Energy and Water Statistics, 2022*

3.1.1. General methodology

The general methodology used in the energy sector is collected in the following table:

Table 14: Methodology used for the Energy Sector

Category	Activity data	Emission factor	Conversion factor/NCV	Activity data source
1.A. Fuel Combustion Activities				
1.A.1. Energy Industries				
1.A.1.a.i. Electricity generation by Energy Industries	T1	D/T1	CS	Energy and Water Statistics Mauritius
1.A.2. Manufacturing Industries and Construction				
1.A.2. Manufacturing Industries and Construction	T1	D/T1	CS	Energy and Water Statistics Mauritius
1.A.3. Transport				
1.A.3.a.ii. Civil Aviation	T1	D/T1	CS	Air Mauritius, Domestic flights
1.A.3.b. Road Transport	T1	D/T2	CS	Transport Toolkit v17.1, Statistics Mauritius
1.A.3.d.ii. Water-borne Navigation	T1	D/T1	CS	Tourism Authority, Shipping Authority, Port Authority
1.A.4. Other Sector				
1.A.4.a. Commercial / Institutional	T1	D/T1	CS	Statistics Mauritius
1.A.4.b. Residential	T1	D/T1	CS	Statistics Mauritius

Category	Activity data	Emission factor	Conversion factor/NCV	Activity data source
1.A.4.c. Agriculture	T1	D/T1	CS	Statistics Mauritius
1.A.4.d. Other	T1	D/T1	CS	Statistics Mauritius
1.B. Fugitive Emissions from Fuels				
1.B. Fugitive Emissions from Fuels	NA	NA	NA	-
1.C. Carbon Dioxide Transport and Storage				
1.C. Carbon Dioxide Transport and Storage	NO	NO	NO	-

T1: Tier 1; T2: Tier 2; D: Default; CS: Country Specific; NO: Not Occurring; NA: Not Applicable; NE: Not Estimated.

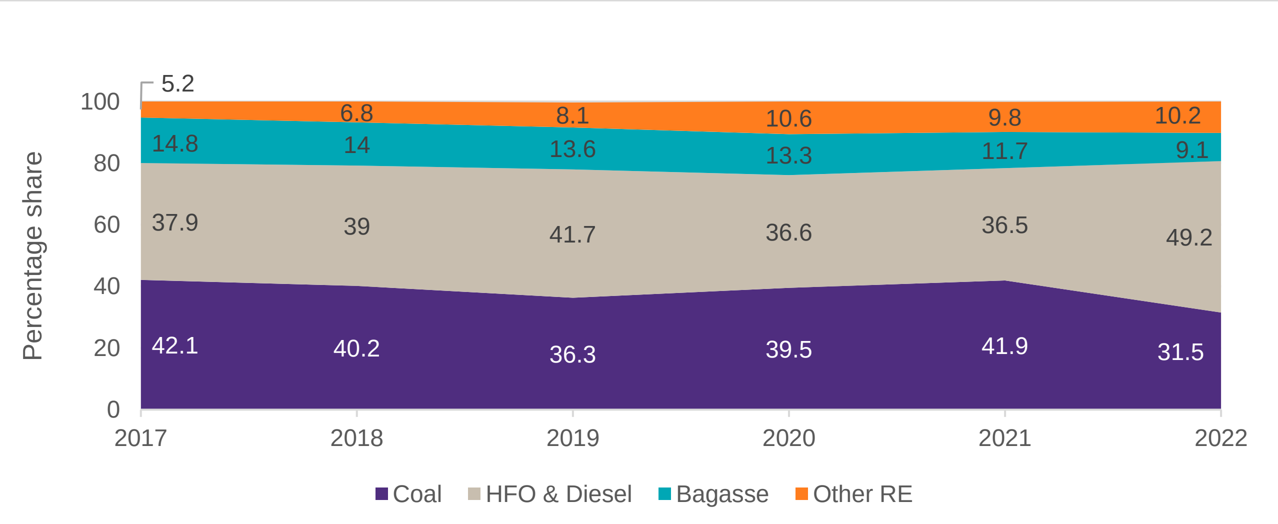
3.2. Energy Industries (Category 1A1)

The energy industries represent the largest share of emissions under the energy sector. In Republic of Mauritius (RoM), category 1A1a Main activity electricity and heat production is the main sub-category under Energy industries and under this subcategory, 1A1ai – Electricity generation has been considered. The other subcategories are not occurring.

3.2.1. Background of the energy industries in Mauritius

Electricity generation in Republic of Mauritius is based on coal, Heavy Fuel Oil (HFO), bagasse, kerosene and other renewable energy sources. In 2022, 53.7% of the total electricity generation was from CEB operated stations and 46.3% was from IPP operated power stations. The electricity generation mix for RoM from 2017[1] till 2022[2] is shown in Figure 13.

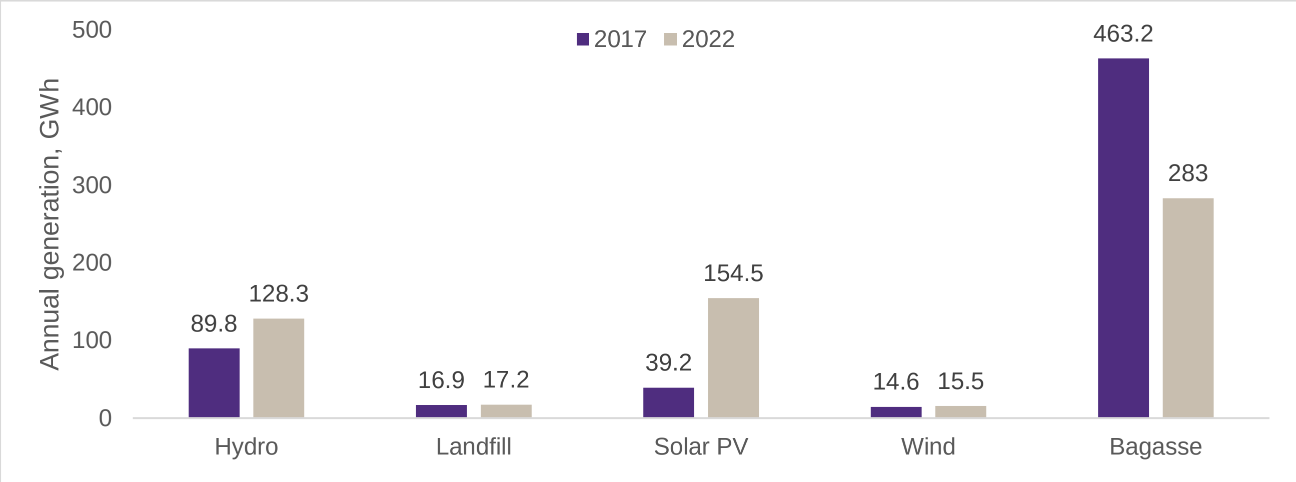
Figure 13: Electricity generation mix of RoM from 2017 till 2022



From Figure 13, the share of coal has dropped from 2017 till 2022, and the same has been compensated by an increase in electricity generation from HFO, diesel and kerosene (CEB operated stations). Figure 14 shows the renewable energy source wise generation in 2017 and 2022.

[1] Digest of Energy and Water Statistics 2017
[2] Energy and Water Statistics Year 2018 to 2022

Figure 14: Source wise Renewable Energy generation in 2017 and 2022



From 2017 till 2022, the share of electricity generation from non-bagasse RE sources increased from 5.2% to 10.2%. However, there has been a decline in electricity generation from bagasse, due to the reduction in availability of bagasse in the country.

3.2.2. Methodology adopted for GHG emission calculation

The activity data for calculation of emissions was collected from the Energy and Water Statistics for Republic of Mauritius from 2017 till 2022. As the country did not have Tier 2 or Tier 3 emission factors for the reporting period, Tier 1 emission factor mention in 2006 IPCC Guidelines were used. The Net Calorific Value (NCV) for Fuel Oil, Kerosene, Coal and Bagasse was shared by Central Electricity Board (CEB) and individual Independent Power Producers (IPPs). For coal and bagasse, the NCV figures shared by the four IPP operated power stations was used to arrive at annual weighted average NCV for each year. For HFO and kerosene, it was observed that the NCV figure as shared by CEB was constant from 2017 till 2022. Since RoM imports all fossil fuels, fuel test certificates are provided to CEB and IPPs for the fuel properties and NCV for each consignment of fuel imported. The NCV values reported are based on the fuel test certificates. For NCV of bagasse, fuel testing is carried out by the IPPs once a year or once in two years.

As reported in the 2006 IPCC Guidelines, CO_2 emissions from renewable energies is not accounted with the rest of CO_2 emissions from this category and should be accounted as CO_2 emissions from biomass and taken as a memo item. The non-CO_2 emissions from renewables have been accounted in the equivalent CO_2 emissions from energy industries.

The Activity Data (AD), NCV and Emission Factor (EF) for each of the fuel used was entered in the 2006 IPCC Inventory Software for the computation of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

3.2.2.1 Calculation

For the emission calculation, the equation 2.1 for stationary combustion from Chapter 2, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

Emission $_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$	=	Amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

For CO_2 it included carbon dioxide oxidation factor which is assumed to be 1. The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from energy industries.

3.2.2.2 Activity Data

The activity data for the fuel consumption in energy industries was collected from the Energy and Water Statistics, published annually by Statistics Mauritius under the aegis of the Ministry of Finance, Economic Planning and Development. The activity data used for calculation of GHG emissions from energy industries in Island of Mauritius and island of Rodrigues is presented in Table 15.

Table 15: Activity data for GHG emission calculation in energy industries in Island of Mauritius from 2017 to 2022 (Gg)

Year ↓ Fuel→	Gas/Diesel oil, Gg	Residual Fuel Oil, Gg	Kerosene, Gg	Sub-bituminous coal, Gg	Bagasse, Gg
2017	1.18	230.54	0.94	726.67	1078.81
2018	0.84	247.30	0.65	690.23	1008.86
2019	0.66	273.12	3.71	634.24	1001.81
2020	0.82	212.22	0.26	621.72	843.60
2021	0.89	222.05	0.63	695.24	797.79
2022	0.84	305.87	0.78	552.94	684.52

Table 16: Activity data for GHG emission calculation in energy industries in Island of Rodrigues from 2017 to 2022 (Gg)

Year ↓ Fuel→	Gas/Diesel oil, Gg	Residual Fuel Oil, Gg
2017	0.09	8.82
2018	0.09	8.77
2019	0.09	9.07
2020	0.10	9.32
2021	0.09	9.03
2022	0.10	9.41

The AD was provided in terms of Gg and using the NCV for each fuel type, Gg was converted to TJ. The country specific NCV used in the national inventory are given in the following Table 17 and default NCV used for Diesel is shown in Table 18.

Table 17: Country specific NCV of fuel used for GHG emission calculation (TJ/Gg)

Year ↓ Fuel→	Residual Fuel Oil, TJ/Gg	Kerosene, TJ/Gg	Sub Bituminous Coal, TJ/Gg	Bagasse, TJ/Gg
2017	40.59	43.20	25.480	7.720
2018	40.59	43.20	25.572	7.812
2019	40.59	43.20	25.451	7.733
2020	40.59	43.20	25.459	7.594
2021	40.59	43.20	25.556	7.684

Year ↓ Fuel→	Residual Fuel Oil, TJ/Gg	Kerosene, TJ/Gg	Sub Bituminous Coal, TJ/Gg	Bagasse, TJ/Gg
2022	40.59	43.20	25.560	7.786

Table 18: Default NCV for diesel as per IPCC Software (TJ/Gg)

Year ↓ Fuel→	Gas/Diesel Oil, TJ/Gg
2017	43,300
2018	43,300
2019	43,300
2020	43,300
2021	43,300
2022	43,300

The country specific NCV value for sub bituminous coal and bagasse was calculated as weighted average of NCV shared by Alteo Ltd., Terragen and Omnicane Ltd.

3.2.2.3 Emission Factor

The Emission Factors used for the estimation of the GHG emissions of the energy industries are adopted from the default values proposed in the 2006 IPCC Guidelines, as shown in the table below:

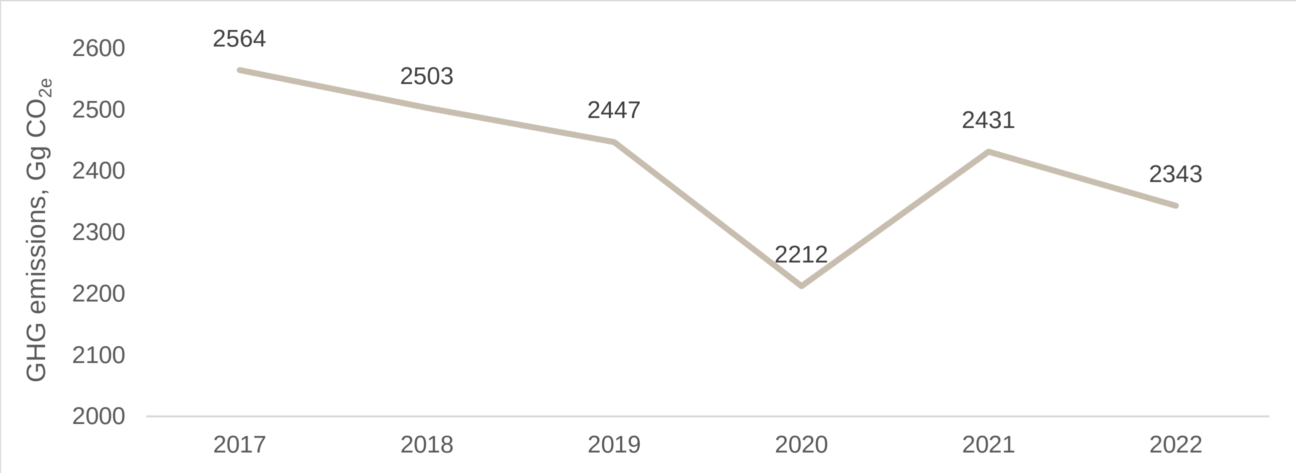
Table 19: Emission factors used for GHG estimation

IPCC Default emission factors for stationary combustion in energy industries - Table 2.2, Chapter 2 Volume 2			
Fuel	**CO_2 emission factor kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Gas/Diesel Oil	74100	3	0.6
Residual Fuel Oil	77400	3	0.6
Kerosene	71900	3	0.6
Sub Bituminous Coal	96100	1	1.5
Other Primary solid biomass	100000	30	4

3.2.3. Results

The GHG emissions from energy industry sub-sector was 2564 Gg in 2017 and stood at 2343 Gg in 2022. The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 15.

Figure 15 GHG emission from energy industries from 2017 to 2022 (Gg CO_{2e}/year)



The year wise fuel wise GHG emissions from energy industries is given in Table 20.

Table 20: Year wise and fuel wise GHG emission from energy industries (Gg CO_{2e})

Year ↓ Fuel→	Gas/Diesel Oil, Gg CO_{2e}	Residual Fuel Oil, Gg CO_{2e}	Kerosene, Gg CO_{2e}	Sub Bituminous Coal, Gg CO_{2e}	Bagasse, Gg CO_{2e}	Total, Gg CO_{2e}
2017	4.10	754.35	2.93	1787.23	15.82	**2564.43**
2018	2.71	779.36	2.02	1703.75	14.97	**2502.82**
2019	2.12	860.74	11.56	1558.11	14.72	**2447.24**
2020	2.63	668.81	0.80	1527.86	12.17	**2212.27**
2021	2.85	699.80	1.96	1714.98	11.65	**2431.24**
2022	2.69	963.96	2.42	1364.20	10.13	**2343.40**

3.2.4. Quality control

The activity data for fuel consumption have been obtained from the respective power plants and sent monthly to Statistics Mauritius. The Statistics Mauritius presents these data annually in the Energy and Water Statistics published on its website. The values used in this inventory have been obtained from these annual statistics. Additionally, the State Trading Corporation (STC), which is the main entity for importing fuels into the country, also shares data with Statistics Mauritius on the fuel quantity imported and distributed to different energy industries.

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between data provided via mail by the CEB and IPPs and data reported in the national Statistics Mauritius.
- Cross verification between EF values provided by institutional authorities and the default values proposed by the IPCC 2006 Guidelines for Energy Industries.
- Cross verification between country specific NCV provided by institutional authorities and the NCV range proposed by the IPCC 2006 Guidelines.
- Cross verification between the GHG emissions estimated in the current inventory for energy industries and the results obtained in the last reported national inventory of the RoM.

3.2.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the energy industries category considering 2000 as base year, are given in the following table:

Table 21: Uncertainty Analysis of Energy Industries Category (1A1) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A1 - Energy Industries - Liquid Fuels	CO_2	5.00	6.14	7.92
1A1 - Energy Industries - Liquid Fuels	CH_4	5.00	228.79	228.84
1A1 - Energy Industries - Liquid Fuels	N_2O	5.00	228.79	228.84
1A1 - Energy Industries - Solid Fuels	CO_2	5.00	12.41	13.38
1A1 - Energy Industries - Solid Fuels	CH_4	5.00	200.00	200.06
1A1 - Energy Industries - Solid Fuels	N_2O	5.00	222.22	222.28
1A1 - Energy Industries - Biomass	CO_2	5.00	18.69	19.35
1A1 - Energy Industries – Biomass	CH_4	5.00	245.45	245.51
1A1 - Energy Industries - Biomass	N_2O	5.00	304.55	304.59

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are presented in Table 23.

Table 22: Comparison of AR2 and AR5 GWP values

Gas	Second Assessment Report (AR2)	Fifth Assessment Report (AR5)
CO_2	1	1
CH_4	21	28
N_2O	310	265

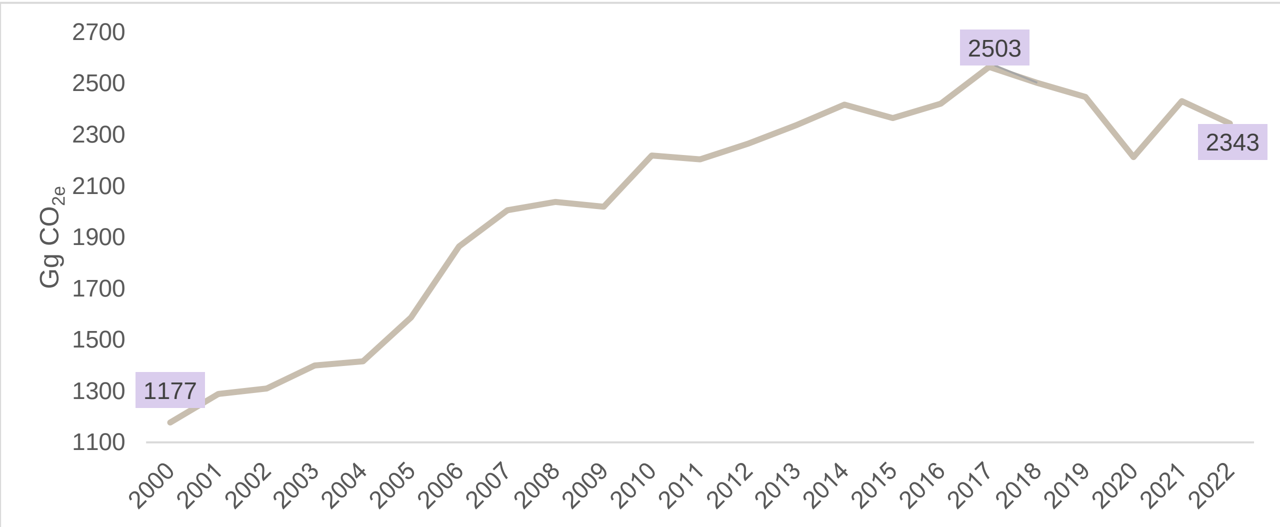
Table 23: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	1177.61	1177.43	-0.18	-0.02%
2001	1289.30	1289.08	-0.23	-0.02%
2002	1310.80	1310.57	-0.23	-0.02%

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2003	1400.80	1400.53	-0.27	-0.02%
2004	1416.17	1415.94	-0.23	-0.02%
2005	1587.64	1587.28	-0.36	-0.02%
2006	1865.46	1864.91	-0.54	-0.03%
2007	2006.65	2005.96	-0.69	-0.03%
2008	2037.94	2037.25	-0.69	-0.03%
2009	2019.18	2018.51	-0.67	-0.03%
2010	2220.08	2219.30	-0.78	-0.04%
2011	2204.57	2203.81	-0.76	-0.03%
2012	2265.34	2264.53	-0.81	-0.04%
2013	2338.85	2337.99	-0.85	-0.04%
2014	2418.84	2417.94	-0.90	-0.04%
2015	2365.32	2364.49	-0.83	-0.03%
2016	2422.37	2421.48	-0.89	-0.04%

The Figure 16 shows the GHG emission trend of energy industries from 2000 to 2022.

Figure 16: GHG emission trend from energy industries of RoM from 2000 to 2022



As seen from above figure, there has been a reduction of 3.2% in emissions from energy industries from 2017 to 2022, even though the electricity generation has increased by 2.5%. This has been possible due to the reduction in the use of coal and increase in use of HFO.

3.2.6. Planned improvements

Mauritius is currently in the process of developing Tier 3 grid emission factor for the energy industries under a GEF Capacity Building initiative for Transparency project. As part of this project, the tier 3 grid emission factor calculation methodology will be finalized, and the calculation will be carried out on monthly basis. Emissions from energy industries will be calculated based on tier 3 methodology, once available.

3.3. Manufacturing Industries (Category 1A2)

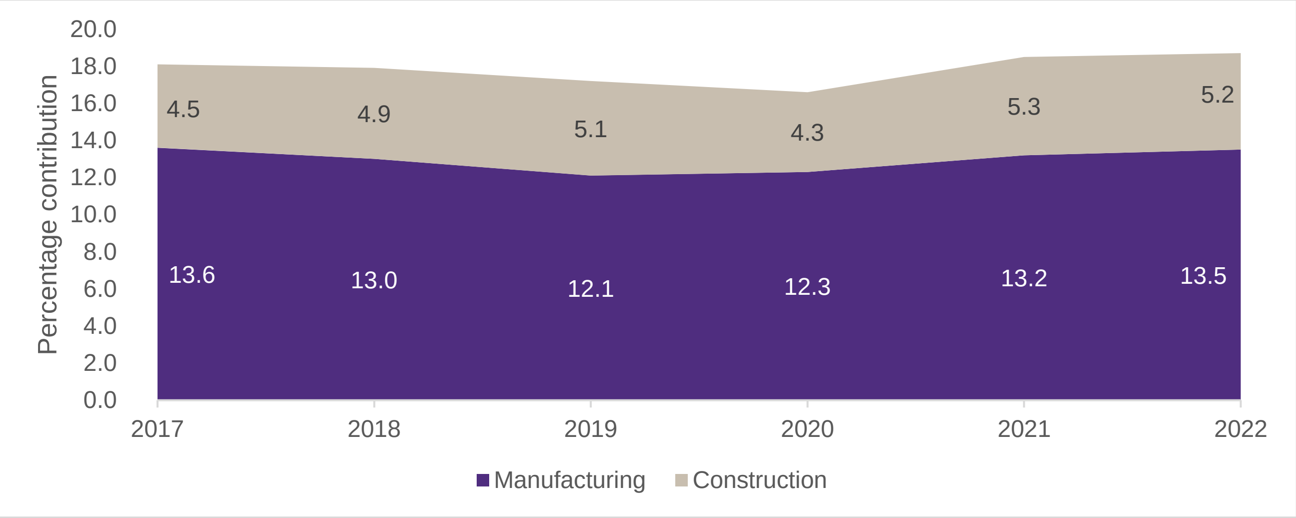
The manufacturing industries category in Republic of Mauritius consists of the following subcategories:

- 1A2a Iron and Steel
- 1A2c Chemicals
- 1A2d Pulp. Paper and Print
- 1A2e Food processing. Beverages and Tobacco
- 1A2k Construction
- 1A2l Textile and Leather
- 1A2m Other

3.3.1. Background of the manufacturing and construction industries in Mauritius

The manufacturing and construction activities are part of the secondary sector of country that contributed to the 20.3% of the total Gross Value Added (GVA) of the country. In 2022, the manufacturing category and its sub-categories along with the financial and insurance activities were the largest contributors in Mauritian economy, both contributing 13.5% of the GVA of the country. Construction activities contributed 5.2% of GVA in 2022[3]. Contribution of manufacturing and construction activities to RoM GVA from 2017 till 2022 is shown in Figure 17.

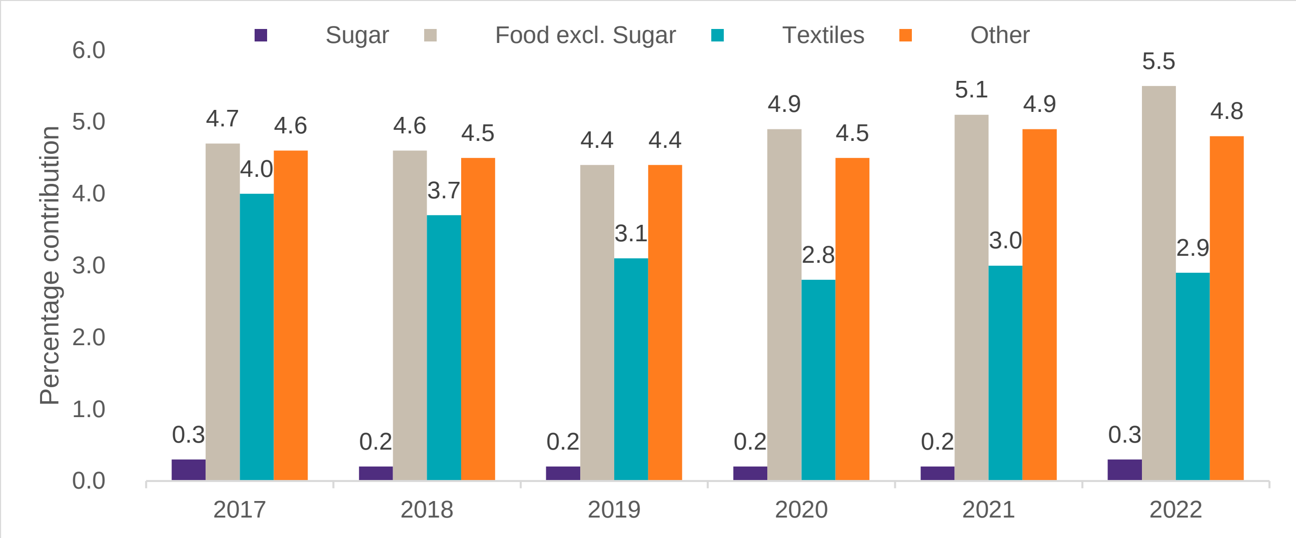
Figure 17: Contribution of Manufacturing and Construction activities to RoM GVA from 2017 till 2022



From Figure 17, total contribution of both manufacturing and construction activities has remained almost constant from 2017 to 2022. Figure 18 shows the contribution of the various manufacturing sub-categories to RoM GVA.

[3] National Accounts 2006 - 2024

Figure 18: Source wise Renewable Energy generation in 2017 and 2022



From 2017 till 2022, the contribution of Food excluding sugar and other manufactured products has increased from 4.7% and 4.6% to 5.5% and 4.8% respectively. However, there has been a decline in contribution of the textile manufacturing subcategory from 4% in 2017 to 2.9% in 2022.

The manufacturing and construction activities use Liquified Petroleum Gas (LPG), Diesel oil, Residual Fuel Oil, motor gasoline, sub bituminous coal, bagasse and wood as fuel for combustion.

3.3.2. Methodology adopted for GHG emission calculation

The activity data for calculation of emissions was collected from Energy and Water Statistics from 2017 till 2022. As the country did not have Tier 2 or Tier 3 emission factors for the reporting period, Tier 1 emission factor mention in 2006 IPCC Guidelines were used. Since all fossil fuel is imported into the country by State Trading Company (STC) and distributed among the thermal power stations and the manufacturing industries, the Net Calorific Value (NCV) for Fuel Oil, was considered the same as shared by CEB. Coal in republic of Mauritius is imported from South Africa and major consumers are the IPPs. For coal and bagasse, the NCV figures shared by the four IPP operated power stations was used to arrive at annual weighted average NCV for each year. For HFO and kerosene, it was observed that the NCV figure as shared by CEB was constant from 2017 till 2022. Since RoM imports all fossil fuels, fuel test certificates are provided to CEB and IPPs for the fuel properties and NCV for each consignment of fuel imported. The NCV values reported are based on the fuel test certificates. For NCV of bagasse, fuel testing is carried out by the IPPs once a year or once in two years.

As reported in the 2006 IPCC Guidelines, CO_2 emissions from biomass energies is not accounted with the rest of CO_2 emissions from this category and should be accounted as CO_2 emissions from biomass and taken as a memo item. The non-CO_2 emissions from renewables have been accounted in the equivalent CO_2 emissions from energy industries.

The Activity Data (AD), NCV and Emission Factor (EF) for each of the fuel used was entered in the 2006 IPCC Inventory Software for the computation of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

3.3.2.1 Calculation

For the emission calculation, the equation 2.1 for stationary combustion from Chapter 2, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:
Emission $_{GHG,fuel}$ = Emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$ = Amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$ = Default emission factor for a given GHG by type of fuel (kg gas/TJ).

For CO_2 it included carbon dioxide oxidation factor which is assumed to be 1. The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from energy industries.

3.3.2.2 Activity Data

The activity data used for the estimation of GHG emissions for manufacturing industries have been estimated based on the TNC data and methodology and data shared by Statistics Mauritius. The Ministry of Industrial Development, SMEs and Cooperatives (Industrial Development Division) was contacted for collecting activity data but it was informed that are such data are not collected nor generated by the Ministry.

The total fuel consumption estimations are available for the period between 2017 to 2022. The percentage of fuel consumed by each manufacturing industry was estimated based on previous inventory data and same was used to distribute the total fuel consumed by the manufacturing sector among manufacturing subcategories.

Table 24 provides the activity data values used in the estimation of GHG emissions for the manufacturing industries from 2017 to 2022.

Table 24: Activity data for GHG emission calculation in manufacturing industries from 2017 to 2022 (Gg)

Year↓ Fuel→	Liquified Petroleum Gas, Gg	Gas/Diesel Oil, Gg	Residual Fuel Oil, Gg	Motor Gasoline, Gg	Sub Bituminous Coal, Gg	Bagasse, Gg	Wood/Wood waste, Gg
2017	5.46	35.53	37.14	1.04	33.53	135.75	1.24
2018	5.67	34.80	38.76	1.03	31.89	116.58	1.20
2019	6.52	37.81	38.93	1.07	29.67	104.29	1.10
2020	4.72	35.64	30.53	1.04	38.80	74.17	1.00
2021	4.82	29.81	32.61	0.96	41.37	71.91	1.00
2022	6.74	40.81	36.71	1.12	26.59	52.33	1.54

The AD was provided in terms of Gg and using the NCV for each fuel type, Gg was converted to TJ. The country specific NCV used in the national inventory are given in the following Table 25 and default NCV used for Diesel is shown in

Table 26.

Table 25: Country specific NCV of fuel used for GHG emission calculation (TJ/Gg)

Year ↓ Fuel→	Residual Fuel Oil, TJ/Gg	Sub Bituminous Coal, TJ/Gg	Bagasse, TJ/Gg
2017	40.59	25.480	7.720
2018	40.59	25.572	7.812
2019	40.59	25.451	7.733
2020	40.59	25.459	7.594
2021	40.59	25.556	7.684
2022	40.59	25.560	7.786

Table 26: Default NCV for diesel as per IPCC Software (TJ/Gg)

Year↓ Fuel→	Liquified Petroleum Gas, TJ/Gg	Gas/Diesel Oil, TJ/Gg	Motor Gasoline, TJ/Gg	Wood/Wood waste, TJ/Gg
2017	47,300	43,300	44,800	15,600
2018	47,300	43,300	44,800	15,600
2019	47,300	43,300	44,800	15,600
2020	47,300	43,300	44,800	15,600
2021	47,300	43,300	44,800	15,600
2022	47,300	43,300	44,800	15,600

The country specific NCV value for sub bituminous coal and bagasse was calculated as weighted average of NCV shared by the IPPs which are the major coal consumers within the country.

3.3.2.3 Emission Factor

The Emission Factors used for the estimation of the GHG emissions of the manufacturing industries are adopted from the default values proposed in the 2006 IPCC Guidelines, as shown in Table 27.

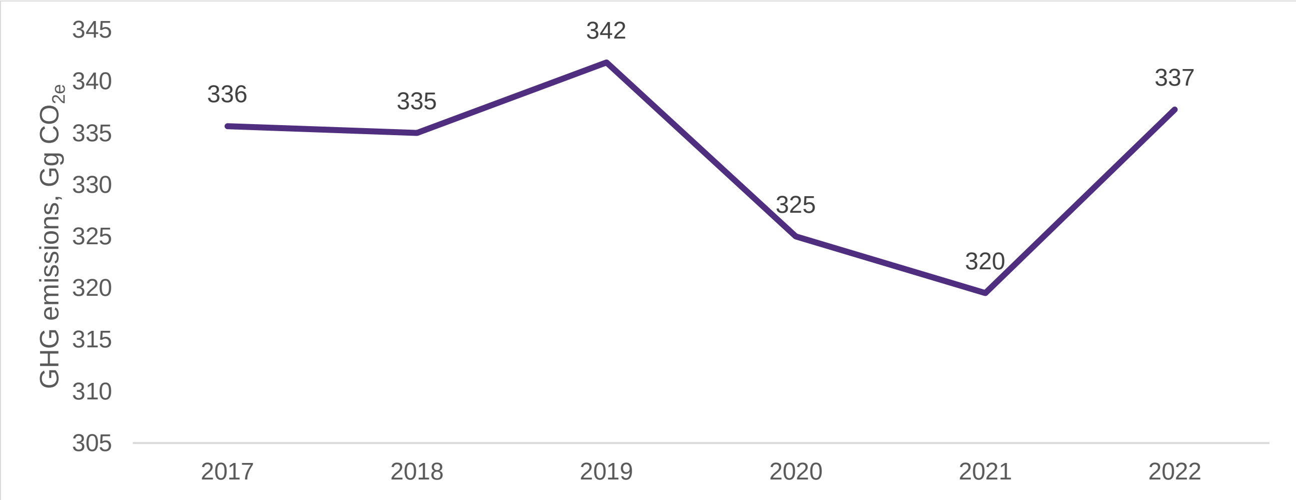
Table 27: Emission factors used for GHG estimation

IPCC Default emission factors for stationary combustion in manufacturing industries and construction - Table 2.3, Chapter 2 Volume 2			
Fuel	**CO_2 emission factor, kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Liquified Petroleum Gas	63100	1	0.1
Gas/Diesel Oil	74100	3	0.6
Residual Fuel Oil	77400	3	0.6
Kerosene	71500	3	0.6
Motor Gasoline	69300	3	0.6
Sub Bituminous Coal	96100	10	1.5
Other Primary solid biomass	100000	30	4
Wood/Wood waste	112000	30	4

3.3.3. Results

The results of the GHG emission estimation for the energy manufacturing industries from 2017 to 2022 is shown in Figure 19.

Figure 19: GHG emission from energy industries from 2017 to 2022 (Gg CO_{2e}/year)



The year wise fuel wise GHG emissions from energy industries is given in Table 28.

Table 28: Year wise and fuel wise GHG emission from manufacturing industries (Gg CO_{2e})

Year↓ Fuel→	Liquified Petroleum Gas, Gg CO_{2e}	Gas/Diesel Oil, Gg CO_{2e}	Residual Fuel Oil, Gg CO_{2e}	Motor Gasoline, Gg CO_{2e}	Sub Bituminous Coal, Gg CO_{2e}	Bagasse, Gg CO_{2e}	Wood/Wood waste, Gg CO_{2e}
2017	31.05	100.86	105.05	14.02	82.68	0.04	1.99
2018	31.35	98.80	109.63	14.55	78.91	0.04	1.73
2019	35.11	107.34	110.14	14.61	73.07	0.03	1.53
2020	28.93	101.19	86.37	11.82	95.59	0.03	1.07
2021	26.53	84.63	91.13	13.83	102.32	0.03	1.05
2022	37.05	115.87	103.91	13.87	65.77	0.05	0.77

3.3.4. Quality Control

The values used in this inventory have been obtained by distribution of the total fuel consumed by manufacturing industries among subcategories on the basis of the subcategory wise fuel consumption data reported in the previous National Inventory Report published in 2021. The Statistics Mauritius presents total fuel consumed by manufacturing industries annually in the Energy and Water Statistics published on its website. The values used in this inventory have been obtained from these annual statistics. Additionally, the State Trading Corporation (STC), which is the main entity for importing fuels into the country, also shares data with Statistics Mauritius on the fuel quantity imported and distributed to different energy industries.

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between EF values provided by institutional authorities and the default values proposed by the IPCC 2006 Guidelines for Energy Industries.
- Cross verification between country specific NCV provided by institutional authorities and the NCV range proposed by the IPCC 2006 Guidelines.
- Cross verification between the GHG emissions estimated in the current inventory for energy industries and the results obtained in the last reported national inventory of the RoM.

3.3.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the manufacturing industries category considering 2000 as base year, are given in the following table:

Table 29: Uncertainty Analysis of Manufacturing Industries Category (1A2) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A2a - Iron and Steel - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2a - Iron and Steel - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2a - Iron and Steel - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2c - Chemicals - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2c - Chemicals - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2c - Chemicals - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2c - Chemicals - Solid Fuels	CO_2	5.00	12.46	13.43
1A2c - Chemicals - Solid Fuels	CH_4	5.00	200.00	200.06
1A2c - Chemicals - Solid Fuels	N_2O	5.00	222.22	222.28
1A2d - Pulp, Paper and Print - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2d - Pulp, Paper and Print - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2d - Pulp, Paper and Print - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2e - Food Processing, Beverages and Tobacco - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2e - Food Processing, Beverages and Tobacco - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2e - Food Processing, Beverages and Tobacco - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2e - Food Processing, Beverages and Tobacco - Solid Fuels	CO_2	5.00	12.46	13.43
1A2e - Food Processing, Beverages and Tobacco - Solid Fuels	CH_4	5.00	200.00	200.06
1A2e - Food Processing, Beverages and Tobacco - Solid Fuels	N_2O	5.00	222.22	222.28
1A2k - Construction - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2k - Construction - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2k - Construction - Liquid Fuels	N_2O	5.00	228.79	228.84

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A2l - Textile and Leather - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2l - Textile and Leather - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2l - Textile and Leather - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2l - Textile and Leather – Solid Fuels	CO_2	5.00	12.46	13.43
1A2l - Textile and Leather – Solid Fuels	CH_4	5.00	200.00	200.06
1A2l - Textile and Leather – Solid Fuels	N_2O	5.00	222.22	222.28
1A2m - Non-specified Industry - Liquid Fuels	CO_2	5.00	6.14	7.92
1A2m - Non-specified Industry - Liquid Fuels	CH_4	5.00	228.79	228.84
1A2m - Non-specified Industry - Liquid Fuels	N_2O	5.00	228.79	228.84
1A2m - Non-specified Industry - Solid Fuels	CO_2	5.00	12.46	13.43
1A2m - Non-specified Industry - Solid Fuels	CH_4	5.00	200.00	200.06
1A2m - Non-specified Industry - Solid Fuels	N_2O	5.00	222.22	222.28
1A2m - Non-specified Industry - Biomass	CO_2	5.00	18.69	19.35
1A2m - Non-specified Industry – Biomass	CH_4	5.00	245.45	245.51
1A2m - Non-specified Industry - Biomass	N_2O	5.00	281.82	281.86

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 30.

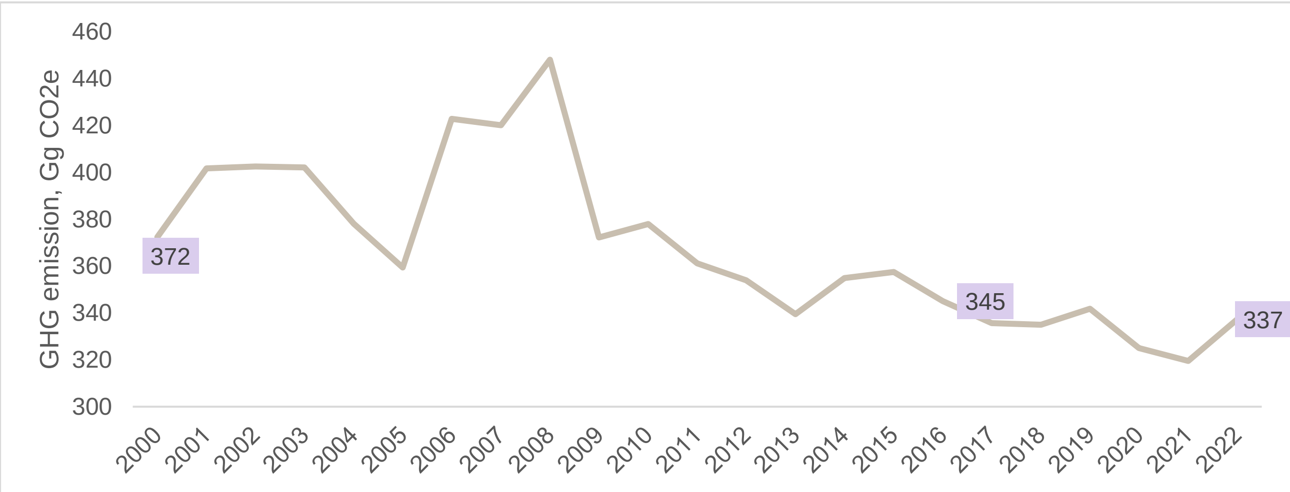
Table 30: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	372.22	372.31	0.09	0.02%
2001	401.62	401.71	0.09	0.02%
2002	402.38	402.46	0.07	0.02%
2003	402.01	402.10	0.09	0.02%
2004	377.99	378.08	0.09	0.02%

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2005	359.33	359.41	0.08	0.02%
2006	422.80	422.87	0.07	0.02%
2007	419.98	420.03	0.05	0.01%
2008	448.02	448.05	0.03	0.01%
2009	372.14	372.17	0.03	0.01%
2010	377.89	377.93	0.04	0.01%
2011	361.19	361.22	0.03	0.01%
2012	353.89	353.92	0.03	0.01%
2013	339.42	339.45	0.03	0.01%
2014	354.81	354.83	0.02	0.01%
2015	357.46	357.48	0.02	0.01%
2016	345.06	345.07	0.02	0.00%

The Figure 20 shows the GHG emission trend of manufacturing industries from 2000 to 2022.

Figure 20: GHG emission trend from manufacturing industries of RoM from 2000 to 2022



As seen from Figure 20, the emissions from manufacturing industries from 2017 to 2022 are almost constant (except Covid 19 period) but with respect to GHG emissions in 2000, there has been a 9% reduction.

3.3.6. Planned Improvement

The data disaggregation available for each of the manufacturing industries and construction categories, is being estimated and not calculated. The country is working to collect more accurate data for each sub-category, especially for iron and steel and construction industries.

3.4. Transport (Category 1A3)

In Republic of Mauritius (RoM), transport category 1A3 comprises of civil aviation, water borne navigation and road transport. Island of Mauritius also has Metro Express which started operations in 2021. The metro is solely powered by electricity from the grid, as such emissions are accounted under energy industries (1A1ai).

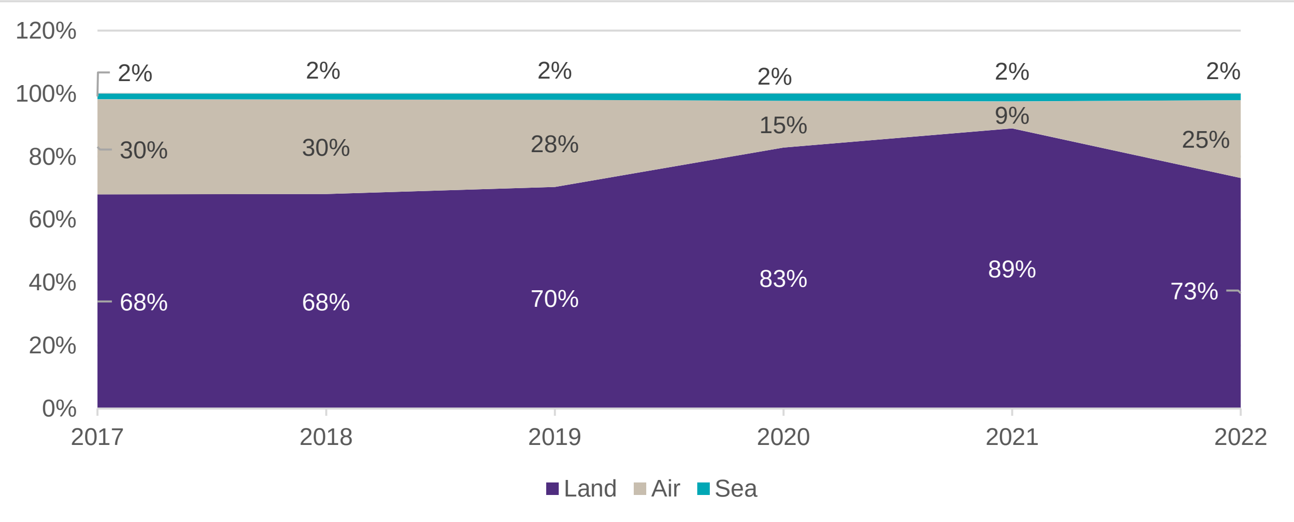
3.4.1. Background of the transport sector in Mauritius

Republic of Mauritius has three modes of transport, by land, water and air. Of the three, land transports accounts for the maximum share of fuel consumption followed by air and water borne transport. Republic of Mauritius has a well-developed road network system of 2 975 km as of 2021, of which 99% are paved roads. Road transportation is the major mode of land transport in Mauritius and commercial services of metro started in January 2020. Road transport caters to both the passenger and freight transport needs. The fleet of vehicles which was 319 000 in the year 2006 almost doubled to 622988 in 2021.

The average growth rate was 5.2% per year. The highest increase was observed in cars followed by motorcycles. The dual-purpose vehicles saw a 5% decrease in the total numbers since 2012. Cars, auto cycles and motorcycles are the three categories with highest number of vehicles in Mauritius. The other category of vehicles represents 20% of vehicles in Mauritius[4]. while that for private vehicles, namely, motor cars and motorcycle was much higher, representing increases of 9.3% and 11.7% respectively. Motorisation rates during the period increased by 38% from 255 to 385 vehicles per thousand people. Agriculture/Forestry/Fishing category is divided into stationary and mobile combustion. Stationary combustion in this category is minimal and the mobile combustion uses diesel and gasoline as fossil fuels for field operations and fishing activities.

The fuel consumption share of different modes of transport in for the RoM from 2017[5] till 2022[6] is presented in Figure 21.

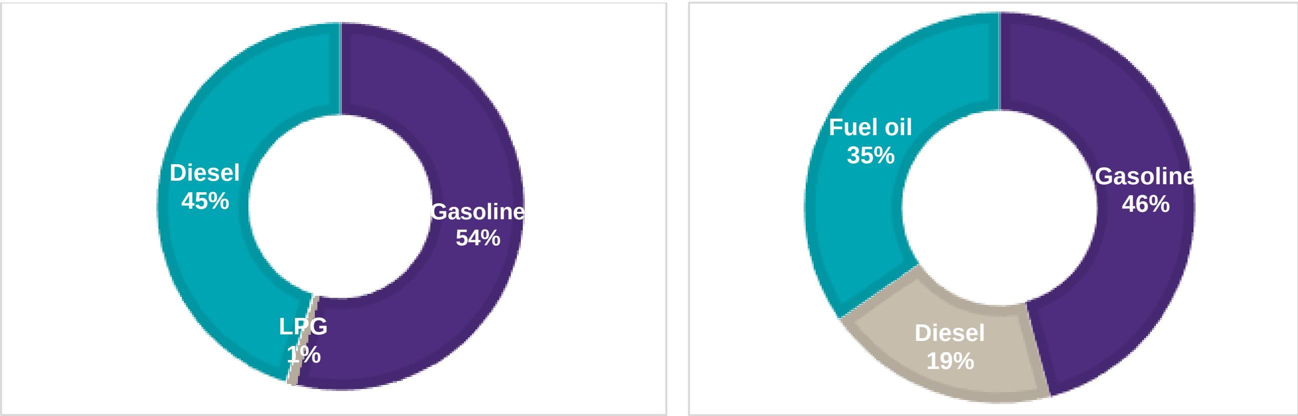
Figure 21: Share of different modes of transport in RoM transport consumption



As seen from Figure 21, the share of fuel consumed for land transport is the highest and has increased from 2017 to 2022 while than for air transport has reduced. Figure 22 shows the renewable energy source wise generation in 2017 and 2022.

[4] Digest of Transport 2020-21
[5] Digest of Energy and Water Statistics 2017
[6] Energy and Water Statistics Year 2018 to 2022

Figure 22: Source wise fuel consumption in road and water borne transport, 2017



In transport category, gasolines is the most used fuel, followed by diesel oil and jet kerosene.

3.4.2. Methodology adopted for GHG emission calculation

The considered approach for the estimation of GHG Emissions for road transport, Civil aviation and Water-borne navigation in the Transport sector is Tier 1.

To obtain the results of the GHG emissions from each fuel type used in the transport sector of the country, each fuel's activity data (AD) and Emission Factor (EF) have been entered in the 2006 IPCC Inventory Software for the computation of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

3.4.2.1 Calculation

For the emission calculation for road transport, the equation 3.2.1 and 3.2.3 for stationary combustion from Chapter 3, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

Emission $_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$	=	Amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from road transport.

The *Fuel Consumption* $_{fuel}$ parameter has been calculated using the 3.2.6 equation of the 2006 IPCC Guidelines, for each vehicle and fuel type.

$$Fuel\ Fuel\ Consumption_{fuel} = Vehicle_{type,fuel} \times Consumption_{vehicle\ type,fuel} \times Distance\ travelled$$

Where:

Fuel Consumption $_{fuel}$	=	Amount of fuel combusted (TJ)
Vehicles $_{type,fuel}$	=	Number of vehicles by type and fuel used
Consumption $_{vehicle\ type,fuel}$	=	Average fuel consumption by vehicle type and fuel used
Distance travelled	=	Average distance travelled by each type of vehicle by fuel type (km)

The emissions are calculated for each vehicle and fuel type and to calculate the total emission by gas the emissions calculated in the 3.2.1 and 3.2.3 equations are summed over all fuels.

For the emission calculation of water borne navigation, the equation 3.5.1 from Chapter 3, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

$Emission_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
$Fuel\ Consumption_{fuel}$	=	Amount of fuel combusted (TJ)
$Emission\ Factor_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from water borne navigation.

For the emission calculation of civil aviation, the equation 3.6.1 from Chapter 3, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

$Emission_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
$Fuel\ Consumption_{fuel}$	=	Amount of fuel combusted (TJ)
$Emission\ Factor_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from air transport.

3.4.2.2 Activity Data

Road Transport

For the road transport, the Activity Data used differs depending on the time period. The National Land Transport Authority (NLTA) facilitated the number of vehicles by type, technology and fuel consumed for the years 2017 to 2020 for both Island of Mauritius. For 2021 and 2022, it was observed that data provided by NLTA was same as 2020. As such fuel consumption data for 2021 and 2022 was collected from Statistics Mauritius.

For the Island of Rodrigues, no data was available for the period 2017 to 2022. To ensure coverage of Rodrigues' Road transport related emissions, the data for number of vehicles by type in Rodrigues till 2016 was taken from National Inventory Report, 2021 and projected till 2022 using the Compound Annual Growth Rate calculated for island of Mauritius from 2000 to 2022. The total number of vehicles so calculated, was distributed among the different types of vehicles based on the percentage share provided in NIR, 2021. The average distance travelled per year and the fuel economy for different types of vehicles was assumed to be same as that for Island of Mauritius.

The number and type of different vehicles in operation from 2017 to 2020, along with annual distance travelled by each vehicle type and the fuel economy considered for Island of Mauritius are shown in Table 31. The fuel consumption data for 2021 and 2022 was directly taken from Statistic Mauritius as the figures shared by NLTA were same as for the year 2020.

Table 31: The number and type of vehicles along with average distance travelled per year and fuel economy considered for Island of Mauritius from 2017 to 2022 (Gg)

Type of vehicle	Fuel	Technology	No of vehicles				Annual distance travelled per vehicle (km)	Fuel economy (km/l)
			2017	2018	2019	2020		
Passenger Cars	Gasoline	3-way catalyst	106187	118307	135715	142507	20929	13
		without 3-way catalyst	106824	107689	102523	80156	19813	12
	Diesel	3-way catalyst	8610	9560	10275	10499	20000	14
		without 3-way catalyst	9930	10646	10646	10646	20000	14
	LPG	3-way catalyst	20	20	20	20	14000	14
		without 3-way catalyst	206	206	206	206	14000	14
	Hybrid	3-way catalyst	3983	4348	4815	8122	996	9000
		without 3-way catalyst	0	0	0	0	0	9000
DPV	Gasoline	3-way catalyst	1023	1023	1023	1023	16000	12
		without 3-way catalyst	6709	5413	5413	6263	16000	12

Type of vehicle	Fuel	Technology	No of vehicles				Annual distance travelled per vehicle (km)	Fuel economy (km/l)
			2017	2018	2019	2020		
	Diesel	3-way catalyst	16931	16931	20931	17359	13000	14
		without 3-way catalyst	18055	22573	22573	19887	13000	14
	LPG	3-way catalyst	5	5	5	5	13000	12
		without 3-way catalyst	9	9	9	9	13000	12
Light commercial vehicles	Diesel	3-way catalyst	5734	5734	5880	8036	17500	10
		without 3-way catalyst	18100	16085	16085	46256	17500	10
Motorcycle	Gasoline	-	205493	211125	217510	221988	6000	36
Buses	Diesel	-	3101	3087	3087	3101	37500	4
Heavy duty trucks	Diesel	-	7323	7691	7781	7833	9583	3
Medium duty trucks	Diesel	-	13510	15505	16086	16086	16500	5
Passenger Cars	Electric	-	44	44	46	51	0	0

The number and type of different vehicles in operation from 2017 to 2022, along with annual distance travelled by each vehicle type and the fuel economy considered for Island of Rodrigues are shown in Table 32. Passenger electric vehicles have also been reported in the number and type of vehicles in operation in RoM from 2017 onwards by NLTA.

Table 32: Number of vehicles, average distance travelled and fuel economy for Rodrigues

Type of vehicle	Fuel	Technology	No of vehicles						Annual distance travelled per vehicle	Fuel economy (km/l)
			2017	2018	2019	2020	2021	2022		
Passenger Cars	Gasoline	3 way catalyst	271	284	297	310	325	340	20929	13
		without 3 way catalyst	679	710	742	776	812	849	19813	12
	Diesel	3 way catalyst	-	-	-	-	0	0	20000	14
		without 3 way catalyst	407	426	445	466	487	509	20000	14

Type of vehicle	Fuel	Technology	No of vehicles						Annual distance travelled per vehicle	Fuel economy (km/l)
			2017	2018	2019	2020	2021	2022		
	LPG	3 way catalyst	-	-	-	-	0	0	14000	14
		without 3 way catalyst	-	-	-	-	0	0	14000	14
	Hybrid	3 way catalyst	-	-	-	-	0	0	996	9000
		without 3 way catalyst	-	-	-	-	0	0	0	9000
DPV	Gasoline	3 way catalyst	-	-	-	-	0	0	16000	12
		without 3 way catalyst	-	-	-	-	0	0	16000	12
	Diesel	3 way catalyst	543	568	594	621	649	679	13000	14
		without 3 way catalyst	1,086	1,135	1,187	1,242	1299	1359	13000	14
	LPG	3 way catalyst	-	-	-	-	-	0	13000	12
		without 3 way catalyst	-	-	-	-	0	0	13000	12
Light commercial vehicles	Diesel	3 way catalyst	-	-	-	-	0	0	17500	10
		without 3 way catalyst	-	-	-	-	0	0	17500	10
Motorcycle	Gasoline	-	9,363	9,793	10,242	10,712	11203	11717	6000	36
Buses	Diesel	-	136	142	148	155	162	170	37500	4
Heavy duty trucks	Diesel	-	1,086	1,135	1,187	1,242	1299	1359	9583	3

The number of vehicles, average distance travelled and the fuel economy were used to arrive at the total fuel consumed for road transport in Island of Mauritius and Rodrigues. The average distance travelled per year per vehicle and the average fuel economy was shared by NLTA based on the TNC Transport Toolkit, 2017. The year wise fuel consumption for land transport for island of Mauritius and Rodrigue is given in Table 33 and Table 34 respectively.

Table 33: Activity data for road transport from 2017 to 2022, Island of Mauritius (Gg)

Year ↓ Fuel→	Gasoline	Diesel	LPG
2017	190.62	200.33	0.14
2018	200.78	210.37	0.14
2019	212.18	217.22	0.14
2020	211.97	214.92	0.14
2021	195.12	205.25	0.14
2022	211.53	222.77	0.18

Table 34: Activity data for road transport from 2017 to 2022, Island of Rodrigues (Gg)

Year ↓ Fuel→	Gasoline	Diesel	LPG
2017	2260.2	5510.4	0.0
2018	2363.9	5763.2	0.0
2019	2472.3	6027.6	0.0
2020	2585.7	6304.1	0.0
2021	2704.3	6593.3	0.0
2022	2828.4	6895.7	0.0

The activity data was provided in terms of Gg and using the NCV for each fuel type, Gg was converted to TJ.

Civil Aviation

The activity data for civil aviation was shared by Air Mauritius and Ministry of Civil Aviation. The activity data used for estimation of emissions from civil aviation sector is shown in Table 35.

Table 35: Activity data for emissions from civil aviation from 2017 to 2022, RoM (Gg)

Fuel consumed	2017	2018	2019	2020	2021	2022
Jet Kerosene, Gg	3.42	3.52	3.736	2.11	0.72	2.91

Air Mauritius also shared fuel consumed for ground operation which was used to estimate GHG emissions from other transportation sub-sector. The activity data for ground operations is given in Table 36.

Table 36: Activity data for emissions from other transport sub-sector from 2017 to 2022, RoM (Gg)

Year	Diesel Oil, Gg	Motor Gasoline, Gg
2017	0.52	0.01
2018	0.56	0.01
2019	0.57	0.01
2020	0.35	0.01
2021	0.37	0.01
2022	0.64	0.01

Water Borne Navigation

The activity data for water borne navigation was shared by Mauritius Ports Authority, Tourism Authority and Shipping Division. The activity data used for estimation of emissions from water borne navigation is presented in Table 37.

Table 37: Activity data for emissions from water borne navigation from 2017 to 2022, RoM (Gg)

Year	Diesel Oil, Gg	Motor Gasoline, Gg	Residual Fuel Oil, Gg
2017	3.36	17.46	0
2018	3.82	18.13	0.724
2019	4.32	18.78	1.0622
2020	3.72	17.41	1.20378
2021	4.63	21.33	0.95331
2022	4.19	21.98	1.78131

The country specific NCV used in the national inventory are given in the following Table 38 and default NCV used for Diesel is shown in Table 39.

Table 38: Country specific NCV of fuel used for GHG emission calculation (TJ/Gg)

Year ↓ Fuel→	Residual Fuel Oil, TJ/Gg	Liquified Petroleum Gas, TJ/Gg
2017	40,590	47,310
2018	40,590	47,310
2019	40,590	47,310
2020	40,590	47,310
2021	40,590	47,310
2022	40,590	47,310

Table 39: Default NCV for diesel as per IPCC Software (TJ/Gg)

Year ↓ Fuel→	Gas/Diesel Oil, TJ/Gg	Motor Gasoline, TJ/Gg	Jet Kerosene, TJ/Gg
2017	43,300	44,800	44,590
2018	43,300	44,800	44,590
2019	43,300	44,800	44,590
2020	43,300	44,800	44,590
2021	43,300	44,800	44,590
2022	43,300	44,800	44,590

3.4.2.3 Emission Factor

The Emission Factors used for the estimation of the GHG emissions of the transport sector are adopted from the default values proposed in the 2006 IPCC Guidelines, as shown in the Table 40 and Table 41.

Table 40: Emission factors used for GHG estimation from road transport

IPCC Default emission factors for Road Transport- Table 3.2.1, Chapter 3, Volume 2			
Fuel	**CO_2 emission factor, kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Motor Gasoline	69300	33	3.2
Gas/Diesel Oil	74100	3.9	3.9
Liquified Petroleum Gas	63100	62	0.2

Table 41: Emission factors used for GHG estimation from water borne navigation and civil aviation

IPCC Default emission factors for Water Borne Navigation - Table 3.52 and Table 5.53, Chapter 3 Volume 2			
Fuel	**CO_2 emission factor, kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Gas/Diesel Oil	74100	7	2
Residual Fuel Oil	77400	7	2
Jet Kerosene	71500	0.5	2
Motor Gasoline	69300	7	2

3.4.3. Results

The emissions rose from 1363 Gg in 2017 to 1525 Gg in 2022. The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 23. The year wise fuel wise GHG emissions from energy industries is given in Table 42.

Figure 23: GHG emission from energy industries from 2017 to 2022 (Gg CO_{2e}/year)

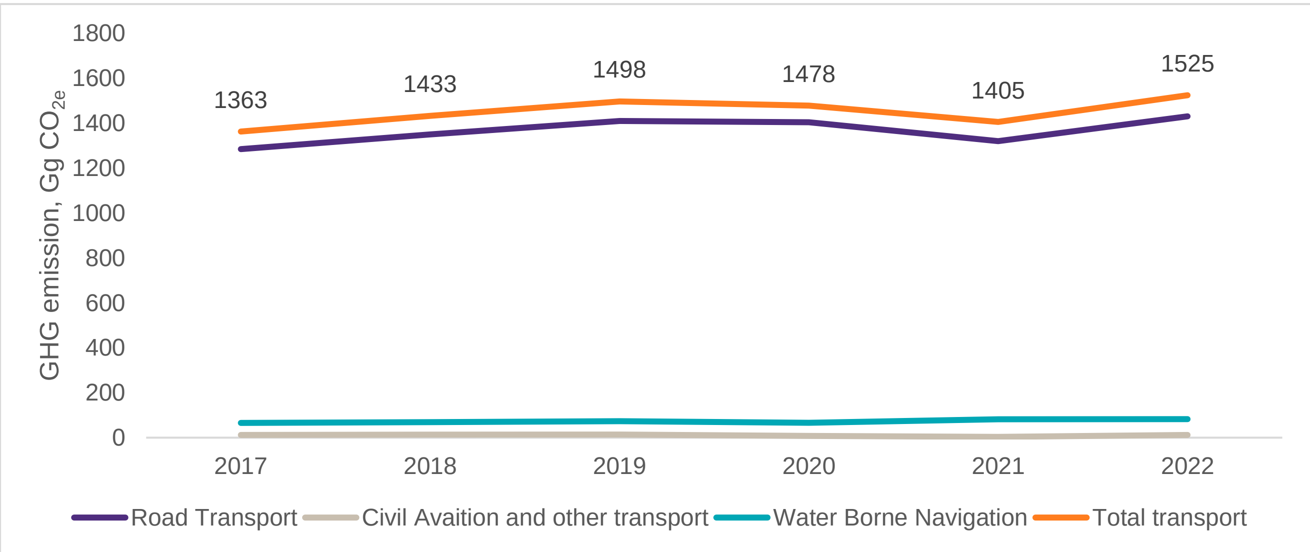


Table 42: Year wise and fuel wise GHG emission from energy industries (Gg CO_{2e})

Year	Liquified Petroleum Gas, Gg CO_{2e}	Diesel Oil, Gg CO_{2e}	Motor Gasoline, Gg CO_{2e}	Residual Fuel Oil, Gg CO_{2e}	Jet Kerosene, Gg CO_{2e}
2017	437	809	665	0	11
2018	437	862	700	2	11
2019	437	893	738	3	12
2020	437	886	731	4	7
2021	433	712	697	3	2
2022	538	769	751	6	9

3.4.4. Quality Control

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between EF values provided by institutional authorities and the default values proposed by the IPCC 2006 Guidelines for Energy Industries.
- Cross verification between country specific NCV provided by institutional authorities and the NCV range proposed by the IPCC 2006 Guidelines.
- Cross verification between the GHG emissions estimated in the current inventory for energy industries and the results obtained in the last reported national inventory of the RoM.

3.4.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the Transport category considering 2000 as base year, are given in the following table:

Table 43 Uncertainty Analysis of Transport Category (1A3) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A3aii - Domestic Aviation - Liquid Fuels	CO_2	5.00	4.17	6.51
1A3aii - Domestic Aviation - Liquid Fuels	CH_4	5.00	100.00	100.12
1A3aii - Domestic Aviation - Liquid Fuels	N_2O	5.00	150.00	150.08
1A3bi1 - Passenger cars with 3-way catalysts - Liquid Fuels	CO_2	5.00	3.07	5.87
1A3bi1 - Passenger cars with 3-way catalysts - Liquid Fuels	CH_4	5.00	244.69	244.74
1A3bi1 - Passenger cars with 3-way catalysts - Liquid Fuels	N_2O	5.00	209.94	210.00
1A3bii1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	CO_2	5.00	3.07	5.87
1A3bii1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	CH_4	5.00	244.69	244.74

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A3bii1 - Light-duty trucks with 3-way catalysts - Liquid Fuels	N_2O	5.00	209.94	210.00
1A3bii2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	CO_2	5.00	5.00	7.07
1A3bii2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	CH_4	5.00	25.00	25.50
1A3bii2 - Light-duty trucks without 3-way catalysts - Liquid Fuels	N_2O	5.00	60.00	60.21
1A3biii - Heavy-duty trucks and buses - Liquid Fuels	CO_2	5.00	5.00	7.07
1A3biii - Heavy-duty trucks and buses - Liquid Fuels	CH_4	5.00	5.00	7.07
1A3biii - Heavy-duty trucks and buses - Liquid Fuels	N_2O	5.00	5.00	7.07
1A3biv - Motorcycles - Liquid Fuels	CO_2	5.00	3.07	5.87
1A3biv - Motorcycles - Liquid Fuels	CH_4	5.00	244.69	244.74
1A3biv - Motorcycles - Liquid Fuels	N_2O	5.00	209.94	210.00
1A3dii - Domestic Water-borne Navigation - Liquid Fuels	CO_2	5.00	4.30	6.60
1A3dii - Domestic Water-borne Navigation - Liquid Fuels	CH_4	5.00	50.00	50.25
1A3dii - Domestic Water-borne Navigation - Liquid Fuels	N_2O	5.00	140.00	140.09

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 44.

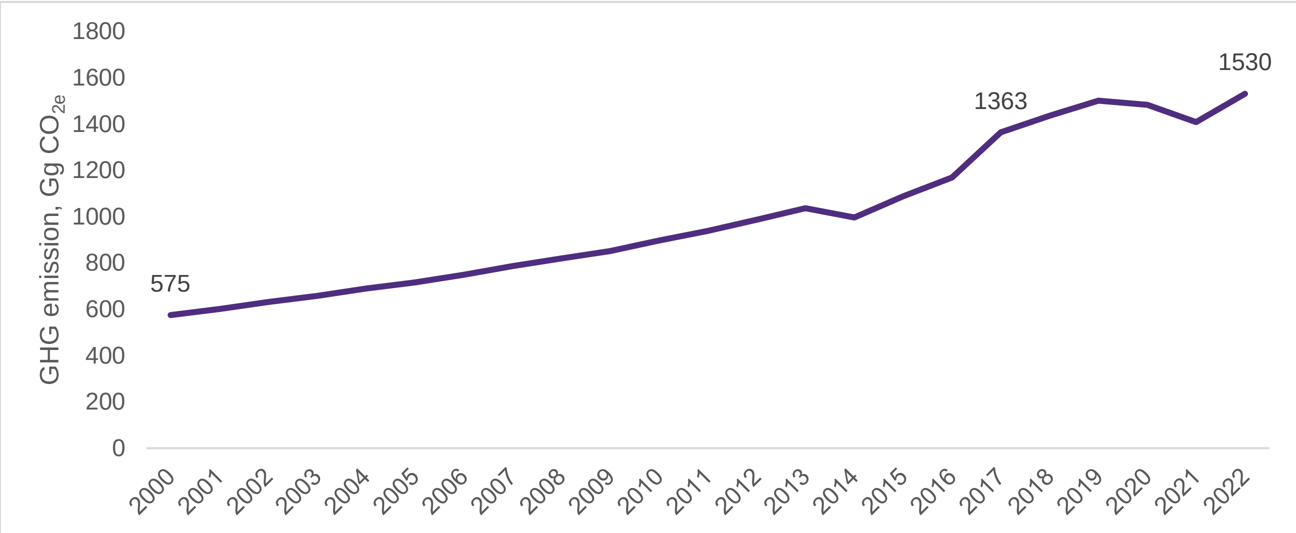
Table 44: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	575.12	574.78	-0.33	-0.06%
2001	600.65	600.30	-0.35	-0.06%
2002	631.06	630.69	-0.37	-0.06%
2003	657.55	657.16	-0.38	-0.06%
2004	689.47	689.07	-0.40	-0.06%
2005	715.93	715.51	-0.42	-0.06%
2006	748.79	748.35	-0.44	-0.06%
2007	786.44	785.98	-0.46	-0.06%

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2008	819.77	819.29	-0.48	-0.06%
2009	851.06	850.56	-0.50	-0.06%
2010	897.19	896.66	-0.52	-0.06%
2011	938.33	937.79	-0.55	-0.06%
2012	987.49	986.91	-0.58	-0.06%
2013	1037.50	1036.89	-0.61	-0.06%
2014	997.49	996.84	-0.65	-0.07%
2015	1087.81	1087.26	-0.55	-0.05%
2016	1169.70	1169.15	-0.54	-0.05%

The Figure 24 shows the GHG emission trend of energy industries from 2000 to 2022.

Figure 24: GHG emission trend from transport sector of RoM from 2000 to 2022



As seen from Figure 24, there has been an increase of 12.3% in emissions from transport sector from 2017 to 2022. Within transport sector, the civil aviation subsector recorded around 10% reduction in emissions while the road transport sub sector recorded 11% increase and water borne navigation recorded 34% increase from 2017 to 2022.

3.4.6. Planned Improvement

Island of Mauritius is currently in the process of developing Tier 2 activity data for the transport sector under a GEF Capacity Building initiative for Transparency. As part of this project, the Tier 2 activity data calculation methodology will be finalized for the Republic of Mauritius and a nationwide survey will be carried out to collect transport sector data.

3.5. Other sector (Category 1A4)

The Other Sector category involves 1A4a Commercial/Institutional sector, 1A4b Residential and 1A4c Agriculture/Forestry/Fishing, which is further sub-divided into 1A4cii Off-road Vehicles, Other Machinery and 1A4ciii Fishing (mobile combustion).

3.5.1. Background of the energy others sector in Mauritius

Commercial or institutional activities use fossil fuel such as LPG and non-fossil fuels such as Charcoal for the development of their activities. Residential sector use kerosene and LPG as fossil fuels and wood and charcoal as non-fossil fuels for cooking.

Agriculture/Forestry/Fishing category is divided into stationary and mobile combustion. Stationary combustion in this category is minimal and the mobile combustion uses diesel and gasoline as fossil fuels for field operations and fishing activities.

3.5.2. Methodology adopted for GHG emission calculation

The considered approach for the estimation of GHG Emissions for Other Sector, was a Tier 1 but using CS NCV wherever available. In this category, as mentioned in the previous section, fossil and non-fossil fuels are used in the combustion activities of this category. As reported in the 2006 IPCC Guidelines and the subsequent 2019 Refinement, CO_2 emissions from non-fossil fuels do not have to be accounted with the rest of CO_2 emissions from this category and should be accounted as CO_2 emissions from biomass and taken as a memo item. The non-CO_2 emissions from non-fossil fuels must be accounted in the national totals.

To obtain the results of the GHG emissions from each fuel type used in the energy combustion activities of energy other sectors of the country, each fuel's activity data (AD), NCV and Emission Factor (EF) have been entered in the 2006 IPCC Inventory Software for the obtention of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

3.5.2.1 Calculation

For the emission calculation, the equation 2.1 for stationary combustion from Chapter 2, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

Emission $_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$	=	Amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

For CO_2 it included carbon dioxide oxidation factor which is assumed to be 1. The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from energy other sector.

3.5.2.2 Activity Data

The activity data used for the estimation of GHG emissions for Energy Other Sectors has been obtained from the amount of fuel consumed for the Commercial/Institutional sector, Residential sector and Agriculture/Forestry/Fishing sector, obtained from Statistics Mauritius.

The activity data used for emission calculation in other categories from 2017 to 2022 is given in Table 45.

Table 45: Activity data for GHG emission calculation in other categories from 2017 to 2022 (Gg)

Year ↓ Fuel→	Liquified Petroleum Gas, Gg	Gas/Diesel Oil, Gg	Kerosene, Gg	Motor Gasoline, Gg	Charcoal, Gg	Wood, Gg
2017	66.184	4.242	0.063	11.87	0.508	13.442
2018	68.671	4.631	0.046	14.557	0.467	13.089
2019	74.448	4.445	0	13.885	0.414	10.12
2020	68.48	3.719	0	10.302	0.38	8.955
2021	74.015	3.444	0	9.182	0.478	8.904
2022	78.831	3.28	0	9.63	0.559	8.568

The AD was provided in terms of Gg and using the NCV for each fuel type, Gg was converted to TJ. The country specific NCV used in the national inventory are given in the following Table 46and default NCV used for Diesel is shown in Table 47.

Table 46: Country specific NCV of fuel used for GHG emission calculation (TJ/Gg)

Year ↓ Fuel→	Kerosene, TJ/Gg
2017	43.20
2018	43.20
2019	43.20
2020	43.20
2021	43.20
2022	43.20

Table 47: Default NCV for fuels as per IPCC Software (TJ/Gg)

Year ↓ Fuel→	Liquified Petroleum Gas, TJ/Gg	Gas/Diesel Oil, TJ/Gg	Motor Gasoline, TJ/Gg	Wood, TJ/Gg	Charcoal, TJ/Gg
2017	47,300	43,300	44,800	15,600	29,500
2018	47,300	43,300	44,800	15,600	29,500
2019	47,300	43,300	44,800	15,600	29,500
2020	47,300	43,300	44,800	15,600	29,500
2021	47,300	43,300	44,800	15,600	29,500
2022	47,300	43,300	44,800	15,600	29,500

3.5.2.3 Emission Factor

The Emission Factors used for the estimation of the GHG emissions of the energy industries are adopted from the default values proposed in the 2006 IPCC Guidelines, as shown in the Table 48 and Table 49.

Table 48: Emission factors used for GHG estimation in commercial/institutional establishments

IPCC Default emission factors for stationary combustion in commercial/institutional - Table 2.4, Chapter 2 Volume 2			
Fuel	**CO_2 emission factor, kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Liquified Petroleum Gas	63100	5	0.1
Charcoal	112000	200	1

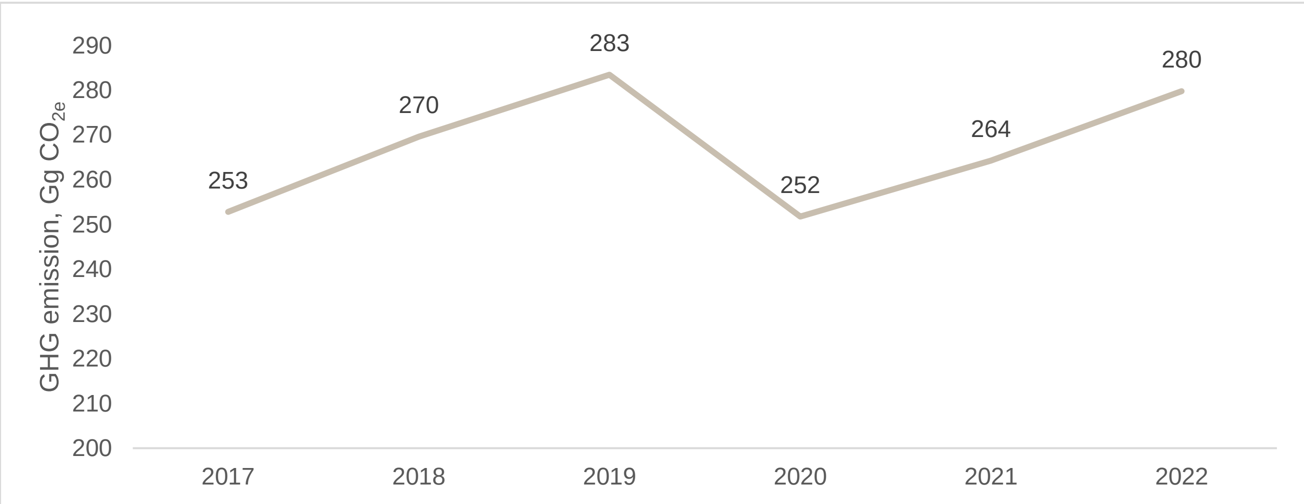
Table 49: Emission factors used for GHG estimation in residential, agricultural, fishing

IPCC Default emission factors for stationary combustion in residential, agricultural, fishing - Table 2.5, Chapter 2 Volume 2			
Fuel	**CO_2 emission factor, kg/TJ**	**CH_4 emission factor kg/TJ**	**N_2O emission factor kg/TJ**
Liquified Petroleum Gas	63100	5	0.1
Gas/Diesel Oil	74100	10	0.6
Kerosene	71900	10	0.6
Motor Gasoline	69300	10	0.6
Wood/Wood Waste	112000	300	4
Charcoal	112000	200	1

3.5.3. Results

The results of the GHG emission estimation for energy other sectors from 2017 to 2022 is shown in Figure 25.

Figure 25: GHG emission from energy other sectors from 2017 to 2022 (Gg CO_{2e}/year)



The year wise fuel wise GHG emissions from energy industries is given in Table 50.

Table 50: Year wise and fuel wise GHG emission from energy industries (Gg CO_{2e})

Year ↓ Fuel→	Liquified Petroleum Gas, Gg CO_{2e}	Gas/Diesel Oil, Gg CO_{2e}	Kerosene, Gg CO_{2e}	Motor Gasoline, Gg CO_{2e}	Charcoal, Gg CO_{2e}	Wood, Gg CO_{2e}	Total, Gg CO_{2e}
2017	198.06	13.69	0.20	37.09	1.77	1.98	252.78
2018	205.50	14.95	0.14	45.48	1.62	1.93	269.62
2019	222.79	14.35	0.00	43.38	1.44	1.49	283.45
2020	204.93	12.00	0.00	32.19	1.32	1.32	251.76
2021	221.49	11.12	0.00	28.69	1.66	1.31	264.27
2022	235.90	10.59	0.00	30.09	1.94	1.26	279.78

3.5.4. Quality Control

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between EF values provided by institutional authorities and the default values proposed by the IPCC 2006 Guidelines for Energy Industries.
- Cross verification between country specific NCV provided by institutional authorities and the NCV range proposed by the IPCC 2006 Guidelines.
- Cross verification between the GHG emissions estimated in the current inventory for energy industries and the results obtained in the last reported national inventory of the RoM.

3.5.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the other sector category considering 2000 as base year, are given in the following table:

Table 51: Uncertainty Analysis of the other sector category (1A4) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A4a – Commercial / Institutional - Liquid Fuels	CO_2	5.00	6.14	7.92
1A4a – Commercial / Institutional - Liquid Fuels	CH_4	5.00	200.00	200.06
1A4a – Commercial / Institutional - Liquid Fuels	N_2O	5.00	222.22	222.28
1A4a – Commercial / Institutional – Biomass	CO_2	5.00	18.69	19.35
1A4a – Commercial / Institutional – Biomass	CH_4	5.00	227.27	227.33
1A4a – Commercial / Institutional – Biomass	N_2O	5.00	297.73	297.77
1A4b - Residential - Liquid Fuels	CO_2	5.00	18.69	19.35
1A4b - Residential - Liquid Fuels	CH_4	5.00	245.45	245.51
1A4b - Residential - Liquid Fuels	N_2O	5.00	304.55	304.59

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A4b - Residential - Biomass	CO_2	5.00	18.69	19.35
1A4b - Residential - Biomass	CH_4	5.00	227.27	227.33
1A4b - Residential - Biomass	N_2O	5.00	297.73	297.77
1A4cii - Off-road Vehicles and Other Machinery - Liquid Fuels	CO_2	5.00	6.14	7.92
1A4cii - Off-road Vehicles and Other Machinery - Liquid Fuels	CH_4	5.00	200.00	200.06
1A4cii - Off-road Vehicles and Other Machinery - Liquid Fuels	N_2O	5.00	236.36	236.42
1A4ciii - Fishing (mobile combustion) - Liquid Fuels	CO_2	5.00	6.14	7.92
1A4ciii - Fishing (mobile combustion) - Liquid Fuels	CH_4	5.00	200.00	200.06
1A4ciii - Fishing (mobile combustion) - Liquid Fuels	N_2O	5.00	236.36	236.42

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 52.

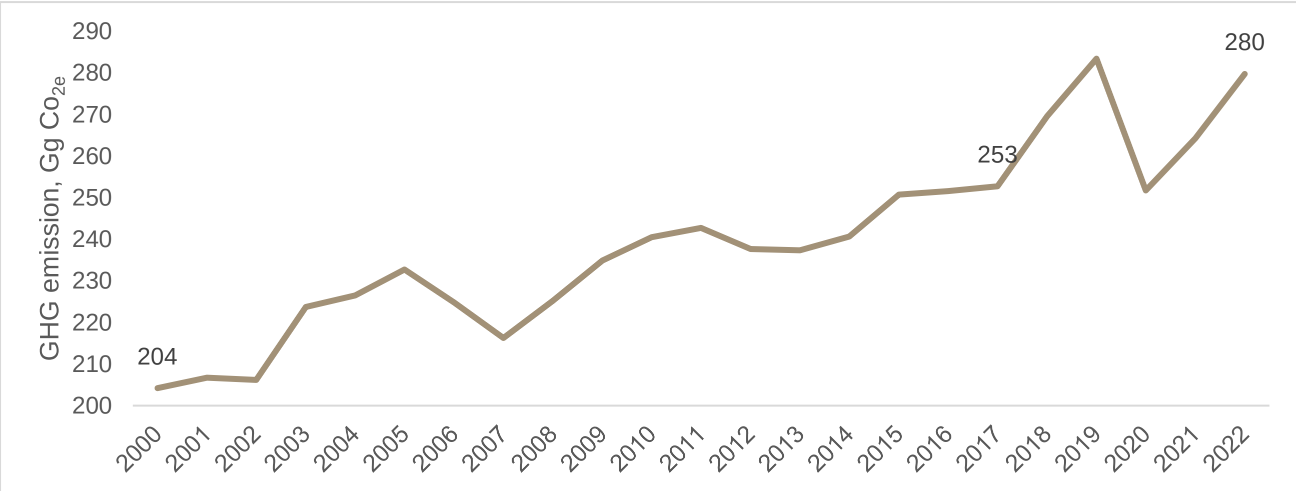
Table 52: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5, GWP Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	204.239763	204.2112	-0.03	-0.01%
2001	206.741148	206.7004	-0.04	-0.02%
2002	206.1163	206.172	0.06	0.03%
2003	223.743984	223.7374	-0.01	0.00%
2004	226.475486	226.4707	0.00	0.00%
2005	232.695183	232.7688	0.07	0.03%
2006	224.725368	224.8109	0.09	0.04%
2007	216.095411	216.2466	0.15	0.07%
2008	224.873274	225.2021	0.33	0.15%
2009	234.51178	234.8738	0.36	0.15%
2010	240.187781	240.5083	0.32	0.13%
2011	242.418235	242.7593	0.34	0.14%
2012	237.282783	237.6438	0.36	0.15%
2013	237.024826	237.3743	0.35	0.15%

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5, GWP Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2014	240.321619	240.6692	0.35	0.14%
2015	250.427674	250.729	0.30	0.12%
2016	251.232555	251.5764	0.34	0.14%

The Figure 26 shows the GHG emission trend of energy other sectors from 2000 to 2022.

Figure 26: GHG emission trend from energy other sectors of RoM from 2000 to 2022



As seen from Figure 26, there has been an increase of 11% in emissions from energy other sectors from 2017 to 2022, which is due to the increase in LPG and charcoal consumption in residential and commercial and industrial sectors.

3.5.6. Planned Improvement:

A potential improvement regarding this category could be encouraging the suppliers to keep track of fuel sales for monitoring the GHG emissions. The fossil fuels consumed in this category could be improved by having country specific NCV values for LPG and charcoal.

3.6. Non-Specified Sector (Category 1A5)

The Other Sector category considers the non-specified fuel consumptions within the Energy sector in the country. These fuel consumptions are consumed in stationary combustion (1A5a).

3.6.1. Background of the energy non-specific sector in Mauritius

Commercial or institutional activities use fossil fuel such as LPG and non-fossil fuels such as Charcoal for the development of their activities. Residential sector use kerosene and LPG as fossil fuels and wood and charcoal as non-fossil fuels for cooking.

3.6.2. Methodology adopted for GHG emission calculation:

The considered approach for the estimation of GHG Emissions for Non-Specified Sector, was a Tier 1 but using CS NCV.

3.6.2.1 Calculation

For the emission calculation, the equation 2.1 for stationary combustion from Chapter 2, Volume 2 of the 2006 IPCC Guidelines was used.

$$Emissions_{GHG,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,fuel}$$

Where:

Emission $_{GHG,fuel}$	=	Emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$	=	Amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$	=	Default emission factor for a given GHG by type of fuel (kg gas/TJ).

For CO_2 it included carbon dioxide oxidation factor which is assumed to be 1. The gas wise CO_{2e} emissions for all fuel types was summed up to arrive at the total GHG emissions from energy non-specific sector.

3.6.2.2 Activity Data

The activity data used for the estimation of GHG emissions for non-specified sector has been obtained from Energy and Waster Statistic published annually for the year 2017. From 2018 onwards no LPG consumption is mentioned in the Energy and Water Statistics. As such data from 2018 till 2022 was estimated considering the growth rate to be same as manufacturing sector consumption.

The activity data used for emission calculation in non-specified sector from 2017 to 2022 is given in Table 53.

Table 53: Activity data for GHG emission calculation in non-specified sector from 2017 to 2022 (Gg)

Fuel consumed	2017	2018	2019	2020	2021	2022
Liquified Petroleum Gas, Gg	0.272	0.275	0.279	0.283	0.286	0.290

3.6.2.3 Emission Factor

The Emission Factors used for the estimation of the GHG emissions of the energy industries are adopted from the default values proposed in the 2006 IPCC Guidelines, as shown in the Table 54.

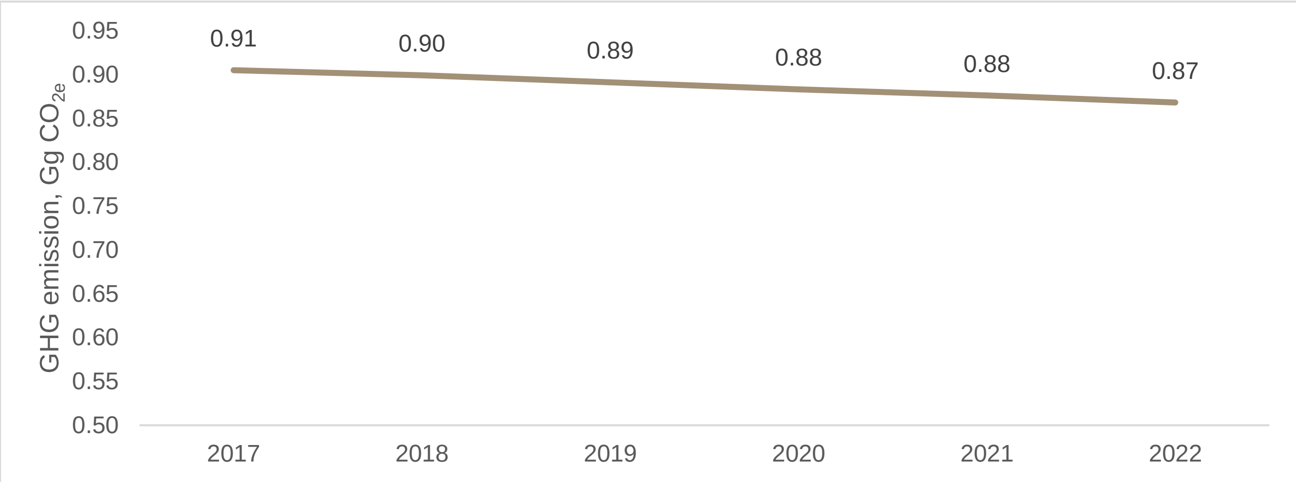
Table 54: Emission factors used for GHG estimation in non-specific sector

IPCC Default emission factors for stationary combustion in non-specific - Table 2.3, Chapter 2 Volume 2			
Fuel	CO_2 emission factor, kg/TJ	CH_4 emission factor kg/TJ	N_2O emission factor kg/TJ
Liquified Petroleum Gas	63100	1	0.1

3.6.3. Results

The results of the GHG emission estimation for energy other sectors from 2017 to 2022 is shown in Figure 27 .

Figure 27 GHG emission estimation for energy non-specific sector from 2017 to 2022



3.6.4. Quality Control

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between EF values provided by institutional authorities and the default values proposed by the IPCC 2006 Guidelines for Energy Industries.
- Cross verification between country specific NCV provided by institutional authorities and the NCV range proposed by the IPCC 2006 Guidelines.
- Cross verification between the GHG emissions estimated in the current inventory for energy industries and the results obtained in the last reported national inventory of the RoM.

3.6.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the non-specified category considering 2000 as base year, are given in the following table:

Table 55: Uncertainty Analysis of the Non-Specified Category (1A5) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
1A5a - Stationary - Liquid Fuels	CO_2	5.00	5.00	7.07
1A5a - Stationary - Liquid Fuels	CH_4	5.00	5.00	7.07
1A5a - Stationary - Liquid Fuels	N_2O	5.00	5.00	7.07

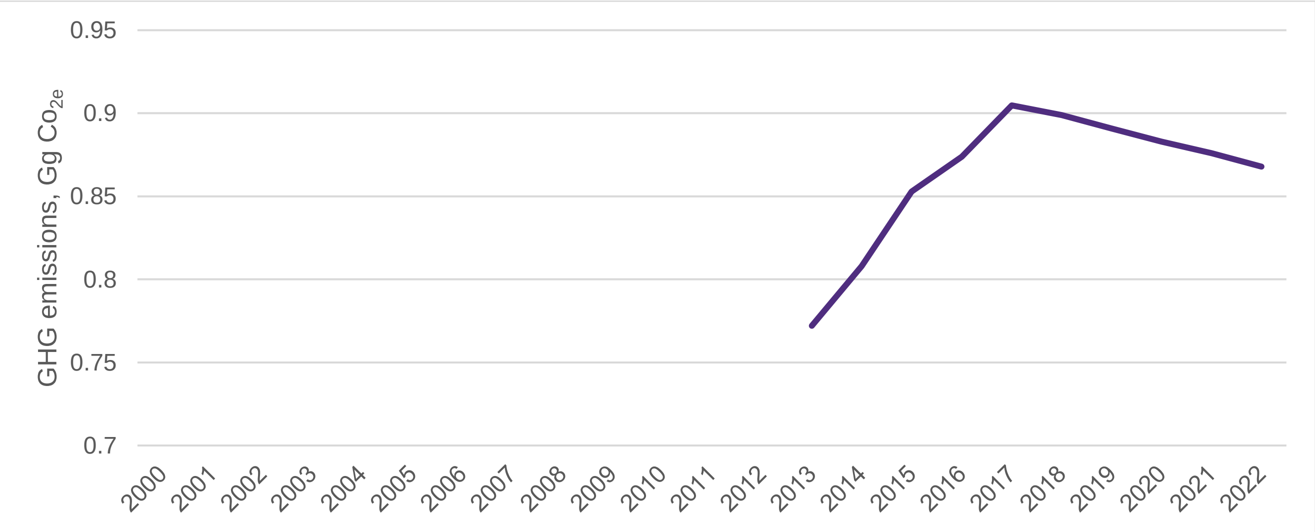
The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 56.

Table 56: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5, GWP Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	NO	NO	0.00	NO
2001	NO	NO	0.00	NO
2002	NO	NO	0.00	NO
2003	NO	NO	0.00	NO
2004	NO	NO	0.00	NO
2005	NO	NO	0.00	NO
2006	NO	NO	0.00	NO
2007	NO	NO	0.00	NO
2008	NO	NO	0.00	NO
2009	NO	NO	0.00	NO
2010	NO	NO	0.00	NO
2011	NO	NO	0.00	NO
2012	NO	NO	0.00	NO
2013	0.7716942	0.772066	0.00	0.05%
2014	0.80758696	0.807976	0.00	0.05%
2015	0.8524529	0.852864	0.00	0.05%
2016	0.87339034	0.873812	0.00	0.05%

The Figure 28 shows the GHG emission trend of energy other sectors from 2000 to 2022.

Figure 28: GHG emission trend from non-specified energy sector of RoM from 2000 to 2022



3.6.6. Planned Improvement

As this is a non-key category, there are no planned improvements.

Chapter 4: Industrial Processes and Product Use (IPPU)

4.1 Overview

The IPPU sector consists of industrial processes, solvent use, and the use of alternatives to ozone-depleting substances (ODS). The primary source of pollution is the use of products as substitutes for ODS. For example, HFCs are used as alternatives to ODS in various product applications such as refrigeration and air conditioning, resulting in significant GHG emissions throughout their lifecycle. Other sources of emissions include releases from industrial processes that chemically or physically transform materials. For instance, the production of iron and steel results in GHG emissions during its industrial process. Non-energy products from fuels and solvent use also contribute to GHG emissions, which are reported in this category.

This category represents GHG emissions from various industrial activities and the use of several products. In the Republic of Mauritius (RoM), category 2F (Product Uses as Substitutes for Ozone Depleting Substances), sub-category 2C1 (Iron and Steel production under Metal Industry), and category 2D (Non-Energy Products from Fuels and Solvent Use) have been considered. In previous National Inventory Report, emissions from lime production were also reported. However, lime production has been stopped since 2014.

4.1.1 General Methodology

The table below outlines the methodology for estimating GHG emissions in the IPPU sector. It includes details on the tier levels applied to each IPPU sector category, the conversion factors used, and the sources of activity data utilized in developing the National Inventory Report.

Table 57: Overview of methodologies and activity data under IPPU Sector

<table>
<tr><th>Category</th><th>Activity Data</th><th>Emission Factor</th><th>Activity Data Source</th></tr>
<tr><td colspan="4">2.C. Metal Industry</td></tr>
<tr><td>2.C.1. Iron and Steel production</td><td>T1</td><td>D</td><td>Projected production trend as per Index of Industrial Production (IIP) by Statistics Mauritius</td></tr>
<tr><td colspan="4">2.D. Non-Energy Products from Fuels and Solvent Use</td></tr>
<tr><td>2.D.1 Lubricant use</td><td>T1</td><td>D</td><td rowspan="2">Consumption data from Statistics Mauritius (Import-Export) for 2005 to 2022, and extrapolated data for 2000 to 2004</td></tr>
<tr><td>2.D.2 Paraffin wax use</td><td>T1</td><td>D</td></tr>
<tr><td colspan="4">2.F. Product Uses as Substitutes for Ozone Depleting Substances (ODS)</td></tr>
<tr><td colspan="4">2.F.1. Refrigeration and Air Conditioning</td></tr>
<tr><td>2.F.1.a. Refrigeration and Stationary Air Conditioning</td><td>T1</td><td>D</td><td rowspan="2">Consumption data provided by National Ozone Unit, Mauritius</td></tr>
<tr><td>2.F.1.b. Mobile Air Conditioning</td><td>T1</td><td>D</td></tr>
</table>

T1: Tier 1; T2: Tier 2; D: Default; CS: Country Specific; NO: Not Occurring; NA: Not Applicable; NE: Not Estimated.

Detailed methodology for each sub-category is given in specific sub-sections.

4.2 Metal Industry - Iron and Steel production (Category 2.C.1)

In category 2C, only iron and steel manufacturing (2C1) were occurring in the Republic of Mauritius (RoM). Hence the emissions are reported accordingly.

4.2.1 Background of the Iron and Steel Production

In the Republic of Mauritius (RoM), iron and steel production rely entirely on recycling ferrous scrap metals. The process begins with the segregation of scrap metals using magnets in a designated area. These metals are then transported to a furnace for melting. To purify the molten metal, high-quality fluxes, which are imported by the manufacturer, are added. This process results in the production of high-strength, superior-quality steel ingots. These ingots serve as the raw material for the steel rolling mill, where they are ultimately transformed into steel construction bars.

4.2.2 Methodology adopted for GHG emission calculation

The emissions per unit of steel production can vary significantly based on the production method used. The 2006 IPCC Guidelines recommend determining the proportion of steel produced by different steel-making processes. For estimating emissions from iron and steel production, the Tier 1 approach outlined in the 2006 IPCC Guidelines was adopted. This methodology involves calculating GHG emissions by multiplying the activity data (AD) by the appropriate emission factor (EF).

$$Emissions = Activity\ Data \times Emission\ Factor$$

To standardize GHG emissions, the IPCC recommends using Global Warming Potentials (GWP) to convert emissions of gases other than CO_2 into CO_2 equivalents (CO_{2e}). The GWP values applied in the current inventory are those from the Fifth Assessment Report (AR5). These values are detailed in the following table for each greenhouse gas reported in the National Inventory.

4.2.3 Calculation

For the emission calculation, the equation 4.4 from Chapter 4, Volume 3 of the 2006 IPCC Guidelines was used.

$$CO2\ Emissions_{non-energy} = Iron\ \&\ Steel\ Production \times Emission\ Factor_{CO2,GAF}$$

Where:

CO_2 Emissions$_{non\text{-}energy}$	=	*Total CO_2 Emissions, tonne CO_2*
Iron & Steel Production	=	*Annual production of iron & steel, tonne*
Emission Factor $_{CO2,GAF}$	=	*Global average emission factor as per table 4.1, Chapter 4, Volume 3 of the 2006 IPCC Guidelines, tonne CO_2 per tonne of steel produced*

Using the above equation, CO_2 emissions were calculated for iron and steel production.

4.2.4 Activity Data

Due to non-availability of activity data with relevant Ministry, projections for Iron & Steel Production trend were done as per Index of Industrial Production (IIP), published annually by Statistics Mauritius under the aegis of the Ministry of Finance, Economic Planning and Development. Annual production of 2013 was considered as reported in previous National Inventory Report. IIP for Basic metals & fabricated metals was applied to calculate the production from 2017 – 2022 taking reference from annual production in year 2013.

The activity data used for GHG emissions calculation from Iron & Steel production is shown in Table 58.

Table 58: Activity data for GHG emission calculation from Iron & Steel production from 2017 to 2022

Category	Unit	2013	2017	2018	2019	2020	2021	2022
		IIP Base 2013			IIP Base 2018			
IIP for Basic Metals & fabricated metals	-	100	94.8	89.9	103.9	87.2	108.3	124.3
Annual Production	ton	26700	25312	24003	24942	20930	25997	29841

The Emission Factor used for the estimation of the GHG emissions of the Iron & Steel Production is considered from the default values proposed in the 2006 IPCC Guidelines, as shown in the Table 59.

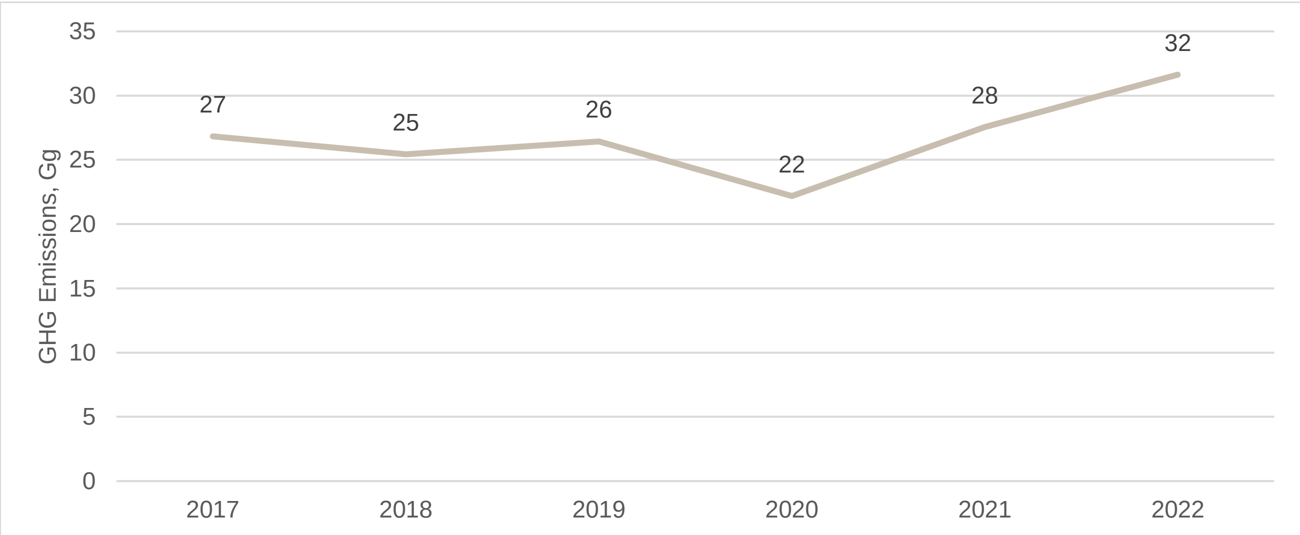
Table 59: Emission factor used for GHG estimation for Iron & Steel Production

IPCC Default emission factors for Iron & Steel Production- Table 4.1, Chapter 4 Volume 3			
Production Process	**CO_2 emission factor,** tonne CO_2 per tonne of steel produced	**CH_4 emission factor**	**N_2O emission factor**
Global Average Factor (65% BOF, 30% EAF, 5% OHF)	1.06	-	-
BOF: Basic Oxygen Furnace, EAF: Electric Arc Furnace, OHF: Open Hearth Furnace			

4.2.5 Results

The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 29.

Figure 29: GHG emission from Iron & Steel Production from 2017 to 2022 (Gg CO_{2e}/year)



The year wise GHG emissions from Iron & Steel Production is given in Figure 30.

Figure 30: Year wise GHG emission from Iron & Steel production (Gg CO_{2e})

Category ↓ / Year→	2017	2018	2019	2020	2021	2022
GHG emission from Iron & Steel production, Gg CO_{2e}	26.83	25.44	26.44	22.19	27.56	31.63

4.2.6 Quality Control

The activity data for Iron & Steel Production has been projected as per Index of Industrial Production (IIP), published annually by Statistics Mauritius. Annual production of 2013 was considered as reported in previous National Inventory Report. For better accuracy, IIP for manufacturing subsector of Basic metals & fabricated metals was applied to calculate the production from 2017 – 2022 taking reference from annual production in year 2013.

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification of the projected production trend as per IIP released by Statistics Mauritius and historical production pattern
- Cross verification between the GHG emissions estimated in the current inventory and the results obtained in the last reported national inventory of the RoM.

4.2.7 Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the Metal Industry sector sub-category are given in Table 60 considering 2000 as base year:

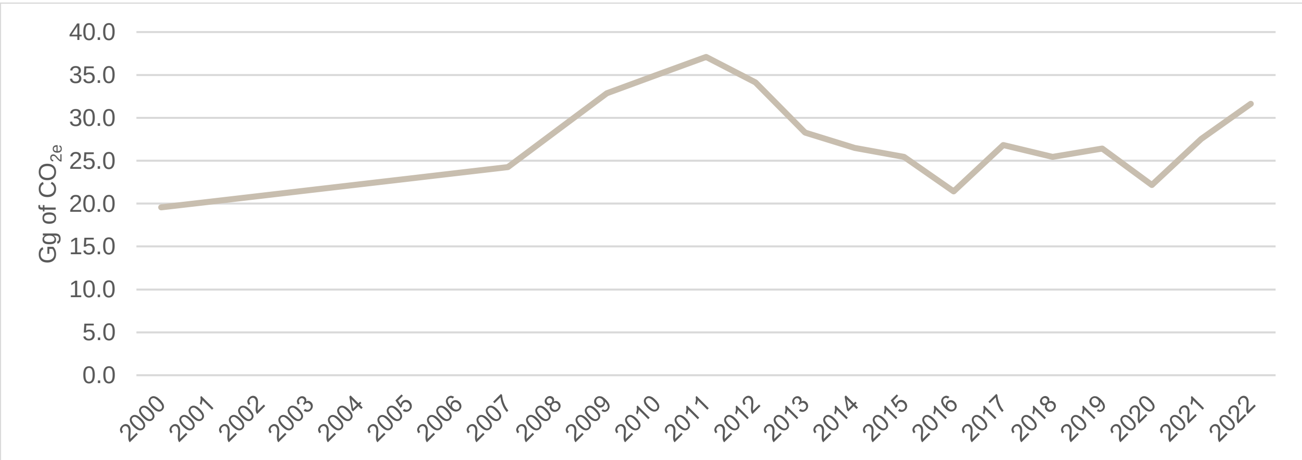
Table 60: Uncertainty Analysis of Iron and Steel Production category (2.C.1) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
2.C.1 - Iron and Steel Production	CO_2	10.00	0.00	10.00

The previous inventory considered Global Warming Potential (GWP) of CH4 and N2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4, and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values.

However, major emissions are through CO_2 released during the process and hence there will be no impact on timeseries calculations. Figure 31 shows the GHG emission trend from Iron & Steel Production from 2000 to 2022.

Figure 31: GHG emission trend from Iron & Steel Production in RoM from 2000 to 2022



As seen from Figure 31, there has been reduction in GHG emissions from 2016 to 2020, followed by increasing trend in 2021 and 2022.

4.2.8 Planned Improvement

To enhance the accuracy of the inventory, the country is focusing on gathering comprehensive information about the technologies used by each industry. As part of this effort, activity data should be collected and categorized by each specific technology. The Republic of Mauritius (RoM) will continue to work on obtaining detailed plant-level information annually.

4.3 Non-Energy Products from Fuels and Solvent Use (Category 2D)

In category 2D, emissions from lubricant use (2D1) and paraffin wax use (2D2) are reported in the Republic of Mauritius (RoM). While trade data is available for bitumen/asphalt and solvents, the lack of application data prevents the use of the IPCC's suggested methods.

4.3.1 Background of Non-Energy Products from Fuels and Solvent Use

According to the 2006 IPCC Guidelines, the products covered include lubricants, paraffin waxes, bitumen/asphalt, and solvents. Statistics Mauritius provides data on the import and export of these materials based on various Harmonized System (HS) Codes. Based upon data availability, emissions by lubricant and paraffin wax use are being reported in this inventory report.

Lubricants are primarily used in industrial and transportation applications, most commonly as engine lubricants. Their emissions should be considered non-combustion emissions within the IPPU sector. The use of lubricants can result in CO_2 emissions. Paraffin wax is mostly used in candles, corrugated boxes, paper coating, board sizing, adhesives, food production, and packaging. Emissions from the use of waxes primarily occur when the waxes or their derivatives are combusted during use.

4.3.2 Methodology adopted for GHG emission calculation

For estimating emissions from iron and steel production, the Tier 1 approach outlined in the 2006 IPCC Guidelines was adopted. This methodology involves calculating GHG emissions by multiplying the lubricant/paraffin wax consumption data by the carbon content, Oxidized During Use (ODU) factor and mass ratio. Since a Tier 1 approach has been used, the carbon content and ODU factor values are obtained from the default values proposed in the 2006 IPCC Guidelines.

4.3.3 Calculation

For the emission calculation, the equation 5.2 and 5.3 from Chapter 5, Volume 3 of the 2006 IPCC Guidelines were used.

For Lubricants:

$$CO2\ Emissions_{Lubricant} = LC \times CC_{Lubricant} \times ODU_{Lubricant} \times 44/12$$

Where:

CO2 Emissions $_{Lubricant}$	=	Total CO_2 Emissions by lubricant use, tonne CO_2
LC	=	total lubricant consumption, TJ
CC $_{Lubricant}$	=	carbon content of lubricants (default), tonne C/TJ (= kg C/GJ)
ODU $_{Lubricant}$	=	ODU factor (based on default composition of oil and grease)
44/12	=	mass ratio of CO_2/C

For Paraffin Wax Use:

$$CO2\ Emissions_{Wax} = PW \times CC_{Lubricant} \times ODU_{Lubricant} \times 44/12$$

Where:

$CO2\ Emissions_{Wax}$	=	Total CO_2 Emissions by lubricant use, tonne CO_2
PW	=	total wax consumption, TJ
CC_{Wax}	=	carbon content of paraffin wax (default), tonne C/TJ
ODU_{Wax}	=	ODU factor for paraffin wax
44/12	=	mass ratio of CO_2/C

Using the above equation, CO_2 emissions were calculated for lubricant and paraffin wax use.

4.3.4 Activity Data

Statistics Mauritius provides annual data on the import and export of these materials based on various Harmonized System (HS) Codes. The consumption data has been extracted from trade statistics, and the HS codes were further validated with Statistics Mauritius. In earlier inventory, IEA statistics were used for non-energy use of fuel. However, since data bifurcation based on various lubricants/ solvents is now available, time series corrections are being applied to previous data as well.

The activity data used for non-energy products from fuels and solvent use (Lubricant and Paraffin wax use) is shown in Table 61.

Table 61: Activity data for GHG emission calculation from lubricants and paraffin wax use from 2017 to 2022

Activity data	Unit ↓ Year →	2017	2018	2019	2020	2021	2022
2.D.1 Lubricant use	ton	7932541	8002734	8628730	6939883	7153597	8593102
	TJ	319	322	347	279	288	345
2.D.2 Paraffin wax use	ton	330295	177935	159914	191549	131850	254893
	TJ	13	7	6	8	5	10

The Emission Factor used for the estimation of the GHG emissions of the Iron & Steel Production is considered from the default values proposed in the 2006 IPCC Guidelines, as shown in the Table 62.

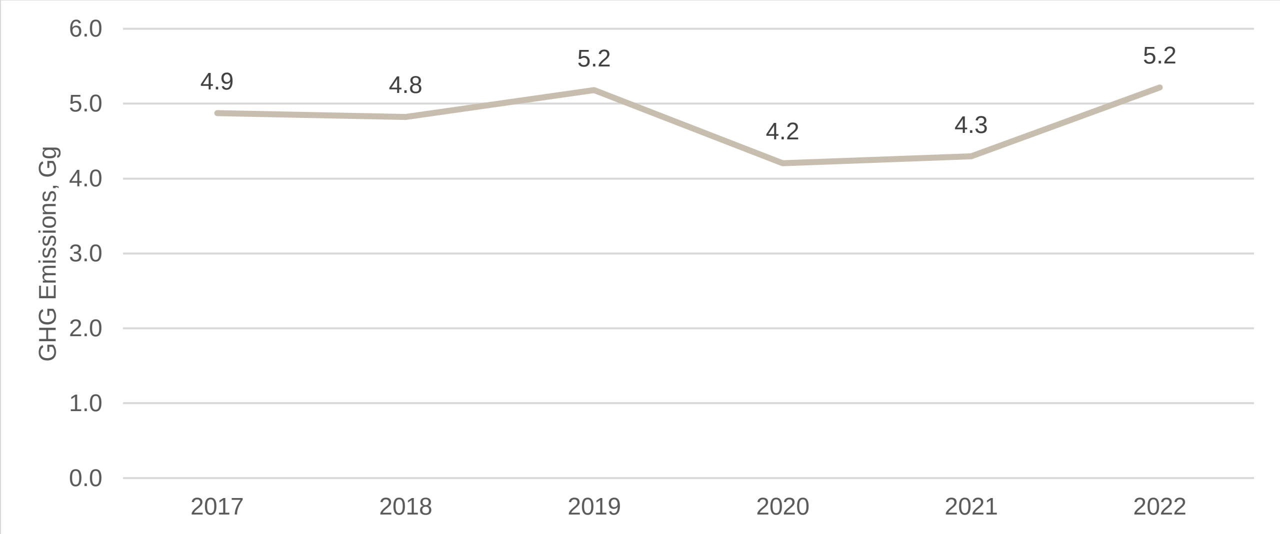
Table 62: Conversion and emission factor used for GHG estimation for lubricants and paraffin wax use

2.D.1 Parameters for Lubricant Use	Unit	Value
Conversion factor Gg to TJ	Tj/Gg	40.20
Carbon content of lubricant type	tC/TJ	20.00
Conversion factor for C to CO_2	tCO2/tC	3.67
Oxidised During Use (ODU) factor	-	0.20
Emission Factor for CO_2	tCO2/TJ	14.67
Emission Factor for CH_4	-	
Emission Factor for N_2O	-	

4.3.5 Results

The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 32.

Figure 32: GHG emission from lubricant and paraffin wax use from 2017 to 2022 (Gg CO2e/year)



The year wise GHG emissions from lubricant and paraffin wax use is given in table below.

Table 63: Year wise GHG emission from lubricant and paraffin wax use (Gg CO2e)

Category ↓ / Year→	2017	2018	2019	2020	2021	2022
GHG emission from lubricant and paraffin wax use, Gg CO_{2e}	26.83	25.44	26.44	22.19	27.56	31.63

4.3.6 Quality Control

The activity data for lubricant and paraffin wax use has been taken from external trade statistics published annually by Statistics Mauritius. HS codes for these materials were further validated with Statistics Mauritius.

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification of the HS Codes of lubricant and paraffin waxes with Statistics Mauritius

4.3.7 Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the Non-Energy Products from Fuels and Solvent Use sub-category are given in the following table considering 2000 as base year:

Table 64: Uncertainty Analysis of Non-Energy Products from Fuels and Solvent Use (2.D.1) for the period 2000 – 2022

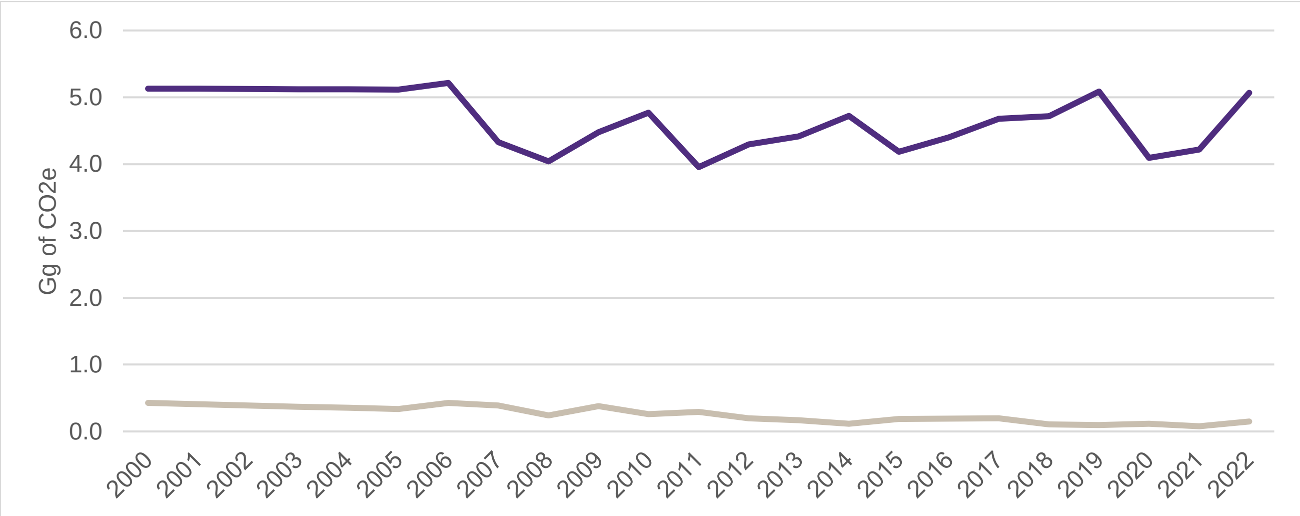
Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
2.D.1 - Non-Energy Products from Fuels and Solvent Use	CO_2	10.00	0.00	10.00

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4, and N_2O in AR2 and AR5 is given in *Table 22*. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values.

Major emissions under this sub-category are through CO_2 released during the process and hence there will be no impact of GWP Change on timeseries calculations. In the previous National Inventory Report, lubricant use data from 2010 – 2016 was reported from consumption data for non-energy use of fuel by International Energy Agency (IEA). However, more accurate data has been extracted from Statistics Mauritius and reported in this NIR, applying the entire timeseries correction. Import-export data has been extracted from 2005 to 2022 and data is extrapolated for 2000 to 2004.

The Figure 33 shows the GHG emission trend from Iron & Steel Production from 2000 to 2022.

Figure 33: GHG emission trend from lubricant and paraffin wax use from 2000 to 2022



As seen from Figure 33, there has been reduction in GHG emissions from 2019 to 2021, followed by increasing trend after 2021.

4.3.8 Planned Improvement

To improve accuracy of the inventory and reporting, the country will work to collate activity wise utilization data for these products.

4.4 Product Uses as Substitutes for Ozone Depleting Substances (Category 2F)

Hydrofluorocarbons (HFCs) and, to a very limited extent, perfluorocarbons (PFCs), are being used as alternatives to ozone-depleting substances (ODS) that are being phased out under the Montreal Protocol. In Mauritius, these substitutes are primarily used in refrigeration and air conditioning systems, as well as in fire extinguishers. These appliances and refrigerants are not produced locally and are all imported. Therefore, this sub-sector will focus on emissions from the use of these appliances.

This sector is divided into two sub-categories: 2F1a Refrigeration and Stationary Air Conditioning, and 2F1b Mobile Air Conditioning.

4.4.1 Background of Product Uses as Substitutes for Ozone Depleting Substances

Application areas of HFCs and PFCs include refrigeration and air conditioning, fire suppression and explosion protection, aerosols, solvent cleaning, foam blowing, and other applications. HFCs and PFCs are not controlled by the Montreal Protocol because they do not contribute to the depletion of the stratospheric ozone layer. HFCs are chemicals containing only hydrogen, carbon, and fluorine. HFCs and PFCs have high global warming potentials (GWPs) and, in the case of PFCs, long atmospheric residence times. Therefore, it is essential to know or accurately estimate the consumption patterns of individual gases to assess their contribution to global warming effectively.

In the Republic of Mauritius (RoM), SF_6 is mostly used in breakers, which are categorized as Sealed Pressure Systems or Sealed-for-life Equipment. This type of equipment does not require any refilling with gas during its lifetime and generally contains less than 5 kg of gas per functional unit. Emissions of SF_6 have therefore been assumed to be insignificant, as the breakers have been installed since the 1990s and have not exceeded their lifetime during the inventory period.

4.4.2 Methodology adopted for GHG emission calculation

According to the 2006 IPCC Guidelines, the Tier 1a approach (emission-factor approach) relies on the availability of basic activity data at the application level, rather than at the level of equipment or product type. For GHG emission estimations, these guidelines state that, despite the time series being from 2000 to 2022, data in this category should be introduced from 1990, if applicable.

4.4.3 Calculation

For the emission calculation, net consumption values for each HFC are used to calculate annual emissions for applications exhibiting prompt emissions as follows

$$CO2\ Emissions_{ODS} = (Net\ Consumption + Total\ Banked\ Chemical) \times EF_{Composite}$$

Where:

$CO2\ Emissions_{ODS}$	=	Total CO_2 Emissions by use of ODS substitutes, tonne CO_2
Net Consumption	=	Net consumption for the application
Total banked chemical	=	Bank of the chemical for the application
$EF_{Composite}$	=	Composite emission factor for the application

Using the above equation, CO_2 emissions were calculated for lubricant and paraffin wax use.

4.4.4 Activity Data

The activity data presented in the table below were obtained from the National Ozone Unit of the Ministry of Environment, Solid Waste Management, and Climate Change. This data represents the net consumption of ODS in the country, calculated as imports minus exports, given that there is no production of these substances within the country.

The activity data used for Product Uses as Substitutes for Ozone Depleting Substances) is shown in Table 65 and Table 66.

Table 65: Net Consumption (ton) of ODS Substitute in RoM for Refrigeration and Stationary Air Conditioning (2017 – 2022)

Year	HFC-23	HFC-32	HFC-125	HFC-134a	HFC-143a	HFC-227a
	ton	ton	ton	ton	ton	ton
2017	0.085	24.91	68.53	42.13	48.4	0
2018	0.89	33.18	64.99	30.34	35.82	0.06
2019	1.7	32.72	41.12	35.53	47.87	0

Year	HFC-23	HFC-32	HFC-125	HFC-134a	HFC-143a	HFC-227a
	ton	ton	ton	ton	ton	ton
2020	0.88	29.02	63.66	42,48	39.42	0
2021	0.045	24.19	44.27	31.5	23.55	0
2022	2.03	29.62	78.41	27.84	60.21	0

Table 66: Net Consumption (ton) of ODS Substitute in RoM for Mobile Air Conditioning (2017 – 2022)

Year	HFC-134a
	ton
2017	8.63
2018	6.21
2019	7.28
2020	7.4
2021	6.45
2022	5.7
2023	12.87

A composite emission factor is required to complete a Tier 1 method, as well as some necessary parameters. All these parameters and factors are estimated from the default factors proposed in the 7.5.2.1 section of 2006 IPCC Guidelines.

Table 67: Emission factor and other factors used for emission calculation by use of ODS Substitutes

Parameters	Unit	Value
Lifetime	years	15
Emission Factor (EF)	%	15%
Destruction	%	25%

Table 68: Introduction year of various ODS Substitutes

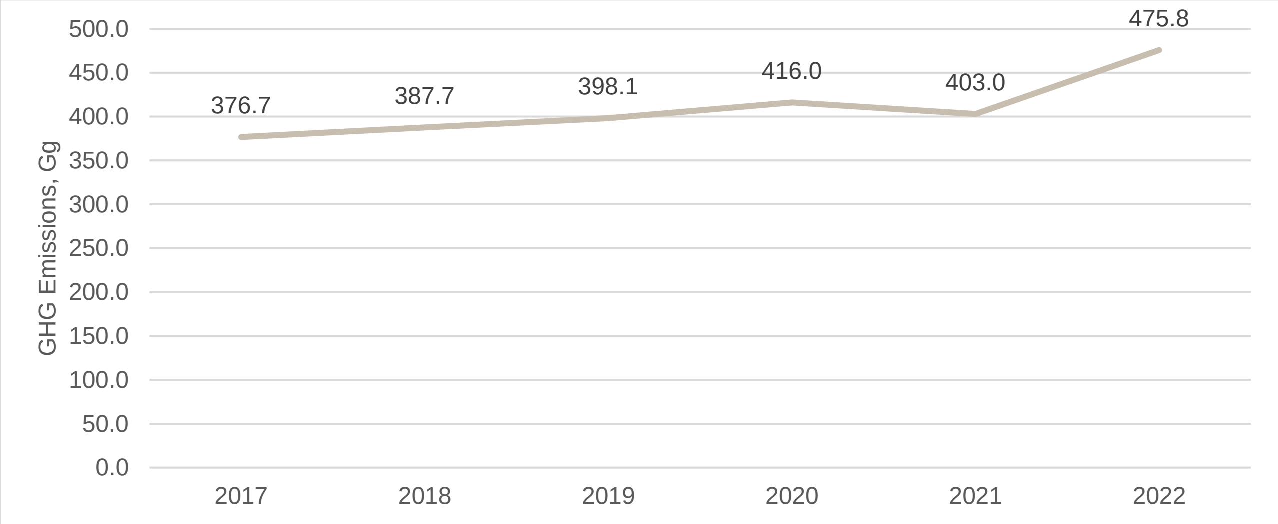
2.F.1.b - Refrigerants	Intro year
HFC-23	2007
HFC-32	1990
HFC-125	1990
HFC-134a	1990
HFC-143a	1990
HFC-227ea	2013

2.F.1.b - Refrigerants	Intro year
HFC-134a	2000

4.4.5 Results

The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 34.

Figure 34: GHG emission use of ODS Substitutes from 2017 to 2022 (Gg CO2e/year)



The year wise GHG emissions from use of ODS Substitutes is given in Table 69.

Table 69: Year wise and HFC wise GHG emission from lubricant and paraffin wax use (Gg CO_{2e})

Category ↓ / Year→	2017	2018	2019	2020	2021	2022
2.F.1.a. Refrigeration and stationary air conditioning, Gg CO2e						
HFC-23	1.0	2.5	5.3	6.1	5.3	9.6
HFC-32	8.2	10.4	12.1	13.3	13.8	15.3
HFC-125	137.9	147.8	145.1	154.9	152.6	179.6
HFC-134a	38.0	38.2	39.4	43.2	44.3	51.1
HFC-143a	182.2	180.2	187.4	189.6	178.0	209.7
HFC-227ea	0.2	0.2	0.2	0.1	0.1	0.1
2.F.1.b. Mobile Air Conditioning, Gg CO_{2e}						
HFC-134a	1.0	2.5	5.3	6.1	5.3	9.6
Sum	408.4	418.0	429.7	442.4	434.9	512.6

4.4.6 Quality Control

The activity data for consumption of ODS substitutes was provided by National Ozone Unit of the Ministry of Environment, Solid Waste Management, and Climate Change.

To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between the GHG emissions estimated in the current inventory and the results obtained in the last reported national inventory of the RoM.

4.4.7 Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for the Product Uses as Substitutes for Ozone Depleting Substances category are given in the following table considering 2000 as base year:

Table 70: Uncertainty Analysis of Product Uses as Substitutes for Ozone Depleting Substances Use (2.F) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
2.F.1.a - Refrigeration and Stationary Air Conditioning	HFC-23 (CHF_3)	0.00	0.00	0.00
2.F.1.a - Refrigeration and Stationary Air Conditioning	HFC-32 (CH_2F_2)	0.00	0.00	0.00
2.F.1.a - Refrigeration and Stationary Air Conditioning	HFC-125 (CHF_2CF_3)	0.00	0.00	0.00
2.F.1.a - Refrigeration and Stationary Air Conditioning	HFC-134a (CH_2FCF_3)	0.00	0.00	0.00
2.F.1.a - Refrigeration and Stationary Air Conditioning	HFC-143a (CF_3CH_3)	0.00	0.00	0.00
2.F.1.b - Mobile Air Conditioning	HFC-134a (CH_2FCF_3)	0.00	0.00	0.00

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4, N_2O and various HFCs in AR2 and AR5 is given in Table 72. To maintain time series consistency, the GHG emission data from 2000 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 71.

Table 71: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP	Recalculated emission as per AR5 GWP	Difference in GHG emissions	Percentage change
	Gg CO_{2e}	Gg CO_{2e}	Gg CO_{2e}	%
2000	48.8	55.4	6.6	13.53%
2001	51.2	58.2	7.0	13.67%
2002	53.4	60.7	7.4	13.78%
2003	55.5	63.2	7.7	13.91%
2004	57.5	65.6	8.1	14.05%
2005	88.6	100.9	12.3	13.90%
2006	82.7	94.2	11.5	13.91%
2007	87.9	100.3	12.3	14.01%
2008	89.7	100.4	10.7	11.97%
2009	104.1	116.8	12.7	12.18%

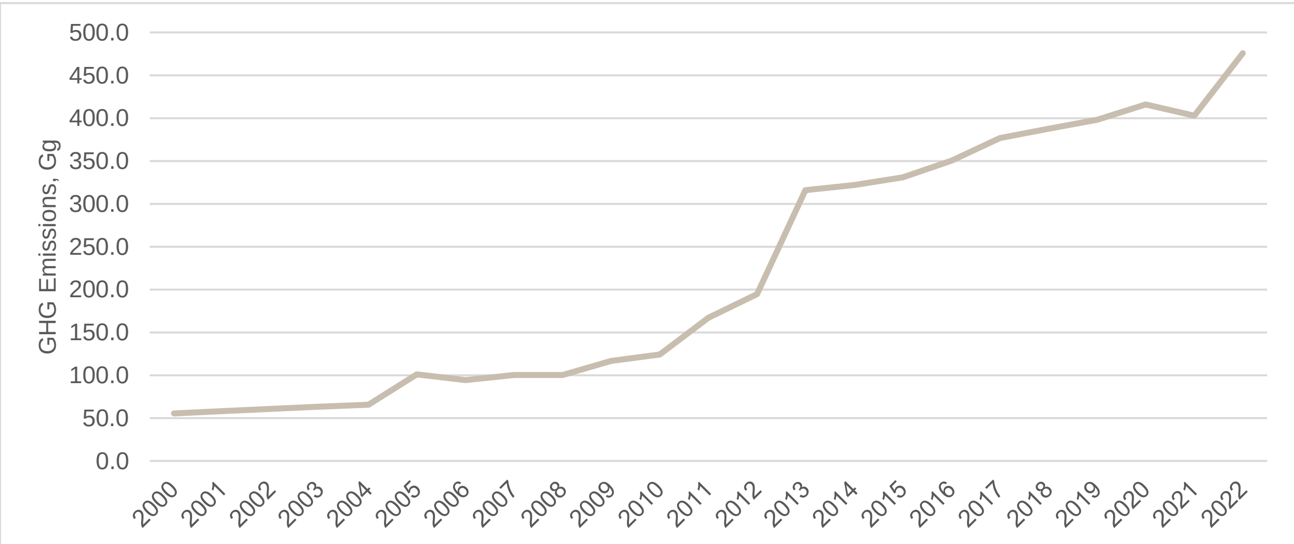
Year	GHG emission as per AR2 GWP	Recalculated emission as per AR5 GWP	Difference in GHG emissions	Percentage change
	Gg CO_{2e}	Gg CO_{2e}	Gg CO_{2e}	%
2010	110.1	124.3	14.2	12.93%
2011	146.5	167.0	20.5	13.98%
2012	169.9	194.7	24.8	14.61%
2013	267.3	316.0	48.8	18.25%
2014	273.8	322.1	48.3	17.63%
2015	282.1	330.9	48.9	17.32%
2016	299.2	350.4	51.2	17.11%

Table 72: Comparison of AR2 and AR5 GWP values

Gas	Second Assessment Report (AR2)	Fifth Assessment Report (AR5)
CO_2	1	1
CH_4	21	28
N_2O	310	265
HFC-23	11700	12400
HFC-32	650	677
HFC-125	2800	3170
HFC-134a	1300	1300
HFC-143a	3800	4800
HFC-227ea	2900	3350

Due to revision in global warming potential (GWP) of various HFCs, significant correction has been done in the timeseries as well. Figure 35 shows the GHG emission trend from use of ODS Substitutes from 2000 to 2022.

Figure 35: GHG emission trend from use of ODS substitutes from 2000 to 2022



As seen from above figure, there has been continuous increase in GHG emissions from the use of ODS substitutes.

4.4.8 Planned Improvement

The country will collect data regarding the use of products as substitutes for ozone-depleting substances. This verification is necessary to confirm whether HFC compounds are used in firefighting activities in the country, to determine if this activity is occurring.

Chapter 5: Agriculture, Forestry and Other Land Use (AFOLU)

5.1 Background of the AFOLU sector in Mauritius

In Mauritius, the Agriculture, Forestry, and Other Land Use (AFOLU) sector plays an integral role particularly in terms of nutrition and food security. The AFOLU is vulnerable to climate and its subsequent impacts which further affects the productivity and production of crops. Factors such as temperature not only a play a key role in impacting crops but also livestock.

5.1.1 Livestock

Livestock in Mauritius is produced locally as well as imported particularly for some sub-categories like bull. The livestock sector plays an integral role in Mauritius in strengthening the food security and nutrition while at the same time providing employment and livelihood opportunities to farmers[7].

Table 73: Category and Sub-Category of Livestock

Category	Sub-Category
Dairy Cows	NA
Other Cattle	Calf
	Heifer
	Bull
Swine	Boar
	Sow
	Piglet
	Fattener
	Gilt
Sheep	Ewes
	Ram
Goat	Buck
	Doe
Poultry	Broiler
	Broiler Parent
	Layer/Parent
	Duck
Horse	
Deer	

The population of cattle which consists of calf, heifer, bull, as well as dairy cow, has declined from 6,107 in 2017 to 5,761 in 2022 indicating a decrease by 5.6 per cent. A decline in population is also witnessed for the category of goat from 25,618 in 2017 to 21,608 in 2022 implying a 15.6 per cent decline in the given period. On the contrary, there has been a significant increase in the population of poultry from 1,030 in 2017 to 2305023 in

[7] https://agriculture.govmu.org/Documents/Report/Book%20Final.pdf

2022. A rise of 48 per cent is observed in the population of sheep from 2,934 in 2017 to 4,367 in 2022, while a miniscule rise of 0.18 per cent is observed for the population of sheep from 2017 to 2022. The deer population has also increased by 25 per cent from 2017 to 2022 while the population of horses has remained largely constant with a slight increase from 855 in 2017 to 866 in 2022.

5.1.2 Land

There are no legal definitions of forest in Mauritius, however, typically an area of land having 0.5 or more hectares of a natural or planted tree canopy cover of at least 30% can be cited as forest land and it usually includes both natural forests as well as plantations. Mauritius has two types of forest categories – public or state-owned, and private. The total forest area in 2022 including both public and private forests was 47,002 ha.

Figure 36: Forest Area in ha from 2017 to 2022

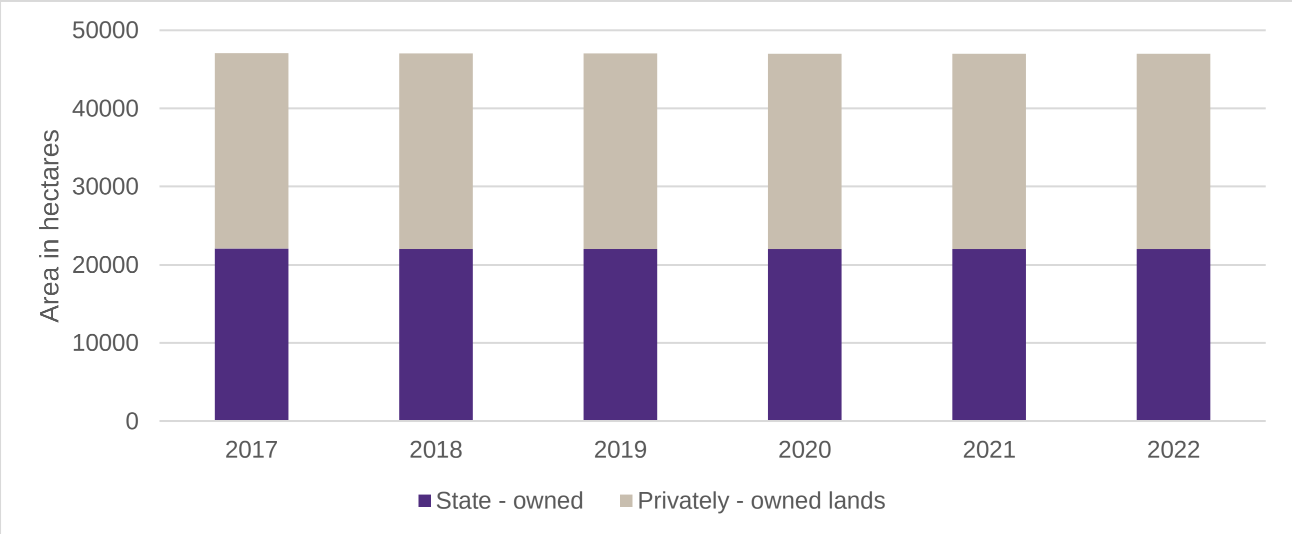
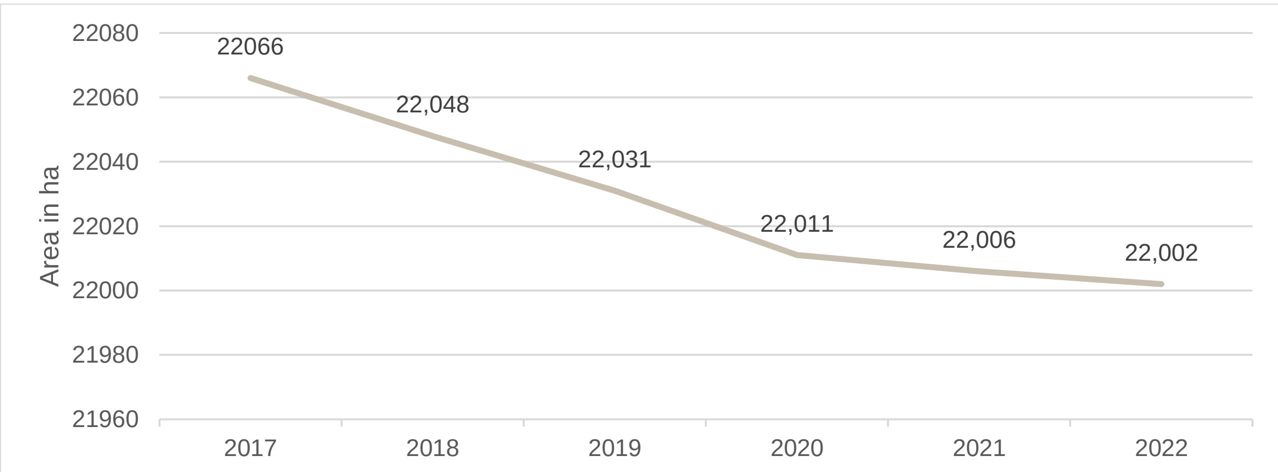


Figure 36 indicates the forest area in hectares over a period of six years. The private forest areas have remained constant over the given period at 25,000 ha however, there have been some variations in the forest area cover under state-owned forests during this period as indicated in Figure 37.

Figure 37: State-owned Forests in ha from 2017-2022



This has resulted in a slight decrease in the total forest area from 47,066 ha in 2017 to 47,002 ha in 2022. Out of the total state-owned forest areas in 2022, around 11,771 ha were plantations, while 799 ha and 6,574 ha accounted for nature reserves and Black River Gorges National Park. Pas Geometriques accounted for 588 ha, while other forest lands stood at 1,316 ha.

Land use changes have been observed during 2017-2022. While there was no land converted into infrastructure or settlement during 2017, there have been some level of land use change witnessed since 2017 up until 2022.

Figure 38: Tree Species Converted into Infrastructure

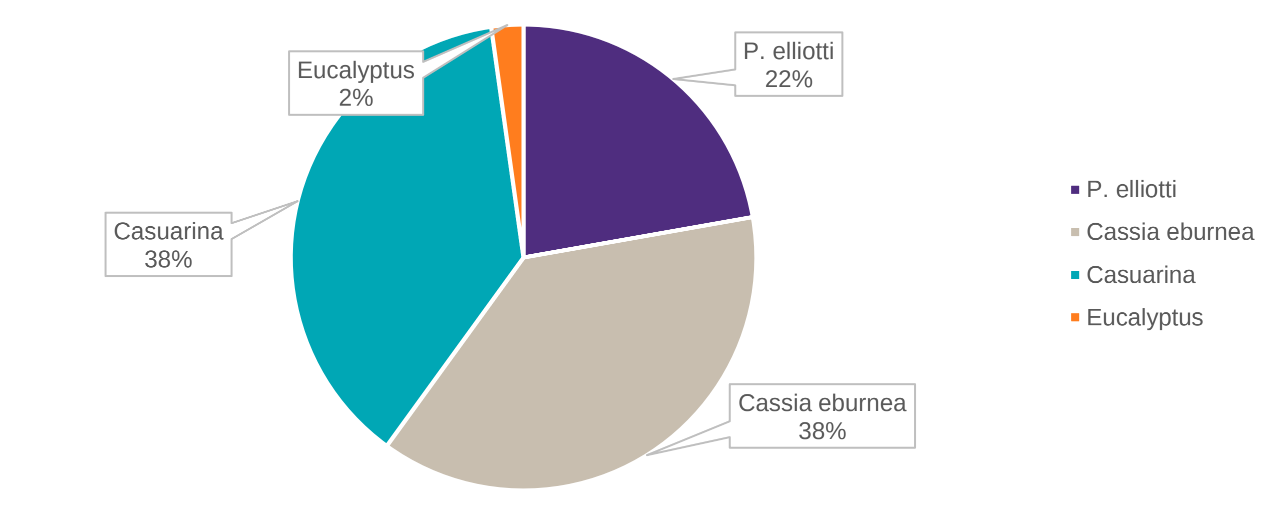


Figure 38 highlights the different species that were converted into infrastructure such as road and hotel development. A total of 45 ha of land use change has been observed during 2017 to 2022, where both the Cassia eburnea and Casuarina equisetifolia were the most converted species of tree.

Mangroves are another important part of the coastal areas in Mauritius. Over the period of 2017 to 2022, there has been a steady increase in the extent of mangrove forest area. The total forest area for mangrove was 183 ha both in 2017. Since then, the area has increase to 243 ha and has remained constant up until 2022.

In terms of the offences registered against forest laws, there has been a decline observed from 91 offences in 2017 to 65 offences in 2022. In 2022, out of the total offences registered, 38 were accounted for unauthorized felling or removal of trees followed by 10 offences for illegal deposit of stones/materials. Other offences included 7 for erection of structures and others, 5 for encroachment, 4 for illegal possession of goods, and 1 for illegal possession for implements. Table 74 highlights number of offences against forest laws from 2017 to 2022.

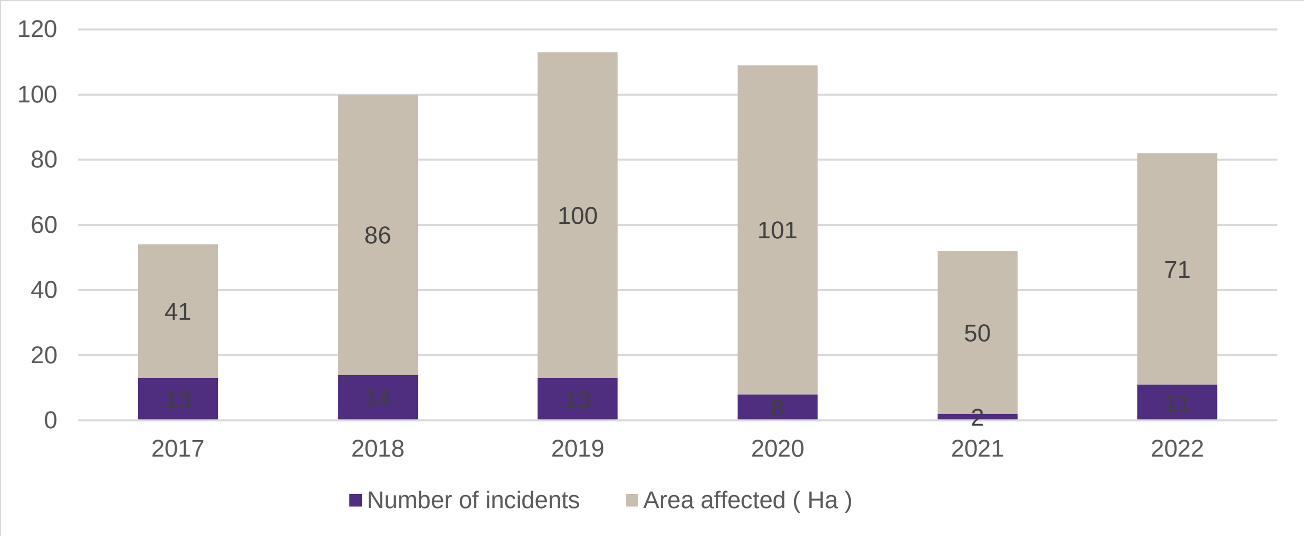
Table 74: Number of Offences Against Forest Laws from 2017 to 2022

Category	2017	2018	2019	2020	2021	2022
Unauthorised felling/removal	78	43	31	25	46	38
Illegal possession of wood	0	0	0	2	3	4
Encroachment	0	11	1	0	1	5
Illegal deposit of stones/materials	12	7	6	7	3	10
Illegal possession of implements	0	3	0	0	0	1
Erection of structures and others	1	5	8	9	2	7
Total	**91**	**69**	**46**	**43**	**55**	**65**

5.1.3 Aggregate sources and non-CO2 emissions sources on land

Disturbances such as forest fires can impact the forest area as well as the carbon stock. Figure 39 depicts the number of incidents pertaining to forest fires as well as the areas affected from 2017 to 2022.

Figure 39: Forest Fires and Areas Affected from 2017 to 2022



The total number of incidents regarding forest fires have decreased from 13 in 2017 to 11 in 2022, however, the total area affected has increased substantially from 41 ha in 2017 to 71 ha in 2022. The years 2019 and 2020 had 13 and 8 number of incidents respectively, however, the total area affected during the same respective years were 100 ha and 101 ha. The forest fires of 2022 destroyed around 10 ha of eucalyptus and 61 ha of scrubland. Pest and disease outbreaks are also disturbances that affected the area of forestland. During 2017 to 2022, at least 10 ha of pinus has been affected by pest and disease outbreaks. However, there has been no area affected from pest and disease outbreaks in 2021 and 2022.

5.1.4 Methodology adopted for GHG emission calculation

Table 75 shows information on methodology, emission factor and activity data used by source category in the AFOLU sector.

Table 75: Methodology used in the AFOLU sector

Category	Methodology	Emission Factor	Activity Data source
3 – Agriculture, Forestry and Other Land Use			
3.A – Livestock			
3.A.1 – Enteric Fermentation			
3.A.1.a – Cattle	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.1.a.i – Dairy Cows	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.1.a.ii – Other Cattle	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.1.b – Buffalo	NA	NA	NA

Category	Methodology	Emission Factor	Activity Data source
3.A.1.c – Sheep	T1	D	Digest of Agricultural Statistics Mauritius and MMA Annual Report Importation
3.A.1.d – Goats	T1	D	Digest of Agricultural Statistics Mauritius and MMA Annual Report Importation
3.A.1.e – Camels	NA	NA	NA
3.A.1.f – Horses	T1	D	Statistics Mauritius
3.A.1.g – Mules and Asses	NA	NA	NA
3.A.1.h – Swine	T1	D	Digest of Agricultural Statistics Mauritius
3.A.1.i – Poultry	NA	NA	NA
3.A.1.j – Other – Deer	T1	D	FAREI estimation
3.A.2 – Manure Management			
3.A.2.a - Cattle	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.2.a.i – Dairy cows	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.2.a.ii – Other cattle	T1	D	Digest of Agricultural Statistics Mauritius, FAREI and MMA Annual Report Importation
3.A.2.b - Buffalo	NA	NA	NA
3.A.1.c – Sheep	T1	D	Digest of Agricultural Statistics Mauritius and MMA Annual Report Importation
3.A.1.d – Goats	T1	D	Digest of Agricultural Statistics Mauritius and MMA Annual Report Importation
3.A.1.e – Camels	NA	NA	NA
3.A.1.f – Horses	T1	D	Statistics Mauritius
3.A.1.g –Mules and Asses	NA	NA	NA
3.A.1.h – Swine	T1	D	Digest of Agricultural Statistics Mauritius
3.A.1.i – Poultry	T1	D	Digest of Agricultural Statistics Mauritius and FAREI estimation
3.A.1.j – Other – Deer	T1	D	FAREI estimation
3.B – Land			
3.B.1 – Forest land			
3.B.1.a – Forest land remaining forest land	T2	D, CS	Forestry Service, Ministry of Agro- Industry & Food Security, TNC land use areas
3.B.1.b – Land converted to Forest land	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC land use areas
3.B.1.b.i – Cropland converted to Forest land	T1	D	Forestry Service, Ministry of Agro- Industry & Food Security, TNC land use areas
3.B.2 – Cropland			
3.B.2.a – Croplandremaining cropland	T1	D	TNC land use areas

Category	Methodology	Emission Factor	Activity Data source
3.B.2.b – Land converted to Cropland	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC landuse areas
3.B.2.b.i – Forest land converted to Cropland	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC land use areas
3.B.3 – Grassland			
3.B.3.a – Grass land remaining grassland	T1	D	TNC land use areas
3.B.3.b – Land converted to grassland	T1	NO	TNC land use areas
3.B.4 – Wetland			
3.B.4.a – Wetlands remaining wetlands	T1	NO, NA	TNC land use areas
3.B.4.a.i– Peatlands remaining peatlands	T1	NO	NO
3.B.4.a.ii – Flooded land remaining flooded land	T1	NA	TNC land use areas
3.B.4.a – Wetlands remaining wetlands	NO, NA	D, CS	Ministry of Agro-Industry & FoodSecurity, TNC land use areas
3.B.5 – Settlements			
3.B.5.a –Settlements remaining settlements	T1	D	TNC land use areas
3.B.5.b – Land convertedto settlements	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC land use areas
3.B.5.b.i – Forest land converted to settlements	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC landuse areas
3.B.6 – Other land			
3.B.6.a – Other land remaining other land	T1	NA	TNC land use areas
3.B.6.b – Land converted to other land	T1	D, CS	Forestry Service, Ministry of Agro- Industry & Food Security, TNC land use areas
3.B.6.b.i – Forest land converted to other land	T1	D, CS	Forestry Service, Ministry of Agro-Industry & Food Security, TNC land use areas
3.C – Aggregate sources and non-CO_2 emissions sources on land			
3.C.1 GHG emissions from biomass burning	T1	D	Forestry Service, Ministry of Agro- Industry & Food Security
3.C.1.a – Biomass burning in forest lands	T1	D	Forestry Service, Ministry of Agro- Industry & Food Security
3.C.1.b – Biomass burning in croplands	T1	D	Digest of Agricultural Statistics, MCIA
3.C.1.c – Biomass burning in grasslands	NA	NA	-
3.C.1.d – Biomass burning in other lands	NA	NA	-
3.C.2 - Liming	NA	NA	-
3.C.3 – Urea application	NA	NA	-

Category	Methodology	Emission Factor	Activity Data source
3.C.4 – Direct N_2O Emissions from managed soils	T1	D	Statistics Mauritius FAREI and livestock estimates in category 3.A
3.C.5 - Indirect N_2O Emissions from managed soils	T1	D	Statistics Mauritius, FAREI and livestock estimates in category 3.A
3.C.6 - Indirect N_2O Emissions from manure management	T1	D	Digest of Agricultural, Statistics Mauritius, FAREI and MMA Annual Report Importation
3.C.7 – Rice cultivation	NA	NA	NA
3.C.8 – Other	NA	NA	NA
3.D.1 – Harvested wood products	T1	D	FAOSTAT
3.D.2 – Other	NA	NA	

T1 -Tier 1 and Tier 2 Methods; CS – Country Specific Emission; D –Default Emission Factors; NA: Not Applicable

5.2 Livestock

5.2.1 Source Category Description

Livestock production can result in methane (CH_4) emissions from enteric fermentation (IPCC category 3.A.1) and both CH_4 and nitrous oxide (N_2O) emissions from livestock manure management systems fermentation (IPCC category 3.A.2). Usually, cattle are an important source of CH_4 because of their large population and high CH_4 emission rate due to their ruminant digestive system, as it is the situation in Mauritius. Methane emissions from manure management tend to be smaller than enteric emissions, with the most substantial emissions associated with confined animal management operations where manure is handled in liquid- based systems. Nitrous oxide emissions from manure management vary significantly between the types of management system used and can also result in indirect emissions due to other forms of nitrogen loss from the system. Manure management category, 3.A.2, only covers the volatilization in the farms, so emissions from animals in pasture are not included in category 3.A.2, but in category 3.C.4. The calculation of the nitrogen loss from manure management systems is also an important step in determining the amount of nitrogen that will ultimately be available in manure applied to managed soils, or used for feed, fuel, or construction purposes, emissions that are calculated 3.C.4 Direct N_2O emissions from managed soils.

Based on the available information, the following animal species are estimated in the GHGI of Mauritius:

Table 76: Animal species considered for preparing GHGI of Mauritius

Animal Category	Animal Subcategory
Dairy Cows	NA
Other Cattle	Bull
	Calf
	Heifer
	Imported Bull
Sheep	Ewes
	Ram
	Followers

Animal Category	Animal Subcategory
Goat	Bucks
	Does
	Followers
Horse	NA
Swine	Boar
	Fattener
	Piglet
	Sow/Gilt
Poultry	Broiler
	Broiler parent
	Layer/Parent
	Duck
Other	Deer

The island of Mauritius has been divided in 3 regions (Flacq District, central region and other regions) for the estimation of the emissions. The Table 77 shows the regions, areas covered and average annual temperatures.

Table 77: Livestock Regions and Average Annual Temperature

Region	Area included	Average temperature (°C)
Flacq	Flacq District	24
Central regions	Plaines Wilhems and Moka District	22
Other regions	Pamplemousses, Grand Port, Savanne, Black River, Riviere du Rempart and Port Louis Districts	25
Rodrigues	Rodrigues island	25
Mauritius island	Total area of Mauritius island	21

Average temperatures were provided for all regions and total Mauritius Island were provided by the FAREI.

5.2.2 Methodological Issues

Tier 1 approach of the 2019 Refinement to the 2006 IPCC Guidelines has been used to estimate the emissions from enteric fermentation and manure management.

5.2.3 Calculations

Enteric Fermentation (CH_4)

2019 Refinement to the 2006 IPCC Guidelines Tier 1 approach involves multiplying the number of animals (N) by the respective EF in the appropriate world region:

$$E_T = \Sigma_{(P)} EF_{(T,P)} \bullet \left(\frac{N_{(T,P)}}{10^6} \right)$$

Where:

E_T	=	methane emissions from Enteric Fermentation in animal category T, Gg CH_4 yr^{-1}
$EF_{(T,P)}$	=	emission factor for the defined livestock population T and the productivity system P, in kg CH_4 $head^{-1}$ yr^{-1}
$N_{(T,P)}$	=	the number of head of livestock species / category T in the country classified as productivity system P
T	=	species/category of livestock
P	=	productivity system, either high or low productivity for use in advanced Tier 1a – omitted if using Tier 1 approach

Manure Management (CH_4)

2019 Refinement to the 2006 IPCC Guidelines Tier 1 approach involve multiplying the number of animals (N) by the respective EF (based on the region and the average temperature). On contrast with N_2O emissions from manure management, the Tier 1 approach for CH_4 emissions does not require information on the manure management system used for the animal manure.

$$CH_{4(mm)} = \left[\sum_{T,S,P} \left(N_{(T,P)} \bullet VS_{(T,P)} \bullet AWMS_{(T,S,P)} \bullet EF_{T,S,P} \right) / 1000 \right]$$

Where:

$CH_{4(mm)}$	=	CH4 emissions from Manure Management in the country, kg CH_4 yr^{-1}
$N_{(T,P)}$	=	number of head of livestock species/category T in the country, for productivity system P, when applicable
$VS_{(T,P)}$	=	annual average VS excretion per head of species/category T, for productivity system P, when applicable in kg VS $animal^{-1}$ yr^{-1}
$AWMS_{(T,S,P)}$	=	fraction of total annual VS for each livestock species/category T that is managed in manure management system S in the country, for productivity system P, when applicable; dimensionless
$EF_{(T,S,P)}$	=	emission factor for direct CH_4 emissions from manure management system S, by animal species/category T, in manure management system S, for productivity system P, when applicable, gCH_4kgVS^{-1}
S	=	manure management system
T	=	species/category of livestock
P	=	high productivity system or low productivity system for use in advanced Tier 1a – omitted if using a simple Tier 1 approach

Direct N_2O emissions from manure management (N_2O)

Direct N_2O emissions due to manure management are estimated based on Tier 1 approach of the 2019 Refinement to the 2006 IPCC Guidelines. This approach requires information on the number of animals, the nitrogen (N) excreted by head (estimated based on the weight of the animal and default N excretion rates), the percentage of manure in each manure management system (MMS) and the emission factor of that MMS.

$$N_2O_{D(mm)} = \left[\sum_S \left[\sum_{T,P} \left(\left(N_{(T,P)} \bullet Nex_{(T,P)} \right) \bullet AWMS_{(T,S,P)} \right) + N_{cdg(s)} \right] \bullet EF_{3(S)} \right] \bullet \frac{44}{28}$$

Where:

$N_2O_{D(mm)}$	=	direct N_2O emissions from Manure Management in the country, kg N_2O yr^{-1}
$N_{(T,P)}$	=	number of head of livestock species/category T in the country, for productivity system P, when applicable
$Nex_{(T,P)}$	=	annual average N excretion per head of species/category T in the country, for productivity system P, when applicable in kg N $animal^{-1}$ yr^{-1}

$N_{cdg(s)}$ = annual nitrogen input via co-digestate in the country, kg N yr^{-1}, where the system (s) refers exclusively to anaerobic digestion

$AWMS_{(T,S,P)}$ = fraction of total annual nitrogen excretion for each livestock species/category T that is managed in manure management system S in the country, dimensionless; to consider productivity class P, if using a Tier 1a approach

$EF_{3(S)}$ = emission factor for direct N_2O emissions from manure management system S in the country, kg N_2O-N/kg N in manure management system S

S = manure management system

T = species/category of livestock

P = productivity class, high or low, to be considered if using the Tier 1a approach

44/28 = conversion of N_2O-N(mm) emissions to N_2O(mm) emissions

5.2.4 Activity Data

The activity data for all these emissions is the number of animals by species and subcategory. Table 78 shows the number of animals disaggregated by subcategory for Mauritius Island,

Table 78: Number of animals by subcategory in Mauritius Island

Animal	2017	2018	2019	2020	2021	2022
Dairy Cows	**1513**	**1273**	**1238**	**1226**	**1317**	**1263**
Non-Dairy	**2297**	**2235**	**2246**	**2867**	**2417**	**2249**
Calves	333	270	223	257	333	216
Heifers	1091	999	979	999	880	806
Bulls	873	966	1044	1611	1204	1227
Swine	**21445**	**19662**	**20897**	**20749**	**22422**	**21484**
Boars	453	428	433	433	475	446
Sows	2884	2671	2771	2781	2904	2872
Piglets	7311	5617	5344	5374	5690	5641
Fatteners	10183	10086	11470	11272	12335	11846
Gilts	614	860	879	889	1018	679
Sheep	**2934**	**3005**	**4622**	**4626**	**5034**	**4367**
Ewes	1090	3005	1354	1384	1511	1491
Ram	311	0	381	388	551	540
Followers	1533	0	2887	2854	2972	2336
Goat	**25618**	**25540**	**25831**	**25165**	**22142**	**21608**
Bucks	2812	25540	2867	2535	7482	2191
Does	8240	0	8446	8138	10332	6481
Followers	14566	0	14518	14492	4328	12936
Poultry	**1030**	**0**	**569094**	**547075**	**2502344**	**2305023**
Layers	230	0	154675	142251	557376	591825
Broilers	800	0	414419	404824	1944968	1713198
Horses	855	856	860	986	1006	866

Animal	2017	2018	2019	2020	2021	2022
Deer	8000	10000	10000	10000	10000	10000

Source: *Own elaboration based on the national sources.*

The information for the period 2017-2022 for the number of animals in Mauritius island was compiled as follows:

Table 79: Number of animals in Mauritius for the period 2017-2022

Species	Source
Cattle	Digest of Agricultural Statistics Mauritius and FAREI estimation
Sheep	Digest of Agricultural Statistics Mauritius and FAREI estimation
Goat	Digest of Agricultural Statistics Mauritius and FAREI estimation
Horse	Digest of Agricultural Statistics Mauritius and FAREI estimation
Swine	Digest of Agricultural Statistics Mauritius and FAREI estimation
Poultry	Digest of Agricultural Statistics Mauritius and FAREI estimation
Deer	Digest of Agricultural Statistics Mauritius and FAREI estimation

5.2.5 Emission factors

Enteric fermentation and manure management (CH_4) are estimated using the default Tier 1 values for Africa/developing countries in the 2019 Refinement to the 2006 IPCC Guidelines, as shown in the Table 80:

Table 80: Enteric Fermentation and Manure Management (CH_4) Emissions Factors

Livestock sub-category	CH_4 Emission factor from manure management (kgCH_4/(head/year)	CH_4 Emission factor from enteric fermentation (kgCH_4/(head/year)
Dairy cow	4.4	76
Bull	4.4	52
Calf	4.4	52
Heifer	4.4	52
Imported bull	4.4	52
Sheep	4.4	5
Goat	4.4	5
Horse	8.7	18
Mule & Asses	8.7	10
Boar	9.7	1
Fattener	9.7	1
Piglet	9.7	1
sow/gilt	9.7	1
Broiler	13.1	n.a.
Broiler parent	13.1	n.a
Layer/Parent	13.1	n.a
Duck	0.6	n.a

Livestock sub-category	CH_4 Emission factor from manure management ($kgCH_4$/(head/year)	CH_4 Emission factor from enteric fermentation ($kgCH_4$/(head/year)
Deer	0.6	20

Source: Table 10.10, table 10.11, table 10.14 (2019 Refinement to the 2006 IPCC Guidelines, volume 4, chapter 10).

Emission factor per MMS is the default IPCC values included in table 10.21 (2019 Refinement to the 2006 IPCC Guidelines, volume 4, chapter 10) have been shown in Table 81.

Table 81: Emission factors per MMS

System	EF
Solid storage	0.010

Emission factors for Volatile Solid Excretion Rate have been shown in Table 82 (Source: table 10.13A 2019 Refinement to the 2019 Refinement to the 2006 IPCC Guidelines, volume 4, chapter 10):

Table 82: Emission factors for Volatile Solid Excretion Rate

Livestock sub-category	Volatile Solid Excretion Rate (kg VS animal^{-1} yr^{-1})
Dairy Cattle	15.2
Other cattle	12.7
Goat	10.4
Sheep	8.3
Pig	8.7
Broiler	15.4
Layer	n.a.
Duck	7.4
Horse	7.2
Deer	n.a.

IPCC Default Animal Waste Management System (AWMS) Regional Averages for Tier 1 Method have been shown in Table 83 (Source: Table 10.A.6, A.7, A.8, Chapter 10):

Table 83: IPCC Default Animal Waste Management System (AWMS) Regional Averages

Category	AWMS (dimensionless)
Dairy Cattle	0.2
Other cattle	0.15
Goat	0.17
Sheep	0.17
Pig	0.15
Broiler	n.a.
Layer	n.a.
Duck	n.a.
Horse	n.a.

Category	AWMS (dimensionless)
Deer	n.a.

IPCC Default Values for annual average N excretion per head have been shown in Table 84 (Source: Table 10A.1,10A.2,10.A.6, 10A.7,10 A.8 Chapter 10). The values for other cattle except dairy cow have been taken from Low Productivity Systems in Africa for – 'Bulls Grazing' category.

Table 84: IPCC Default Values for annual average N excretion per head

Category	N excretion per head (kg N animal^{-1}yr^{-1})
Cattle	0.45
Dairy cow	0.41
Bulls	0.29
Calf	0.29
Heifers	0.29
Boar	0.29
Fattener	0.29
Piglet	0.29
Sow/gilt	0.29
Sheep	0.29
Goat	0.29
Horse	0.29
Broiler	0.29
Layers	0.29

5.2.6 Results

Livestock (category 3.A) emissions decreased from 38.23 Gg CO_{2e} to 37.29 Gg CO_{2e} in the year 2022, a decrease of 2.45%. Enteric fermentation (3.A.1) emissions increased from 16.07 Gg CO_2e in the year 2017 to 16.23 Gg CO_{2e} in 2022, an increase of 0.001%. CH_4 emissions from manure management decreased from 1.26 Gg CO_{2e} in the year 2017 to 1.21 Gg CO_{2e} in 2022, a decrease of 3.96%. N_2O emissions from manure management decreased from 7.36 Gg CO_{2e} in the year 2017 to 6.97 Gg CO_{2e} in 2022, a decrease of 5.29%.

Table 85: GHG Emissions from 3A livestock (Gg CO_{2e})

Category and GHG ↓ Year→	2017	2018	2019	2020	2021	2022
Enteric fermentation – CH_4	16.07	16.54	16.78	17.63	16.86	16.23
Manure management - CH_4	1.26	1.16	1.21	1.23	1.26	1.21
Manure management - N_2O	7.36	7.07	7.50	7.47	7.30	6.97
Total	38.23	37.67	39.12	39.88	38.86	37.29

5.2.7 Quality Control

Information was generally obtained from official sources, including Statistics Mauritius and its Digest of Agriculture and Environment Statistics. Statistics Mauritius applies quality controls to the information before publicly realising it. If statistics were not available, expert judgement has been used to fill the gaps.

On the other hand, in order to ensure the use of right data in the inventory, some QC were implemented during the data collection and emission estimation is listed below:

- Cross verification by the Department of Climate Change, FAREI and data reported in the national Statistics Mauritius.
- Cross verification between data provided by FAREI and the default values proposed by the 2019 Refinement to the IPCC 2006 Guidelines for AFOLU sector.
- Cross verification between the GHG emissions estimated in the current inventory for AFOLU sector and the results obtained in the last reported national inventory of the RoM.

Activity data check: The livestock data collection methods were reviewed, in particular checking that livestock data for each species/sub species was collected and aggregated correctly with consideration for the duration of production cycles and taking into account imported animals. The data were cross-checked with previous years to ensure the data were reasonable and consistent with the expected trend.

Source specific verification (Quality control): The personnel from FAREI assessed the quality of the data, determined the conformity of the procedures which were followed for the compilation of this inventory and to identify areas of improvement.

Quality and reliability of data: All data collected was done using local expertise, experience in this sector and to the best of knowledge.

5.2.8 Uncertainty Assessment and Time-series Consistency

Uncertainties on the number of animals are: Dairy cattle ±7,5%; Other cattle ±7,5%; Swine ±5%; Goat ±7,5%; Sheep ±7,5%; Horses ±6%; Poultry ±10%; Deer ±2%. Uncertainty values were provided by FAREI Research Department. Emission Factor uncertainties were obtained from 2006 IPPC Guidelines Volume 4, chapter 10, pages 10.33, 10.48 and 10.66. Given the insularity of Mauritius and its differences from mainland Africa, it was decided to use the upper range of the uncertainty values provided by the 2006 IPCC Guidelines. The uncertainty analysis results for livestock are reported in the following table for 2016 as base year:

Table 86: Uncertainty Analysis of Livestock category (3.A)

IPCC Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
3.A.1.a.i - Dairy Cows	CH4	7.50	50.00	50.56
3.A.1.a.ii - OtherCattle	CH4	7.50	50.00	50.56
3.A.1.c - Sheep	CH4	7.50	50.00	50.56
3.A.1.d - Goats	CH4	7.50	50.00	50.56
3.A.1.f - Horses	CH4	6.00	50.00	50.36
3.A.1.h - Swine	CH_4	5.00	50.00	50.25
3.A.1.j - Other (Deer)	CH_4	2.00	50.00	50.04
3.A.2.a.i - Dairy cows	CH_4	50.56	30.00	58.79
3.A.2.a.i - Dairy cows	N_2O	50.56	100.00	112.05
3.A.2.a.ii – Other cattle	CH_4	50.56	30.00	58.79
3.A.2.a.ii - Other cattle	N_2O	50.56	100.00	112.05
3.A.2.c - Sheep	CH_4	50.56	30.00	58.79

IPCC Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
3.A.2.c -Sheep	N_2O	50.56	100.00	112.05
3.A.2.d - Goats	CH_4	50.56	30.00	58.79
3.A.2.d - Goats	N_2O	50.56	100.00	112.05
3.A.2.h - Swine	CH_4	50.25	30.00	58.52
3.A.2.h - Swine	N_2O	50.25	100.00	111.92

Note: The activity data of N_2O emissions from manure management is the N excreted by manure management system. Therefore, its uncertainty is based on the number of animals andthe N excretion per animal, being the second ± 50% according to 2006 IPCC Guidelines, volume 4, chapter 10, pg. 10.66.

5.2.9 Recalculations

No recalculations have been implemented for this category. Only new data have been incorporated for 2017-2022 period.

5.2.10 Planned Improvements

Information on the number of animals is not complete. It includes gaps such as lack of data or data not disaggregated by region in some years. In addition, some time series show unusual trends. In this GHG Inventory, the gaps have been filled using assumptions and gap-filling techniques. However, this should be a temporary solution. It is needed to analyse and verify the existing information, as well as raising the missing information to ensure consistent time-series of number of animals in line with the IPCC requirements.

Tier 1 methodology and default EF have been used for the livestock subsector. They may not be appropriate for local conditions and carry large uncertainties as RoM is a SIDS country. There is a need to update the estimates to Tier 2 for the most significant categories.

In general, the collection of activity data and parameters must be standardized, clarifying to the data providers the format, timeline, scope and QC needed for the data.

5.3 Land (Category 3B)

5.3.1 General

- Forest land (IPCC Category 3B1)
- Cropland (IPCC Category 3B2)
- Grassland (IPCC Category 3B3)
- Wetlands (IPCC Category 3B4)
- Settlements (IPCC Category 3B5)
- Other Land (IPCC Category 3B6)

5.3.2 Information on approaches used for representing land areas and on land use databases used for the inventory preparation

In this GHG inventory various data sources have been used and assumptions have been made for the land representation. It should be noted, that in the current GHG inventory a consistent land representation has been developed, given the available data, for the whole time series of the inventory period.

For the total forest land area, the information provided by the Forest Service has been used as presented in Table 87. The table presents the information for the different forest speciesincluding their area distribution during the inventory period.

Table 87: Land area of each major forest species (ha) for Island of Mauritius

Ecological Zone (Tropical)	Category	Species	2017	2018	2019	2020	2021	2022
	Plantation	Pinus elliottii	8,104	8,088	8,088	8,068	8,063	8,063
Wet Upland Forest	Plantation	Eucalyptus	565	565	565	565	565	565
R > 2000mm	Plantation	Cryptomeria japonica	965	965	965	965	965	965
	Plantation	Araucaria	60	60	60	60	60	60
	Natural	Mostly native forests severely invaded by alien plant species	15,139	15,139	15,139	15,139	15,139	15,139
	Plantation	Eucalyptus	889	889	889	889	889	889
Moist Forest	Plantation	Tabebuia pallida	139	139	139	139	139	139
2000 mm> R > 1000 mm	Plantation	Araucaria	174	174	174	174	174	174
	Plantation	Casuarina equisetifolia	110	110	110	110	110	110
	Natural	Mostly native forests severely invaded by alien plant species	5079	5,079	5,079	5,079	5,079	5,079
	Plantation	Eucalyptus	2402	2,402	2,389	2,389	2,389	2,386
Dry Lowland Forest R <1000mm	Plantation	Tabebuia pallida	710	710	710	710	710	710
	Plantation	Araucaria	382	384	384	384	384	384
	Plantation	Casuarina equisetifolia	104	104	100	100	100	100
	Scrublands	Mainly exotics	12,244	12,240	12,240	12,240	12,240	12,239
		Total	**47,066**	**47,048**	**47,031**	**47,011**	**47,006**	**47,002**

Table 88: Land area of each major forest species (ha) for Island of Rodrigues

Ecological Zone (Tropical)	Category	Species	2017	2018	2019	2020	2021	2022	2023
			Extent (Ha)						
Wet Upland Forest R>2000mm	plantation	Pinus eliotii	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	plantation	Eucalyptus	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	plantation	Cryptomeria japonica	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	plantation	Araucaria							
	Natural	Native Forest Severely invaded by alien plant species	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Moist forest 000 mm>1000mm	plantation	Eucalyptus	700	700	700	700	700	700	700
	plantation	Tabebuia pallida	400	400	400	400	400	400	400
	plantation	Araucaria	2	2	2	2	2	2	2
	plantation	Casuarina equisetifolia	25	25	25	25	25	25	25
	Natural	Native Forest Severely invaded by alien plant species	1200	1200	1200	1200	1200	1200	1200
Dry Lowland Forest R <1000mm	plantation	Eucalyptus	400	400	400	400	400	400	400
	plantation	Tabebuia pallida	100	100	100	100	100	100	100
	plantation	Araucaria	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	plantation	Casuarina equietifolia	75	75	75	75	75	75	75
	Scrubland	Mainly exotics (*Acacia nilotica*)	1140	1160	1180	1200	1220	1240	1260

Furthermore, for the conversion of land-use areas, information provided by the Forestry Service, Ministry of Agro-Industry & Food Security has been used as presented in Table 89.

Table 89: Land-use conversion in RoM (ha)

Year	Change in land use	Extent (ha)	Ecological Zone	Forest Land Category	Soil Type
2017	Nil	0	Nil	Nil	Nil
2018	Forest Land (P.elliottii) to Public Infrastructure (Road development)	1	Wet Upland Forest	Plantation	HAC
2018	Forest Land (Cassia eburnea) to Infrastructure (Hotel Development)	17	Dry Lowland Forest	Plantation	Sandy Mineral

Year	Change in land use	Extent (ha)	Ecological Zone	Forest Land Category	Soil Type
2019	Forest Land (Casuarina) to Infrastructure (Hotel Development)	17	Dry Lowland Forest	Plantation	Sandy Mineral
2020	Forest Land (P.elliottii) to settlement	1	Wet Upland Forest	Plantation	HAC
2021	Forest Land (P.elliottii) to settlement	5	Wet Upland Forest	Plantation	HAC
2022	Forest Land (P.elliottii) to Public Infrastructure (Road development)	3	Wet Upland Forest	Plantation	HAC

For the estimation of carbon stock changes and GHG emissions/removals in the different landuse categories, the following stratification scheme has been applied, considering the available information and the feasibility of constructing a consistent land representation.

Forest land: four combinations of climate region/soil zones for land stratification were used based on the land-use change data available, namely Tropical Wet/High Activity Clay (TW HAC); Tropical Moist Short Dry Season/Low Activity Clay (TM LAC); Tropical Dry/Sandy M. (TD SAN); Tropical Dry/LAC (TD LAC).

5.3.3 Forest land

5.3.3.1 Source Category Description

Greenhouse gas emissions and removals per hectare vary according to site factors, forest or plantation types, stages of stand development and management practices. It is good practice tostratify forest land into various subcategories to reduce the variation in growth rate and other forest parameters and to reduce uncertainty.

The carbon stock changes in forest land are due to:

- biomass increments in forests;
- harvesting of round wood and fuel wood gathering;
- disturbances such as fires, cyclones, pests and diseases.

The GHG gas inventory for forest land involves estimation of changes in carbon stocks from five carbon pools (i.e., above-ground biomass, below ground biomass, dead wood, litter, and soil organic matter), as well as emissions of non-CO_2 gases.

The 2006 IPCC Guidelines and the 2019 Refinement to the to 2006 IPCC guidelines were used for the estimation of emissions and removals from forest land. CO_2 emissions from living biomass, dead organic matter and soil were calculated using a combination of tier 1 and tier 2 methods, with the use of IPCC default and country- specific parameters.

The forestry sector includes all activities dependent on forests, trees and other woody vegetation, and all industries based on them. It has numerous interactions and linkages with other sectors, such as agriculture, water, environment, tourism and communications.

The native forests which originally covered most of the island have almost completely disappeared except for a few inaccessible areas, which have been spared the onslaught of deforestation. These areas have now been converted to national parks, nature reserves or otherprotected areas. Large areas of degraded, upland native forests have since been re-afforested with fast growing exotics that form the bulk of the forest plantations.

The total extent of forest cover in RoM is estimated at 47,002 hectares in 2022. There are only two types of forest ownership: public and private. Approximately 22,002 hectares (47%) of the total forest land area in 2022 was state-owned and the remaining 25,000 hectares (53%) was privately-owned. Out of the 22,002 hectares of state-owned forest area, 11,763 hectares (53.4%) were planted areas while the Black River Gorges National Park and the nature reserves accounted for 6,574 (29.8%) and 799 (3.6%) hectares respectively.

Approximately 14,605 ha of land, including some 2,593 ha of privately-owned land, are covered with planted forests. The remaining are natural forests, most of which are badly degraded. It is estimated that around 2% of the land area of Mauritius is considered to be covered with good quality native forests.

Native species are not commercially logged in RoM and are now legally protected by the Native Terrestrial Biodiversity and National Parks Act (2015). Only exotic plantation is commercially harvested in RoM. However, in line with the National Forest Policy (2006), timber exploitation is gradually being phased out and exotic species are gradually being replaced by native species.

5.3.3.2 Methodology adopted for GHG emission calculation

Living biomass

All forest data are available at the Forestry Service. A combination of 2006 IPCC default and country-specific parameters has been used for estimating carbon stock changes and associated GHG emissions and removals from forest land. This information is available at forest species level, as presented in Table 93.

The methodologies and equations used are those proposed by the 2006 IPCC Guidelines. Most of the country specific emissions factors were not available (basic wood density, biomass expansion factors, root-to-shoot ratio, amongst others).

Carbon stock changes in living biomass were estimated using equation 2.4 from volume 4, chapter 2, 2006 IPCC Guidelines (Gain-loss method).

$$\Delta C = \Delta C_G - \Delta C_L$$

Where:

ΔC	=	annual carbon stock change in the pool, tonnes C yr^{-1}
ΔCG	=	annual gain of carbon, tonnes C yr^{-1}
ΔCL	=	annual loss of carbon, tonnes C yr^{-1}

The annual increase in biomass carbon stock is estimated using Equation 2.9 from volume 4, chapter 2, 2006 IPCC Guidelines in combination with Equation 2.10, where area under each forest land stratum is multiplied by the mean annual growth.

$$\Delta C_G = \sum_{i,j} \left(A_{i,j} \times G_{TOTAL_{i,j}} \times CF_{i,j} \right)$$

Where,

ΔCG	=	annual increase in biomass carbon stocks due to biomass growth in land remaining in the same land-use category by vegetation type and climatic zone, tonnes C yr^{-1}
A	=	area of land remaining in the same land-use category, ha
G_{TOTAL}	=	mean annual biomass growth, tonnes dm ha^{-1} yr^{-1}
I	=	ecological zone (*i* = 1 to *n*)
j	=	climate domain (*j* = 1 to *m)*
CF	=	carbon fraction of dry matter, tonne C (tonne dm)$^{-1}$

$$G_{TOTAL} = \sum \{ G_W \bullet (1 + R) \}$$

Where,

G_{TOTAL}	=	average annual biomass growth above and below-ground, tonnes dm ha^{-1} yr^{-1}

G_W = average annual above-ground biomass growth for a specific woody vegetation type, tonnes dm ha^{-1} yr^{-1}
R = ratio of below-ground biomass to above-ground biomass for a specific vegetation type, in tonne dm below-ground biomass (tonne dm above-ground biomass)$^{-1}$

Biomass carbon stocks losses were estimated using Equation 2.11 from volume 4, chapter 2, 2006 IPCC Guidelines, in combination with Equations 2.12, 2.13 and 2.14 for $L_{wood\text{-}removals}$, $L_{fuelwood}$ and $L_{disturbance}$, respectively)

$$\Delta C_L = L_{wood-removal} + L_{fuelwood} + L_{disturbance}$$

Where,

ΔC_L	= annual decrease in carbon stocks due to biomass loss in land remaining in the same land-use category, tonnes C yr^{-1}
$L_{wood\text{-}removals}$	= annual carbon loss due to wood removals, tonnes C yr^{-1}
$L_{fuelwood}$	= annual biomass carbon loss due to fuelwood removals, tonnes C yr^{-1}
$L_{disturbance}$	= annual biomass carbon losses due to disturbances, tonnes C yr^{-1}

$$L_{wood-removals} = \{H \bullet BCEF_R \bullet (1+R) \bullet CF\}$$

Where:

$L_{wood\text{-}removals}$	= annual carbon loss due to biomass removals, tonnes C yr^{-1}
H	= annual wood removals, roundwood, m3 yr^{-1}
R	= ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$
CF	= carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$
$BCEF_R$	= biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark), tonnes biomass removal (m^3 of removals)$^{-1}$

The emissions from fuelwood collection disturbances are estimated using the default 2006 IPCC Guidelines methodology (volume 4,chapter 2, equation 2.13).

$$L_{fuelwood} = [\{FG_{trees} \bullet BCEF_R \bullet (1+R)\} + FG_{part} \bullet D] \bullet CF$$

Where:

$L_{fuelwood}$	= annual carbon loss due to fuelwood removals, tonnes C yr^{-1}
FG_{trees}	= annual volume of fuelwood removal of whole trees, m^3 yr^{-1}
FG_{part}	= annual volume of fuelwood removal as tree parts, m^3 yr^{-1}
R	= ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$
CF	= carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$
D	= basic wood density, tonnes d.m. m^3
$BCEF_R$	= biomass conversion and expansion factor for conversion of removals in merchantable volume to total biomass removals (including bark), tonnes biomass removal (m^3 of removals)$^{-1}$

The emissions for disturbances are estimated using the default 2006 IPCC Guidelines methodology (volume 4, chapter 2, equation 2.14).

$$L_{disturbance} = \{A_{disturbance} \bullet B_W \bullet (1+R) \bullet CF \bullet fd\}$$

Where:

$L_{disturbances}$	=	annual other losses of carbon, tonnes C yr^{-1}
$A_{disturbance}$	=	area affected by disturbances, ha yr^{-1}
BW	=	average above-ground biomass of land areas affected by disturbances, tonnes d.m. ha^{-1}
R	=	ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$
CF	=	carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$
f_d	=	fraction of biomass lost in disturbance

For Tier 1 emissions, R has been taken as zero as no changes of below-ground biomass are assumed. Also, the value of parameter fd, which defines the proportion of biomass that is lost from the biomass pool has been taken as 1 for Tier 1 emissions, as it is assumed that a stand replacing disturbance will kill all.

Table 90: Parameters used in the GHG inventory per forest species

Ecological Zone	Category	Species	Climate Region	Ecosystem Type	Soil Type	Age class	Growing stock (m3/ha)	C Frac.	R	BCEF	AGB	AGB growth (t C/year)	SOC	Litter C
Wet Upland Forest R > 2000mm	Plantation	Pinus	Tropical Wet	Tropical rainforest	HAC	< 20 yr	121-200	0.47	0.37	0.77	60	20	44	5.2
	Plantation	Pinus	Tropical Wet	Tropical rainforest	HAC	> 20 yr	121-200	0.47	0.37	0.77	200	20	44	5.2
	Plantation	Euc.	Tropical Wet	Tropical rainforest	HAC	> 20 yr	121-200	0.47	0.37	1.44	277	6	44	2.1
	Plantation	Cryptomeria	Tropical Wet	Tropical rainforest	HAC	> 20 yr	61-80	0.47	0.37	0.89	38	6	44	5.2
	Plantation	Araucaria	Tropical Wet	Tropical rainforest	HAC	> 20 yr	> 200	0.47	0.37	0.77	202	6	44	5.2
	Natural F.	Natural	Tropical Wet	Tropical rainforest	HAC	> 20 yr	61-80	0.47	0.37	1.89	130	3.1	44	2.1
Moist Forest 2000mm>R>1000mm	Plantation	Euc.	Trop. Moist,Short Dry Season	Trop.Moist deciduous F.	LAC	> 20 yr	121-200	0.47	0.24	1.44	166	9	47	2.1
	Plantation	Tabebuia	Trop. Moist,Short Dry Season	Trop. Moist deciduous F.	LAC	> 20 yr	121-200	0.47	0.2	1.44	280	9	47	2.1
	Plantation	Araucaria	Trop. Moist,Short Dry Season	Trop. Moist deciduous F.	LAC	> 20 yr	> 200	0.47	0.24	0.77	190	9	47	5.2
	Plantation	Casuarina	Trop. Moist,Short Dry Season	Trop. Moist deciduous F.	LAC	> 20 yr	121-200	0.47	0.24	1.44	155	9	47	2.1
	Natural F.	Natural	Trop. Moist,Short Dry Season	Trop. Moist deciduous F.	LAC	> 20 yr	41-60	0.47	0.2	2.28	82	1.3	47	2.1
Dry Lowland Forest R< 1000mm	Plantation	Euc.	Tropical Dry	Tropical Dry Forest	Sandy M.	> 20 yr	41-80	0.47	0.28	0.89	139	13	31	2.1
	Plantation	Tabebuia	Tropical Dry	Tropical Dry Forest	LAC	> 20 yr	121-200	0.47	0.28	0.73	260	10	35	2.1
	Plantation	Araucaria	Tropical Dry	Tropical Dry Forest	LAC	> 20 yr	> 200	0.47	0.28	0.61	179	10	35	5.2

Ecological Zone	Category	Species	Climate Region	Ecosystem Type	Soil Type	Age class	Growing stock (m3/ha)	C Frac.	R	BCEF	AGB	AGB growth (t C/year)	SOC	Litter C
	Plantation	Casuarina	Tropical Dry	Tropical Dry Forest	Sandy M.	> 20 yr	81-120	0.47	0.28	0.73	126	10	31	2.1
	Natural F.	Scrubland	Tropical Dry	Tropical Dry Forest	Sandy M.	> 20 yr	21-40	0.47	0.28	2.11	55	1.8	31	2.1

Since there was not available information for all changes between and from/to the different forest species categories for the whole inventory period and because by applying this disaggregated level (at forests species level) the development of the annual land use matrices would be very complicated, for the purposes of this GHG inventory, parameters of specific forest species were assigned to each of the forest land strata presented above, taking into account the information available for deforestation events, harvestings and disturbances occurring in the different forest species (i.e. in which forest species harvestings, wood removals and disturbances occur).

For the estimation of carbon losses due to hardwood and fuelwood removals, the following data on annual harvestings was used:

Table 91: Data on annual harvestings

Year	Harvest of roundwood (m^3/year)	Hardwood (*Eucalyptus spp*)	Softwood (*Pinus elliottii*)	Fuelwood gathering (m^3/year)	Hardwood (*Eucalyptus spp*)	Softwood (*Pinus elliottii*)
2017	939	81	858	4,116	355	3,761
2018	846	79	767	3,821	357	3,464
2019	963	272	691	5,456	1,541	3,915
2020	341	88	273	3,517	908	2,609
2021	278	54	224	2,197	427	1,770
2022	266	87	179	2,550	834	1,716

The basic density values of 0.51 t dm/m3 and 0.46 t dm/m3 for Eucalyptus and Pinus, respectively, were used. The harvesting of Christmas trees (Pinus) has also been considered while estimating carbon losses due to hardwood. The data for harvested Christmas trees for the year 2017-2022 is given in Table 92.

Table 92: Data on harvested Christmas trees

Year	Volume (m^3)	Extent (Ha)
2017	11.27	0.7
2018	10	0.63
2019	16.06	1.0
2020	15.22	0.95
2021	18.33	1.15
2022	23.16	1.45

Dead organic matter, Soil organic matter (SOM)

For the dead organic matter and soil organic matter pools, the tier 1 assumption from 2019 Refinement to the 2006 IPCC guidelines was followed, according to which the carbon pools are in equilibrium. Thus, carbon stock changes are assumed to be zero for the whole inventory period.

5.3.4 Cropland, Grassland, Wetlands, Settlements, Other land

5.3.4.1 Source Category Description

Cropland

Cropland includes arable land that includes the cultivation areas of all annual and perennial crops. Cropland also includes areas that are traditionally and historically under cultivation but left fallow, temporarily for the land to ready for cultivation again. The amount of time the land is left fallow can range from months to several years, depending on the farming practices followed.

While annual crops include vegetables, root crops and cereals which complete their production cycle within one year of planting. Perennial crops include trees and shrubs like tea and also grasses like sugarcane. Other perennial crops include fruit trees and orchards including oil palm, coconut, rubber trees, and bananas, so long as they are part of the agricultural system and not of the forest system. Land areas that contribute to agriculture allied systems like grazing land for livestock are also considered as under croplands.

In the Republic of Mauritius cropland comprises mostly sugarcane cultivation which covers about 42,145 ha (2022) land area (Statistics Mauritius 2023). Cropland in RoM comprise:

- Sugarcane
- Tea
- Mixed cropping
- Orchards

Grassland

Grasslands are distinct from forests. Grasslands are defined as ecosystems which have less than 10% of tree or shrub coverage. In some cases, wooded grasslands are categorised as those that have 10-40% of tree and shrub coverage. The percentage composition changes from region to region. Below-ground carbon is the most significant carbon pool in grassland ecosystems.

According to 2006 IPCC Guidelines, this category includes rangelands and pastureland that are not considered cropland. It also includes systems with woody vegetation and other non-grass vegetation such as herbs and brushes that fall below the threshold values used in the forest land category. The category also includes all grassland from wild lands to recreational areas as well as agricultural and silvi-pastoral systems, consistent with national definitions. In RoM, this category includes land that is left as unoccupied that is invaded by bushes and a few patches of trees, part of hunting areas in private forests and along mountainsides. Since they include some woody biomass, they have been accounted for.

Wetlands

Wetlands include any land that is temporarily or permanently covered or saturated by water for all or part of the year, and that does not fall into the forest land, cropland, or grassland categories.

Wetlands can be constructed and managed and also be natural and unmanaged.

Constructed wetlands and managed wetlands are artificially recharged whereas natural wetlands are naturally replenished through.

Emissions from unmanaged wetlands need not to be estimated.

This category in RoM is considered to be managed as reservoirs and rivers and their surrounding areas. Hence, the trees around them have been considered. However, the 2006 IPCC Guidelines do not provide methods to account for these sinks and therefore the calculations have been included in forests.

Settlements

Settlements are defined as including all built up areas and supporting infrastructure. Any habitation, residential or private property, manufacturing and commercial units, roads, transportation, are included in this category, unless included in some other category.

The land-use category settlements include soils, herbaceous perennial vegetation such as turf grass and garden plants, trees in rural settlements, homestead gardens and urban areas. Examples of settlements include land along streets, in residential (rural and urban) and commercial lawns, in public and private gardens, in golf courses and athletic fields, and in parks, provided such land is functionally or administratively associated with particular cities, villages or other settlement types and is not accounted for in another land-use category.

The trees within the compounds of houses, along roads, parks and others within settlements form an additional sink of carbon in the Republic of Mauritius.

Other Land

Other land includes bare soil, rock and all land areas that do not fall into any of the other five land-use categories. Other land is often unmanaged, and in that case changes in carbon stocks and non-CO2 emissions and removals are not estimated. According to the 2006 IPCC Guidelines, this land-use category is included to allow the total of identified land areas to match the national area.

5.3.4.2 Methodological Issues

Tier 1 approach of the 2019 Refinement to the 2006 IPCC Guidelines has been used to estimate the emissions for settlements.

5.3.5 Results

Land (category 3.B) net removals decreased from -401.32 Gg CO_{2e} in the year 2017 to -400.97 Gg CO_{2e} in 2022, a decrease of 0.07%. In Table 93 below, net emissions and removals from forest land and settlements category are presented for the inventory time series:

Table 93: Net emissions/removals from Land (3.B) and the six main land-use categories (Gg CO_{2e})

IPCC Categories ↓ Year→	2017 (Gg CO_{2e})	2018 (Gg CO_{2e})	2019 (Gg CO_{2e})	2020 (Gg CO_{2e})	2021 (Gg CO_{2e})	2022 (Gg CO_{2e})
3.B.1 Forest land	-427.14	-427.07	-424.14	-426.80	-427.97	-427.46
3.B.5 Settlements	0	0.28	0.70	0.10	0.50	0.43
Total	-427.14	-426.79	-423.45	-426.70	-427.47	-427.03

5.3.6 Quality Control

All the field data collected (e.g. Plantation sites, area, silvicultural practices, dbh, tree height, volume of forest produce harvested, among others) are verified at every stages by the ForestryService of Mauritius and the same is reported regularly to the Statistics of Mauritius which then reports the total amount of emission reduction, harvesting of wood, plantation details in Digest of Environment which is published annually by the Statistics of Mauritius. The values used in this inventory have been obtained from these annual statistics.

On the other hand, to ensure the use of right data in the inventory, some of the QC implemented during the data collection and emission estimation is listed below:

- Cross verification between data provided via mail by Forest Service and data reported in the national statistics of Mauritius.
- Cross verification between the GHG emissions and removals estimated in the current inventory for AFOLU sectors and the results obtained in the last reported national inventory of the RoM.

Finally, it should be noted that an appropriate archiving system is in place in order to store all information used in the development of the GHG inventory, including the time series of activity data, emission/stock change factors and parameters used, along with their data sources.

5.3.7 Uncertainty Assessment

The uncertainty analysis does not include the Land sector. In relation to the uncertainty of the input data, since most of the parameters used in the GHG inventory are 2019 Refinement to the 2006 IPCC defaults, the uncertainty associated with those parameters is the respective provided by the 2019 Refinement to the 2006 IPCC Guidelines. The uncertainty associated with activity data, in particular with the area data for land representation has not been assessed and is planned as a future improvement for the next GHG inventory.

5.3.8 Recalculations

The recalculations implemented in the current GHG inventory are mainly the result of the complete refinement of the land representation and the updated approach for developing consistent land-use matrices.

5.3.9 Planned Improvements

During the development process of the GHG inventory, the major data gaps identified were in relation to the area data availability for land uses and land use changes. This information covers the changes within the same land-use category (e.g. changes between different forest species, changes between annual and perennial croplands, etc.) but also changes between different land-use categories (e.g. possible changes in addition to forest land conversions to other land uses) in order to develop a finer and more disaggregated land-use matrix.

5.4 Aggregate sources and non-CO2 emissions sources on land (Category 3C)

5.4.1 Source Category Description

Aggregate Sources and non-CO_2 Emissions Sources on Land (3.C) include the following sources of emissions.

- 3C1 GHG emissions from biomass burning
- 3C2 Liming
- 3C3 Urea application
- 3C6 Indirect N_2O emissions from manure management
- 3C7 Rice cultivation
- 3C8 Other

In the GHGI of Mauritius, the following sources have been estimated:

- 3C1 GHG emissions from biomass burning (only forest land)
- 3C4 Direct N_2O emissions from managed soils
- 3C5 Indirect N_2O emissions from managed soils
- 3C6 Indirect N_2O emissions from manure management

It is considered that the use of limestone and dolomite (liming) is not occurring and there is no information available on the use of or urea application in the crops. So, emissions from categories 3C2 and 3C3 have not been calculated. Furthermore, rice cultivation emissions are associated to flooding of rice fields. However, no flooded rice practices occur in Mauritius so emissions from category 3C7 have not been calculated.

5.4.2 Methodological Issues

Tier 1 approach of the 2019 Refinement to the 2006 IPCC Guidelines has been used to estimate the emissions from biomass burning, direct and indirect N_2O emissions from managed soils and indirect emissions from manure management.

5.4.3 Calculations

GHG emissions from biomass burning

The emissions are estimated using the default 2019 Refinement to the 2006 IPCC Guidelines methodology (volume 4, chapter 2, equation 2.27):

$$L_{disturbance} = \{A_{disturbance} \bullet B_W \bullet (1+R) \bullet CF \bullet fd\}$$

Where:

$L_{disturbances}$	=	annual other losses of carbon, tonnes C yr^{-1}
$A_{disturbance}$	=	area affected by disturbances, ha yr^{-1}
BW	=	average above-ground biomass of land areas affected by disturbances, tonnes d.m. ha^{-1}
R	=	ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)$^{-1}$
CF	=	carbon fraction of dry matter, tonne C (tonne d.m.)$^{-1}$
f_d	=	fraction of biomass lost in disturbance

The value of R has been taken as 0 as no changes of below-ground biomass are assumed during Tier 1 calculations. Additionally, the Above Ground Biomass values for Dry Lowland forests have been considered for calculating emissions by burning of Eucalytus spp., Csuarina spp., and scrubland, whereas for Pinus spp., Above Ground Biomass values for Wet Lowland forests have been considered.

Direct N_2O emissions from managed soils

Direct N_2O emissions from managed soils are the result of different inputs to the soil:

- Synthetic fertilizers;
- Animal manure, compost and sewage sludge;
- Crop residues; and
- Pasture, range and paddock

Synthetic fertilizers

For 2017-2022, the fertilizer has been estimated by considering local production in estimating the amount of fertiliser applied to land (i.e., data from Statistics Mauritius and FAREI).

Animal manure, compost and sewage sludge

Animal manure applied to soils is estimated based on the N excreted in the farms (see section 5.2 Livestock) No information was available on the content of compost and sewage sludges applied to soils.

Crop residues

Data on crop residues inputs to soils is taken from Digest Statistic Report (2019) and past unpublished results of research projects available at the FAREI. The dry matter fraction of crop residues was obtained from a combination of unpublished data and expert knowledge from different crop specialists. The 2017 value was used for all the years for the period 2018-2022 due to lack of available data for those years.

Pasture, range and paddock

Animal manure in pasture, range and paddock is estimated based on the N excreted and the percentage of animals in pasture system (see section 5.2 Livestock). No losses are considered in line with the 2006 IPCC Guidelines.

The N inputs to managed soils are shown in the below table:

Table 94: N inputs to soils (t N)

Year	Synthetic fertilizers (kg N)	Animal manure, compost and sewage sludge (kg N)	Crop residues (kg N)	Pasture, range and paddock (kg N)
2017	11153161	570190	27980017	20966
2018	9730376	566370	27980017	13736
2019	9553430	594123	27980017	19241
2020	7887746	610643	27980017	26163
2021	10740317	613894	27980017	22663
2022	8000306	582823	27980017	17822

Indirect N_2O emissions from managed soils

The indirect N_2O emissions from managed soils activity data is same as the inputs of N to the managed soils:

- Synthetic fertilizers;
- Animal manure, compost and sewage sludge;
- Crop residues; and
- Pasture, range and paddock

Indirect N_2O emissions from manure management

Indirect N_2O emissions due to manure management are estimated based on Tier 1 approach of the 2019 Refinement to the 2006 IPCC Guidelines. The Tier 1 calculation of N volatilisation in forms of NH_3 and NO_x from manure management systems is based on multiplication of the amount of nitrogen excreted (from all livestock categories) and managed in each manure management system by a fraction of volatilised nitrogen. N losses are then summed over all manure management systems. The Tier 1 method is applied using default nitrogen excretion data, default manure management system data and default fractions of N losses from manure management systems due to volatilisation.

$$N_{volatilization-MMS} = \sum_{S}\left[\sum_{T,P}\left[\left(\left(\left(N_{(T,P)} \bullet Nex_{(T,P)}\right) \bullet AWMS_{(T,S,P)}\right) + N_{cdg(s)}\right) \bullet Frac_{GasMS(T,S)}\right]\right]$$

Where:

$N_{volatilization-MMS}$	=	amount of manure nitrogen that is lost due to volatilisation of NH_3 and NO_x, kg N yr^{-1}
$N_{(T,P)}$	=	number of head of livestock species/category T in the country, for productivity system P, when applicable
$Nex_{(T,P)}$	=	annual average N excretion per head of species/category T in the country, for productivity system P, when applicable in kg N $animal^{-1}$ yr^{-1}
$N_{cdg(s)}$	=	amount of nitrogen from co-digestates added to biogas plants such as food wastes or purpose grown crops, kg N yr^{-1} where the system (s) refers exclusively to anaerobic digestion
P	=	productivity class, high or low, to be considered if using the Tier 1a approach
$AWMS_{(T,S,P)}$	=	fraction of total annual nitrogen excretion for each livestock species/category T that is managed in manure management system S in the country, dimensionless. To consider productivity class P, if using a Tier 1a approach
$Frac_{GasMS(T,S)}$	=	fraction of managed manure nitrogen for livestock category T that volatilises as NH_3 and NO_x in the manure management system S

5.4.4 Activity Data

GHG emissions from biomass burning

Forest land

Biomass burning emissions from forest land are the result of fires in forest land. For the estimation of carbon losses due to forest fires, the following data was used:

Table 95: Area affected by forest fires

Year	Forest fires	Pinus	Eucalyptus	Casuarina	Scrubland
2017	41	0	6	0	35
2018	86	0	15	0	71
2019	100	0	19	0	81
2020	101	0	18	0	83
2021	50	0	8	0	42
2022	71	0	10	0	61

Indirect N_2O emissions from manure management

The number of species in each livestock category is the same as taken for calculation of direct N_2O emissions from manure management.

5.4.5 Emission factors

For indirect N_2O emissions from manure management, IPCC Default Values for fraction of managed manure nitrogen for livestock category T that volatilizes as NH_3 have been shown in Table 96 (Source: Table 10.22 Chapter 10). FRAC values have been taken for Solid storage system in covered/compacted system variation:

Table 96: IPCC Default Values for fraction of managed manure nitrogen for livestock category T that volatilises as NH3

Category	FRAC - fraction of managed manure nitrogen for livestock category T that volatilises as NH_3 and NOx in the manure management system S
Cattle	0.14
Dairy cow	0.14
Bulls	0.22
Calf	0.22
Heifers	0.22
Boar	0.22
Fattener	0.22
Piglet	0.22
Sow/gilt	0.22
Sheep	0.05
Goat	0.05
Horse	NA
Broiler	0.2
Layers	0.2

Table 97: IPCC Default Emission Factors to Estimate Direct N2O Emissions from Managed Soils for Tier 1 Method

Emission factor	**Aggregated Default value**
EF_1 for N additions from synthetic fertilisers, organic amendments and crop residues, and N mineralised from mineral soil as a result of loss of soil carbon1 [kg N_2O– N (kg N)$^{-1}$]	0.01
$EF3_{PRP}$, CPP for cattle (dairy, non-dairy and buffalo), poultry and pigs3 [kg N_2O–N (kg N)$^{-1}$]	0.004
EF_4 [N volatilisation and redeposition]$^{-1}$, kg N_2O–N (kg NH_3–N + NOx–N volatilised)$^{-1}$	0.01
$Frac_{GASF}$ [Volatilisation from synthetic fertiliser], (kg NH_3–N + NOx–N) (kg N applied)$^{-1}$	0.11
$Frac_{GASM}$ [Volatilisation from all organic N fertilisers applied, and dung and urine deposited by grazing animals], (kg NH_3–N + NOx–N) (kg N applied or deposited)$^{-1}$	0.21

5.4.6 Results

Category 3.C emissions decreased from 48.40 Gg CO_2e in the year 2017 to 48.27 Gg CO_{2e} in 2022, which resulted in a decrease of 0.26%. GHG emissions from category 3.C.1a biomass burning increased from 0.24 Gg CO_{2e} in the year 2017 to 0.41 Gg CO_{2e} in 2022, an increase of 70.83%. Direct N_2O emissions from managed soils decreased from 165.37 Gg CO_2e in 2017 to 152.29 Gg CO_{2e} in 2022, a decrease of 7.9%. Category 3C5 Indirect N_2O emissions from managed soils decreased from 48.16 Gg CO_{2e} in 2017 to 47.86 Gg CO_{2e} in 2022, a decrease of 0.62%. Indirect N_2O emissions from manure management decreased from 48.16 Gg CO_{2e} in the year 2017 to 47.86 Gg CO_{2e} in 2022, a decrease of 0.62%.

Table 98: GHG Emissions from Forest land and manure management for 2017 - 2022

Year ↓ IPCC Categories→	3C1a GHG emissions from biomass burning – forest land (Gg CO_{2e})	3C4 Direct N_2O emissions from managed soils (Gg CO_{2e})	3C5 Direct N_2O emissions from managed soils (Gg CO_{2e})	3C6 Indirect N_2O emissions from manure management (Gg CO_{2e})	Total
2017	0.24	165.37	5.63	48.16	48.40
2018	0.56	159.42	4.96	47.87	48.43
2019	0.68	158.81	4.91	47.83	48.50
2020	0.66	151.95	4.17	47.81	48.47
2021	0.31	163.84	5.48	47.92	48.23
2022	0.41	152.29	4.19	47.86	48.27

5.4.7 Quality Control

Information was generally obtained from official sources, including Statistics Mauritius and its Digest of Agriculture and Environment Statistics. Statistics Mauritius applies quality controls to the information before publicly realising it. If statistics were not available, expert judgement has been used to fill the gaps. Quality and reliability of data: All data collected was done using local expertise, experience in this sector and to the best of knowledge.

5.4.8 Uncertainty Assessment and Time-series Consistency

Category 3C uncertainties have not been considered in this National GHG Emission Inventory due to the lack of information on the uncertainty of the activity data used.

5.4.9 Recalculations

No recalculations have been implemented for this category. Only new data have been incorporated for 2014-2016 period.

5.4.10 Planned Improvements

Several categories were not estimated due to the lack of activity data. There is a need to raise information for enhancing the completeness of this category.

Activity data time-series are not complete (e.g. crop residues). A system for collecting updated data needs to be put in place.

Chapter 6: Waste Sector

6.1. Overview

Waste sector emissions estimation of CO_2, CH_4, and N_2O is categorised into four categories:

1. Solid Waste Disposal
2. Biological treatment of solid waste
3. Incineration and open burning of waste
4. Wastewater treatment and discharge

Waste sector in the RoM corresponds to the second highest GHG emissions in the country. Methane (CH_4) emissions from solid waste is the largest source of greenhouse gas emissions in waste sector, whereas CH_4 emissions from wastewater treatment and discharge are typically the second largest contributor. Nitrous oxide emissions (N_2O) may also be an important source of emissions through nitrification and denitrification at wastewater treatment plants.

Incineration and open burning of waste such as clinical waste are the most important sources of direct CO_2 emissions in the Waste sector. All greenhouse gas emissions from waste-to-energy, where waste material is used directly as fuel or converted into a fuel, should be estimated and reported under the Energy Sector. Biological treatment of solid waste e.g., composting releases both CH_4 and N_2O emissions, typically having a minor share in emissions from waste sector.

It is important to mention that CO_2 is also produced in SWDS, wastewater treatment and burning of non-fossil waste, but this CO_2 is of biogenic origin and is therefore not included as a reporting item in this sector.

6.1.1. General methodology

The general methodology used in the waste sector is collected in the Table 99:

Table 99: Methodology used for the Waste Sector

Category	Activity data	Emission factor	Activity data source
4.A - Solid Waste Disposal			
4.A.1 - Managed Waste Disposal Sites	T2	D/T1	Solid Waste Management Division, Statistics Mauritius
4.B - Biological Treatment of Solid Waste			
4.B - Biological Treatment of Solid Waste	T1	D/T1	Solid Waste Management Division, Statistics Mauritius
4.C - Incineration and Open Burning of Waste			
4.C.1 - Waste Incineration	T1	D/T1	Ministry of Health and Wellness
4.D – Wastewater Treatment and Discharge			
4.D.1 - Domestic and commercial Wastewater Treatment and Discharge	T1/T2	D/T1	Wastewater Management Authority, Statistics Mauritius
4.D.2 - Industrial Wastewater Treatment and Discharge	T1/T2	D/T1	Wastewater Management Authority, Statistics Mauritius

T1: Tier 1; T2: Tier 2; D: Default; CS: Country Specific; NO: Not Occurring; NA: Not Applicable; NE: Not Estimated.

6.2. Solid Waste Disposal (Category 4A)

Solid waste is a major category consisting of municipal, industrial and other solid waste produces deposited typically in solid waste disposal sites (SWDS) such as Landfills. Methane (CH_4) emissions from solid waste disposal sites are a significant contributor to global greenhouse gas emissions. Decomposition of organic material derived from biomass sources (e.g., paper, food, garden, wood) produces carbon dioxide (CO_2) along with methane. These CO_2 emissions are not included in national totals, because the carbon is of biogenic origin and net emissions are accounted for under the AFOLU Sector.

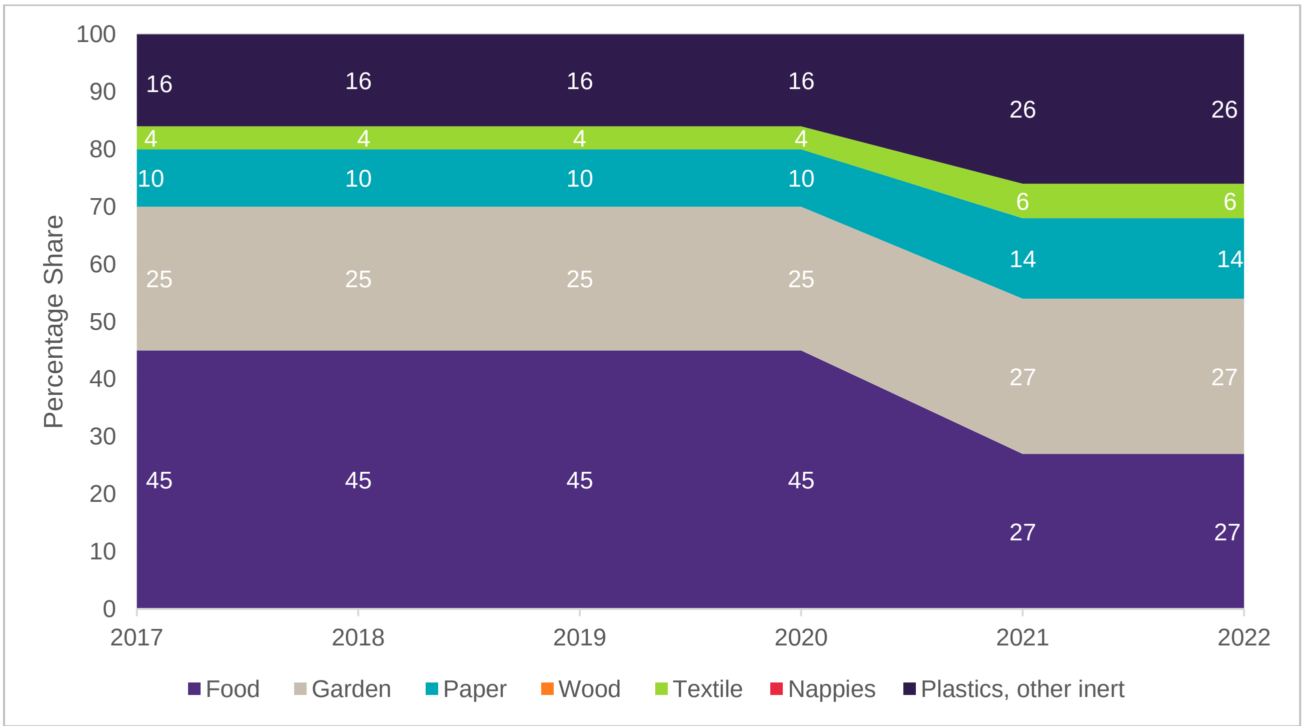
The solid waste is the largest share of emissions under the waste sector. In Republic of Mauritius (RoM), category 4A solid waste disposal, there are two prominent categories - Managed Waste Disposal Sites and Uncategorized Waste Disposal Sites where the solid waste disaggregation is taken into account.

6.2.1. Background of the solid waste disposal in Mauritius

The Solid Waste Management Division is responsible for the setting up and operation of waste management facilities, including landfill and transfer stations whilst Local Authorities, which operate under the aegis of the Ministry of Local Government, are responsible for the collection and conveyance of domestic wastes to the five transfer stations across the Mauritius island. Domestic wastes are stored in appropriate storage receptacles by households. Solid waste in Mauritius is sent to waste management facilities. The waste management facilities in the island of Mauritius are modern and well managed. Whereas the management facilities in Rodrigues are under upgradation and will be well managed in the future as well.

The composition of solid waste in the Republic of Mauritius has typically been dominated by food waste which had a share of 45% in 2017 but reduced to 27% in 2021 onwards. Garden waste has been the second biggest contributor with a 25% share from 2017-20 which increased to 27% in 2021 onwards. Plastics and other inert waste are the third biggest contributor having a share of 16% from 2017-20 which increased to 26% from 2021 onwards. Similarly other categories of waste being deposited are Paper waste and textile waste having minor share whereas it was reported that wood and nappies share in solid waste is negligible.

Figure 40: Composition of solid waste in RoM from 2017 till 2022



6.2.2. Methodology adopted for GHG emission calculation:

The activity data for calculation of emissions was collected from the Solid Waste Management Division from 2017 till 2022. Tier 2 activity data has been provided by the Solid Waste Management Division for solid waste disposal on a country level for the period of 2017 – 2022. The emission factors and other factors considered are default values given for relevant categories in IPCC 2006 guidelines and the 2019 refinement.

As reported in the IPCC Guidelines, CO_2 emissions of biogenic nature are not accounted. Methane (CH_4) emissions are considered as per the methodology given in IPCC guidelines. Nitrous Oxide (N_2O) emissions are not significant from solid waste disposal sites, therefore are not included in the national inventory. The non-CO_2 emissions from solid waste have been converted to the equivalent CO_2 emissions and subsequently accounted using the IPCC AR5 GWP values.

The IPCC methodology for estimating CH_4 emissions from SWDS is based on the First Order Decay (FOD) method. This method assumes that the degradable organic component (degradable organic carbon, DOC) in waste decays slowly throughout a few decades, during which CH_4 and CO_2 are formed. If conditions are constant, the rate of CH_4 production depends solely on the amount of carbon remaining in the waste. As a result, emissions of CH_4 from waste deposited in a disposal site are highest in the first few years after deposition, then gradually decline as the degradable carbon in the waste is consumed by the bacteria responsible for the decay.

Half-lives for different types of waste vary from a few years to several decades or longer. The FOD method requires data to be collected or estimated for historical disposals of waste over a period of 3 to 5 half-lives to achieve an acceptably accurate result. As per IPCC methodology, it is therefore good practice to use disposal data for at least 50 years as this time frame provides an acceptably accurate result for most typical disposal practices and conditions.

The Activity Data (AD), Emission Factors (EF) and other parameters for each of the category were entered in the latest IPCC Inventory Software for the computation of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

6.2.2.1 Calculation

The method presented in the 2006 IPCC Guidelines for calculation of CH_4 emissions from landfills is based on the "first order decay" method (FOD method), and same has been used for calculation of the emissions from solid waste disposal. The IPCC software has been used, so all required data and parameters have been included here to obtain the final CH_4 emissions. As per IPCC guidelines, the is therefore good practice to use disposal data for at least 50 years as this time frame, so activity data since 1960 have been considered as provided by the Solid Waste Management Division.

For the emission calculation, the FOD method is described below, as well as the relevant activity data and parameters used for determining methane formation in landfills.

$$CH_4\ emissions = [\Sigma\ CH_4\ generated\ _{x,T} - R_T] \bullet [1 - OX_T]$$

Where:

CH_4 Emissions	=	*CH_4 emitted in year T, Gg*
T	=	*inventory year*
x	=	*waste category or type/material*
R_T	=	*recovered CH_4 in year T, Gg*
OX_T	=	*oxidation factor in year T, (fraction)*

The CH_4 potential that is generated throughout the years can be estimated on the basis of the amounts and composition of the waste disposed into SWDS and the waste management practices at the disposal sites. The basis for the calculation is the amount of Decomposable Degradable Organic Carbon (DDOCm). The amount of CH_4 formed from decomposable material is found by multiplying the CH_4 fraction in generated landfill gas and the CH_4/C molecular weight ratio.

$$CH_4\ generated_T = DDOC_m\ decomp_T \bullet F \bullet 16/12$$

Where:

CH_4 generated$_T$	=	*amount of CH4 generated from decomposable material*
DDOCm decomp$_T$	=	*DDOCm decomposed in year T, Gg*
F	=	*fraction of CH4, by volume, in generated landfill gas (fraction)*
16/12	=	*molecular weight ratio CH_4/C (ratio)*

DDOCm is the part of the organic carbon that will degrade under the anaerobic conditions in SWDS. It is used in the equations and spreadsheet models as DDOCm. The index *m* is used for mass. DDOCm equals the product of the waste amount (W), the fraction of degradable organic carbon in the waste (DOC), the fraction of the degradable organic carbon that decomposes under anaerobic conditions (DOCf), and the part of the waste that will decompose under aerobic conditions (prior to the conditions becoming anaerobic) in the SWDS, which is interpreted with the methane correction factor (MCF). The amount of Decomposable Degradable Organic Carbon (DDOCm) is calculated as defined in below equation.

$$DDOCm = W \bullet DOC \bullet DOC_f \bullet MCF$$

Where:

DDOCm	=	*DDOCm decomposed in year T, Gg*
W	=	*mass of waste deposited, Gg*
DOC	=	*degradable organic carbon in the year of deposition, fraction, Gg C/Gg waste*
DOC_f	=	*fraction of DOC that can decompose (fraction)*
MCF	=	*CH_4 correction factor for aerobic decomposition in the year of deposition (fraction)*

First Order Decay Basics

With a first order reaction, the amount of product is always proportional to the amount of reactive material. This means that the year in which the waste material was deposited in the SWDS is irrelevant to the amount of CH4 generated each year. It is only the total mass of decomposing material currently in the site that matters.

This also means that when we know the amount of decomposing material in the SWDS at the start of the year, every year can be regarded as year number 1 in the estimation method, and the basic first order calculations can be done by following two simple equations, with the decay reaction beginning on the 1st of January the year after deposition.

DDOCm accumulated in the SWDS at the end of year T,

$$DDOCma_T = DDOCmd_T + (DDOCma_{T-1} \bullet e^{-k})$$

DDOCm decomposed at the end of year T,

$$DDOCm\ decomp_T = DDOCma_{T-1} \bullet (1 - e^{-k})$$

Where:

T	=	*Inventory year*
$DDOCma_T$	=	*DDOCm accumulated in the SWDS at the end of year T, Gg*
$DDOCma_{T-1}$	=	*DDOCm accumulated in the SWDS at the end of year (T-1), Gg*
$DDOCmd_T$	=	*DDOCm deposited into the SWDS in year T, Gg*

DDOCm decomp$_T$	=	*DDOCm decomposed in the SWDS in year T, Gg*
k	=	*reaction constant, k = ln (2)/$t_{1/2}$ (y^{-1}), where $t_{1/2}$ is half life time (y)*

6.2.2.2 Activity Data

The total activity data for solid waste disposal was collected from Solid Waste Management Division. The activity data used for calculation of methane emissions from solid waste disposal in republic of Mauritius is shown in Table 100 (Island of Mauritius) and Table 101 (Rodrigues).

Table 100: Total activity data for Solid waste disposal in Island of Mauritius

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
1960	652,703	156.5	102,135	0
1961	667,161	159.2	106,207	0
1962	681,619	161.9	110,358	0
1963	696,077	164.6	114,587	0
1964	710,535	167.3	118,895	0
1965	724,993	170.1	123,281	0
1966	739,451	172.8	127,746	0
1967	753,909	175.5	132,289	0
1968	768,367	178.2	136,911	0
1969	782,825	180.9	141,611	0
1970	797,283	183.6	146,389	0
1971	811,741	186.3	151,246	0
1972	826,199	189.0	156,181	0
1973	838,987	191.8	160,875	0
1974	851,774	194.5	165,638	0
1975	864,562	196.1	169,541	0
1976	877,350	199.9	175,372	0
1977	890,137	202.6	180,343	0
1978	902,925	205.3	185,383	0
1979	915,712	208.0	190,493	0
1980	928,500	210.7	195,672	0
1981	941,288	213.5	200,921	0
1982	954,075	216.2	206,239	0
1983	966,863	218.9	211,626	0
1984	974,805	221.6	216,009	0
1985	982,747	224.3	220,435	0

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
1986	990,689	227.0	224,904	0
1987	998,630	229.7	229,416	0
1988	1,006,572	232.4	233,972	0
1989	1,014,514	235.2	238,570	0
1990	1,022,456	237.9	243,212	0
1991	1,035,411	240.6	249,102	0
1992	1,048,367	243.3	255,063	0
1993	1,061,322	246.0	261,095	0
1994	1,074,278	251.3	269,966	0
1995	1,087,233	251.4	273,368	0
1996	1,100,189	254.2	279,611	0
1997	1,113,144	256.9	285,923	0
1998	1,125,118	259.6	292,051	0
1999	1,139,718	262.3	298,933	0
2000	1,151,094	262.4	302,000	0
2001	1,160,083	298.4	346,175	125
2002	1,167,995	320.3	374,152	48
2003	1,176,323	319.7	376,080	120
2004	1,183,533	326.0	385,811	189
2005	1,190,361	345.9	411,787	5,913
2006	1,195,676	333.7	398,983	8,056
2007	1,200,887	311.4	373,998	13,077
2008	1,204,955	321.5	387,340	12,148
2009	1,207,842	336.8	406,822	9,126
2010	1,210,391	344.4	416,853	10,949
2011	1,211,970	337.7	404,141	10,402
2012	1,214,987	341.9	380,556	7,370
2013	1,217,341	363.3	422,972	6,963
2014	1,219,265	371.8	412,287	5,191
2015	1,220,663	394.7	443,784	4,692
2016	1,221,213	392.0	440,411	4,284
2017	1,222,217	390.4	477,115	5,081
2018	1,222,208	440.7	538,605	4,592

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
2019	1,221,663	438.1	535,218	1,929
2020	1,221,759	412.5	504,020	5,074
2021	1,219,187	406.9	496,076	5,091
2022	1,216,139	406.8	494,717	2,875

Source: The activity data was provided by the Solid Waste Management Division, with actual values reported for population Municipal Solid Waste (MSW) – Landfill and sludge in tonnes. The values for waste generated per capital has been calculated for 2017 -2022 based on total solid waste to landfill and population figures.

Table 101: Total activity data for Solid waste disposal in Island of Rodrigues

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
1960	17,048	102.1	1,741	0
1961	17,692	102.1	1,806	0
1962	18,335	102.1	1,872	0
1963	18,978	102.1	1,938	0
1964	19,622	102.1	2,003	0
1965	20,265	102.1	2,069	0
1966	20,909	102.1	2,135	0
1967	21,552	102.1	2,200	0
1968	22,195	102.1	2,266	0
1969	22,839	102.1	2,332	0
1970	23,482	102.1	2,398	0
1971	24,126	102.1	2,463	0
1972	24,769	102.1	2,529	0
1973	25,525	102.1	2,606	0
1974	26,280	102.1	2,683	0
1975	27,036	102.1	2,760	0
1976	27,792	102.1	2,838	0
1977	28,548	102.1	2,915	0
1978	29,303	102.1	2,992	0
1979	30,059	102.1	3,069	0
1980	30,815	102.1	3,146	0
1981	31,571	102.1	3,223	0
1982	32,326	102.1	3,301	0
1983	33,082	102.1	3,378	0

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
1984	33,242	102.1	3,394	0
1985	33,403	102.1	3,410	0
1986	33,563	102.1	3,427	0
1987	33,723	102.1	3,443	0
1988	33,883	102.1	3,459	0
1989	34,044	102.1	3,476	0
1990	34,204	102.1	3,492	0
1991	34,355	102.1	3,508	0
1992	34,506	102.1	3,523	0
1993	34,657	102.1	3,538	0
1994	34,808	102.1	3,554	0
1995	34,958	102.1	3,569	0
1996	35,109	102.1	3,585	0
1997	35,260	102.1	3,600	0
1998	35,411	102.1	3,615	0
1999	35,640	102.1	3,639	0
2000	35,992	102.1	3,675	0
2001	36,414	102.1	3,718	0
2002	36,837	102.1	3,761	0
2003	37,258	102.1	3,804	0
2004	37,681	102.1	3,847	0
2005	38,106	102.1	3,891	0
2006	38,531	102.1	3,934	0
2007	38,954	102.1	3,977	0
2008	39,376	102.1	4,020	0
2009	39,798	102.1	4,063	0
2010	40,221	102.1	4,107	0
2011	40,663	102.1	4,152	0
2012	41,083	102.1	4,195	0
2013	41,504	102.1	4,238	0
2014	41,788	102.1	4,267	0
2015	42,058	102.1	4,294	0
2016	42,396	102.1	4,329	0

Year	Population (Capita)	Waste per capita (kg/capita)	MSW – Landfill (T)	Sludge – Landfill (T)
2017	42,818	102.1	4,372	0
2018	43,155	102.1	4,406	0
2019	43,538	102.1	4,445	0
2020	43,997	102.1	4,492	0
2021	44,427	102.1	4,536	0
2022	44,783	102.1	4,572	0

The food composition data provided by SWMD has been presented in Table 102.

Table 102: Total activity data for Solid waste disposal in RoM (Mauritius + Rodrigues), data in percentage

Year	Food	Garden	Paper	Wood	Textile	Nappies	Plastics, other inert	Total
1960	25	43	12	0	3	0	17	100
1961	25	43	12	0	3	0	17	100
1962	25	43	12	0	3	0	17	100
1963	25	43	12	0	3	0	17	100
1964	25	43	12	0	3	0	17	100
1965	25	43	12	0	3	0	17	100
1966	25	43	12	0	3	0	17	100
1967	25	43	12	0	3	0	17	100
1968	25	43	12	0	3	0	17	100
1969	25	43	12	0	3	0	17	100
1970	25	43	12	0	3	0	17	100
1971	25	43	12	0	3	0	17	100
1972	25	43	12	0	3	0	17	100
1973	25	43	12	0	3	0	17	100
1974	25	43	12	0	3	0	17	100
1975	25	43	12	0	3	0	17	100
1976	25	43	12	0	3	0	17	100
1977	25	43	12	0	3	0	17	100
1978	25	43	12	0	3	0	17	100
1979	25	43	12	0	3	0	17	100
1980	25	43	12	0	3	0	17	100
1981	25	43	12	0	3	0	17	100

Year	Food	Garden	Paper	Wood	Textile	Nappies	Plastics, other inert	Total
1982	25	43	12	0	3	0	17	100
1983	25	43	12	0	3	0	17	100
1984	25	43	12	0	3	0	17	100
1985	25	43	12	0	3	0	17	100
1986	25	43	12	0	3	0	17	100
1987	25	43	12	0	3	0	17	100
1988	25	43	12	0	3	0	17	100
1989	25	43	12	0	3	0	17	100
1990	25	43	12	0	3	0	17	100
1991	25	43	12	0	3	0	17	100
1992	25	43	12	0	3	0	17	100
1993	25	43	12	0	3	0	17	100
1994	25	43	12	0	3	0	17	100
1995	25	43	12	0	3	0	17	100
1996	25	43	12	0	3	0	17	100
1997	25	43	12	0	3	0	17	100
1998	25	43	12	0	3	0	17	100
1999	25	43	12	0	3	0	17	100
2000	25	43	12	0	3	0	17	100
2001	25	43	12	0	3	0	17	100
2002	25	43	12	0	3	0	17	100
2003	25	43	12	0	3	0	17	100
2004	25	43	12	0	3	0	17	100
2005	25	43	12	0	3	0	17	100
2006	25	43	12	0	3	0	17	100
2007	25	43	12	0	3	0	17	100
2008	25	43	12	0	3	0	17	100
2009	45	25	10	0	4	0	16	100
2010	45	25	10	0	4	0	16	100
2011	45	25	10	0	4	0	16	100
2012	45	25	10	0	4	0	16	100
2013	45	25	10	0	4	0	16	100

Year	Food	Garden	Paper	Wood	Textile	Nappies	Plastics, other inert	Total
2014	27	27	14	0	6	0	26	100
2015	27	27	14	0	6	0	26	100
2016	27	27	14	0	6	0	26	100
2017	45	25	10	0	4	0	16	100
2018	45	25	10	0	4	0	16	100
2019	45	25	10	0	4	0	16	100
2020	45	25	10	0	4	0	16	100
2021	27	27	14	0	6	0	26	100
2022	27	27	14	0	6	0	26	100

The recovered methane values are given in Table 103. Methane was not captured or flared for the years 1960-2008 and 2017-2022 as per Solid Waste Management Division.

Table 103: CH_4 recovered, flared and energy recovery data from solid waste disposal sites (2009 – 2016)

Year	CH_4 recovered (t)	CH_4 flared (t)	CH_4 energy recovery (t)
2009	2,316	2,316	0
2010	1,906	1,906	0
2011	2,289	64	2,224
2012	2,958	166	2,792
2013	3,945	105	3,840
2014	4,223	9	4,214
2015	3,973	32	3,941
2016	3,626	17	3,609

6.2.2.3 Emission Factors and parameters

The calculation of methane emissions is done based on various parameters as stated above. The values for degradable organic carbon in the year of deposition (DOC) and other parameters such as Oxidation Factor (OX), Fraction of DOC that decomposes (DOC_f), fraction of methane in landfill gas generated (F), etc. are taken from IPCC 2006 guidelines for the calculation of emissions as provided in below tables.

Table 104: DOC values (fraction)

Food	Garden	Paper	Wood	Textile	Nappies	Sewage sludge	Plastics, other inert
0.15	0.2	0.4	0.43	0.24	0.24	0.05	0

Table 105: Oxidation Factor (OX) assumed for Solid Waste Disposal Emissions Estimates

IPCC Default Oxidation Factor (OX) for SWDS	
Type of Site	Ox value
Managed, unmanaged and uncategorised SWDS	0

IPCC Default Oxidation Factor (OX) for SWDS	
Managed covered with CH4 oxidising material	0.1

Table 106: Default DOC_f values (fraction) – fraction of degradable organic component which decomposes

IPCC Default Fraction of Degradable Organic Component which decomposes (DOC_f) for different waste types	
Type of MSW	2019 refinement DOC_f values (fraction)
Food	0.5
Garden	0.5
Paper	0.5
Wood	0.5
Textile	0.5
Nappies	0.5
Sewage sludge / Bulk waste	0.5
Plastics, other inert	0.5

Table 107: Default fraction of methane in generated landfill gas (F)

IPCC Default Fraction of CH_4 in generated Landfill gas (F)	
Type of Site	F Value
MSWD	0.5

For the emissions estimates it is necessary to determine the climate zone, which will determine the methane generation rate (k) values to be considered for the estimates. For landfills in RoM the climate zone "Tropical wet" has been assumed, and default *k* values associated to this climate zone are presented in Table 108.

Table 108: Recommended default methane generation (k) values

IPCC Default Methane generation rate (k) values*	
Type of MSW	k values
Food	0.40
Garden	0.17
Paper	0.07
Wood	0.035
Textile	0.07
Nappies	0.17
Sewage sludge / Bulk waste	0.40
Plastics, other inert	0

**Considering Mauritius mean annual precipitation is >1000mm and Mean Annual Temp. > 20C (Tropical)*

The methane correction factor for the republic of Mauritius is taken based on the distribution on the type of solid waste management facilities. The activity data is provided in

Table 109.

Table 109: MCF values for Republic of Mauritius (data in percentage)

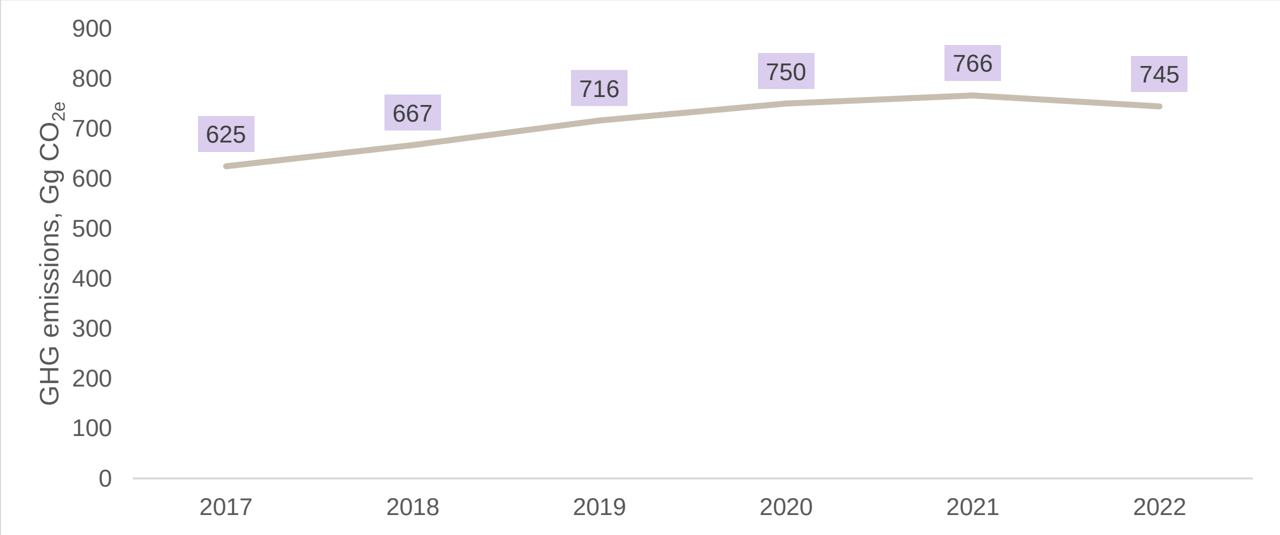
Year	Managed-Aerobic waste share (MCF=1)	Uncategorized SWDS share (MCF=0.6)	Weighted MCF
1960	0%	100%	0.6
1961	0%	100%	0.6
1962	0%	100%	0.6
1963	0%	100%	0.6
1964	0%	100%	0.6
1965	0%	100%	0.6
1966	0%	100%	0.6
1967	0%	100%	0.6
1968	0%	100%	0.6
1969	0%	100%	0.6
1970	0%	100%	0.6
1971	0%	100%	0.6
1972	0%	100%	0.6
1973	0%	100%	0.6
1974	0%	100%	0.6
1975	0%	100%	0.6
1976	0%	100%	0.6
1977	0%	100%	0.6
1978	0%	100%	0.6
1979	0%	100%	0.6
1980	0%	100%	0.6
1981	0%	100%	0.6
1982	0%	100%	0.6
1983	0%	100%	0.6
1984	0%	100%	0.6
1985	0%	100%	0.6
1986	0%	100%	0.6
1987	0%	100%	0.6
1988	0%	100%	0.6
1989	0%	100%	0.6

Year	Managed-Aerobic waste share (MCF=1)	Uncategorized SWDS share (MCF=0.6)	Weighted MCF
1990	0%	100%	0.6
1991	0%	100%	0.6
1992	0%	100%	0.6
1993	0%	100%	0.6
1994	0%	100%	0.6
1995	0%	100%	0.6
1996	0%	100%	0.6
1997	98.80%	1.20%	0.9952
1998	98.80%	1.20%	0.9952
1999	98.80%	1.20%	0.9952
2000	98.80%	1.20%	0.9952
2001	98.90%	1.10%	0.9956
2002	99.00%	1.00%	0.996
2003	99.00%	1.00%	0.996
2004	99.00%	1.00%	0.996
2005	99.10%	0.90%	0.9964
2006	99.00%	1.00%	0.996
2007	98.90%	1.10%	0.9956
2008	99.00%	1.00%	0.996
2009	99.00%	1.00%	0.996
2010	99.00%	1.00%	0.996
2011	99.00%	1.00%	0.996
2012	98.90%	1.10%	0.9956
2013	99.00%	1.00%	0.996
2014	99.00%	1.00%	0.996
2015	99.00%	1.00%	0.996
2016	99.00%	1.00%	0.996
2017	99.00%	1.00%	0.996
2018	99.00%	1.00%	0.996
2019	98.90%	1.10%	0.996
2020	99.00%	1.00%	0.996
2021	99.00%	1.00%	0.996
2022	99.00%	1.00%	0.996

6.2.3. Results

The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 41.

Figure 41: GHG emissions from Solid Waste Disposal - 2017 to 2022 (Gg CO_{2e}/year)



The year wise fuel wise Methane emissions from solid waste disposal are given in Table 110. The emissions for solid waste categories such as Food, Garden, Textile, Paper, and sewage sludge are provided below. There were no methane emissions for other solid waste categories such as wood, nappies, plastics and other inert materials. The Global Warming Potential (GWP) values for methane has been taken from IPCC Assessment Report Version 5 for converting into CO_2 equivalent.

Table 110: Year wise and category wise GHG emissions from solid waste disposal

Year ↓ Waste Category→	Food, Gg CH_4	Garden, Gg CH_4	Paper, Gg CH_4	Textile, Gg CH_4	Sewage sludge, Gg CH_4	Total, Gg CO_{2e}
2017	6.7	8.0	5.2	2.2	0.1	**624.7**
2018	8.1	8.0	5.3	2.3	0.1	**667.1**
2019	9.4	8.2	5.4	2.5	0.1	**716.1**
2020	10.3	8.3	5.6	2.6	0.1	**750.2**
2021	10.7	8.3	5.6	2.7	0.1	**766.4**
2022	9.4	8.4	5.9	2.8	0.1	**744.6**

6.2.4. Quality Control

The activity data for solid waste disposal have been obtained from Solid Waste Management Division. The values used in this inventory have been obtained from the annual statistics. To ensure the use of right data in the inventory, some of the quality check implemented during the data collection and emission estimation are:

- Cross verification between data provided via mail by Solid Waste Management Division and data reported in the national Statistics Mauritius.
- Consistency of the overall generating waste balance
- Cross verification between the GHG emissions estimated in the current inventory for solid waste disposal activity and the results obtained in the last reported national inventory of the Republic of Mauritius.
- Cross verification carried out by key stakeholders once emissions were estimates.

6.2.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for solid waste disposal category are reported in the following table for 2000 as base year.

Table 111: Uncertainty Analysis of the Solid Waste Disposal (4A) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
4A – Solid Waste Disposal	CH_4	30.00	30.00	42.43

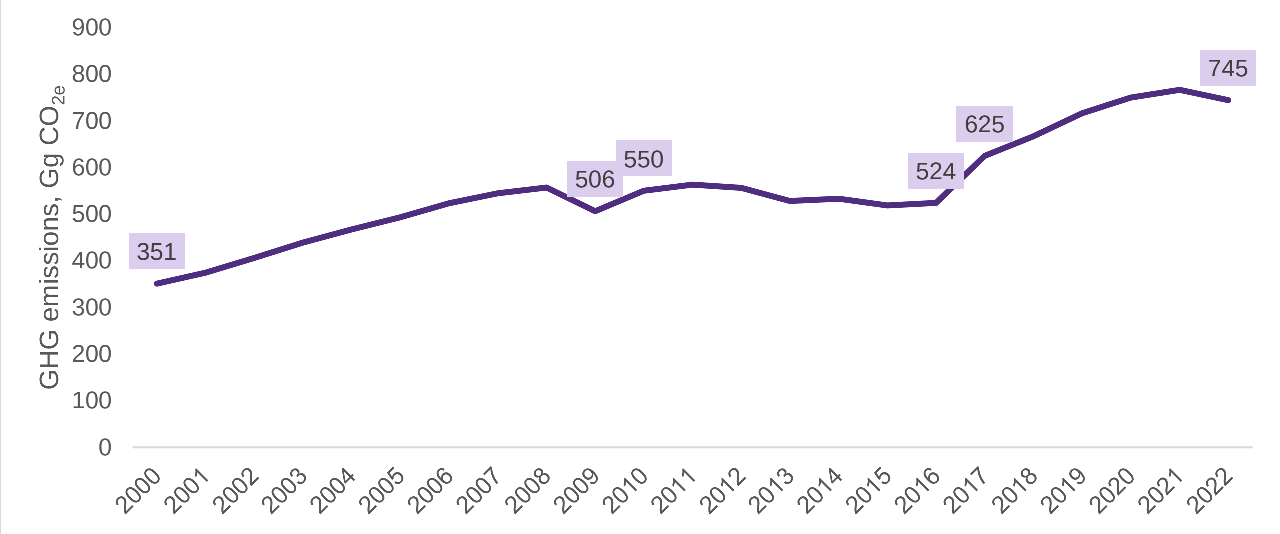
The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 1960 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in Table 112.

Table 112: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per NIR 2021, Gg CO_{2e}	Recalculated emission as per AR5 GWP, Gg CO_{2e}	Percentage change
2000	263.27	351.03	33.33%
2001	280.77	374.36	33.33%
2002	304.40	405.87	33.33%
2003	329.54	439.38	33.33%
2004	350.56	467.42	33.33%
2005	370.07	493.43	33.33%
2006	392.45	523.27	33.33%
2007	408.56	544.74	33.33%
2008	417.61	556.81	33.33%
2009	379.70	506.26	33.33%
2010	412.41	549.88	33.33%
2011	422.42	563.23	33.33%
2012	417.20	556.27	33.33%
2013	396.24	528.32	33.33%
2014	399.65	532.86	33.33%
2015	388.84	518.45	33.33%
2016	392.88	523.84	33.33%

Figure 42 shows the GHG emission trend of solid waste disposal from 2000 to 2022 as per the IPCC Fifth Assessment Report (AR5).

Figure 42: GHG emission trend from solid waste disposal in RoM from 2000 to 2022



After time series correction as per IPCC AR5 report, it was observed that emissions from solid waste disposal were on an increasing trend throughout the period from 2000 to 2008, with a decrease observed in 2009 followed by stagnation till 2016. From 2017 onwards, the emissions were on an increasing trend till 2021 with a slight drop observed in 2022.

6.2.6. Planned Improvement

There are no composition data for 1960-1999 period, and it has been assumed constant and equal to the composition in 2000. RoM will continue working to review and update these values to improve the accuracy of the estimates.

For Rodrigues, no direct data are available regarding waste landfilled so these values have estimated for this inventory based on only one value of waste per capita from 2020, which has kept constant for the whole period. RoM (Rodrigues) will continue working to improve the estimates by obtaining more accurate data.

The methane capture and recovery data are only available from 2009 to 2016. The data for capture is not available since the gas generator has broken down and the methane is not getting flared or converted into energy since then. Once the machinery is in operation, RoM will continue tracking this data and report in inventory for more accuracy.

6.3. Biological treatment of solid waste (Category 4B)

Bio treatment of solid waste such as food waste, yard and garden waste, park waste, sludge etc. through composting and anaerobic digestion happens both in developed and developing countries. Advantages of the biological treatment include reduced volume in the waste material, stabilization of the waste, destruction of pathogens in the waste material, and production of biogas for energy use. The end products of the biological treatment can, depending on its quality, be recycled as fertilizer and soil amendment, or be disposed in SWDS.

Composting is an aerobic process and a large fraction of the degradable organic carbon (DOC) in the waste material is converted into carbon dioxide (CO_2). CH_4 is formed in anaerobic sections of the compost, but it is oxidised to a large extent in the aerobic sections of the compost. The estimated CH_4 released into the atmosphere ranges from less than 1 percent to a few per cent of the initial carbon content in the material. Composting can also produce emissions of N_2O. The range of the estimated emissions varies from less than 0.5 percent to 5 percent of the initial nitrogen content of the material. The emissions from bio-treatment of solid waste are not a major source of methane or nitrous dioxide emissions.

6.3.1. Background of the biological treatment of solid waste in Mauritius

As per NIR 2021, A large-scale compost plant has been operational since October 2011. It was also mentioned that composting started at Petit Verger Prison and used for organic gardening by the Ministry of Environment and other government agencies, in addition to use by Petit Verger Prison. However, as per data provided by Solid Waste Management Division, the composting of solid waste is not occurring since 2017.

6.3.2. Methodology adopted for GHG emission calculation

Tier 1 approach was adopted for emissions from composting according to IPCC 2006 guidelines. The methodology adopted for GHG emissions estimation consist of multiplying activity data (AD) by the relevant appropriate emission factor (EF).

6.3.2.1 Calculation

The CH_4 and N_2O emissions of biological treatment (composting in RoM) can be estimated using the default method given in equations below.

$$CH_4\ emissions\ = [M\ \bullet\ Emission\ Factor\ (EF)] \bullet 10^{-3} - R$$

Where:

CH_4 Emissions	=	*CH_4 emitted in year T, Gg*
M	=	*mass of organic waste treated by composting, Gg*
EF	=	*Emission factor for composting, gCH4/kg waste treated*
R	=	*recovered CH_4 in inventory year, Gg*

$$N_2O\ emissions\ = [M\ \bullet\ Emission\ Factor\ (EF)] \bullet 10^{-3}$$

Where:

N_2O emissions	=	*N_2O emitted in year T, Gg*
M	=	*Mass of organic waste treated by composting, Gg*
EF	=	*Emission factor for composting, gN_2O/kg waste treated*

6.3.2.2 Activity Data and parameters required:

The total activity data for biological treatment was collected from Solid Waste Management Division. As per NIR 2021, this activity started in 2011. The activity data used for calculation composting in republic of Mauritius is shown in **Error! Reference source not found.**.

Table 113: Total activity data for composting in RoM

Year	Compost (tons)
2017	NO
2018	NO
2019	NO
2020	NO
2021	NO
2022	NO

**NO - Not Occurring*

The was no methane recovery from composting as reported by Solid Waste Management Division.

6.3.2.3 Emission Factors

The Default Emission Factors for CH_4 and N_2O emissions from biological treatment of waste are given below. The emission factors (EF) considered are 4 g CH_4/kg waste treated (wet weight basis) and 0.24 g N_2O/kg waste treated (wet weight basis), according to 2006 IPCC Guidelines.

Table 114: Default Emission Factors for CH_4 and N_2O emissions from biological treatment of waste

Default Emission Factors for CH_4 and N_2O emissions from biological treatment of waste	
Composting (wet weight basis)	EF value
CH_4 emission factor (g CH_4/kg waste treated)	4
N_2O emission factor (g N_2O/kg waste treated)	0.24

6.3.3. Results:

There were no emissions from biological treatment of solid waste as the activity has been "not occurring" for the reporting period of 2017 to 2022.

6.3.4. Quality Control:

The activity data for composting have been obtained from Solid Waste Management Division. In absence of the data, emissions have been calculated as zero.

6.3.5. Uncertainty Assessment and Time Series Consistency:

The uncertainty analysis results for biological treatment of solid waste category are reported in the following table for 2000 as base year.

Table 115: Uncertainty Analysis of the biological treatment of solid waste (4B) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
4.B – Biological treatment of solid waste	CH_4	10.00	30.00	31.62
	N_2O	10.00	30.00	31.62

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 1960 to 2016 was recalculated and aligned with AR5 GWP values. The previous inventory data and the recalculated values are given in **Error! Reference source not found.**.

Table 116: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP and 2019 refinement values for calculation parameters

Year	Composting emissions as per AR2, Gg CO_{2e}	Composting emissions as per AR5, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2000	NO	NO	-	-
2001	NO	NO	-	-
2002	NO	NO	-	-
2003	NO	NO	-	-

Year	Composting emissions as per AR2, Gg CO_{2e}	Composting emissions as per AR5, Gg CO_{2e}	Difference in GHG emissions, Gg CO_{2e}	Percentage change
2004	NO	NO	-	-
2005	NO	NO	-	-
2006	NO	NO	-	-
2007	NO	NO	-	-
2008	NO	NO	-	-
2009	NO	NO	-	-
2010	NO	NO	-	-
2011	0.82	0.91	0.09	10.9%
2012	5.51	6.11	0.60	10.9%
2013	3.05	3.38	0.33	10.9%
2014	6.50	7.21	0.71	10.9%
2015	6.02	6.67	0.65	10.9%
2016	6.07	6.73	0.66	10.9%

After time series correction as per IPCC AR5 report and IPCC 2019 refinement, it was observed that emissions from composting have increased by 10.9% based on new GWP values of AR5 report from 2011 to 2016.

6.3.6. Planned Improvement:

RoM would cross verify the data received on the activity to verify the status of the activity in Mauritius. RoM could study the possibility to move to a higher tier by an emission factors country-specific determination in case the activity is again active in the country. RoM will work to obtain plant level information for every year.

6.4. Incineration and open burning of waste (Category 4C)

Waste incineration is defined as the combustion of solid and liquid waste in controlled incineration facilities. Modern refuse combustors have tall stacks and specially designed combustion chambers, which provide high combustion temperatures, long residence times, and efficient waste agitation while introducing air for more complete combustion. Types of waste incinerated include municipal solid waste (MSW), industrial waste, hazardous waste, clinical waste, and sewage sludge. The practice of MSW incineration is currently more common in developed countries, while it is common for both developed and developing countries to incinerate clinical waste. The same is true for the Republic of Mauritius.

Relevant gases emitted include CO_2, CH_4 and N_2O. Normally, emissions of CO2 from waste incineration are more significant than CH_4 and N_2O emissions.

6.4.1. Background of the incineration of solid waste in Mauritius

Based on information provided by the Ministry of Health and Wellness, only clinical waste is incinerated in the country. These incinerators are placed at the hospitals[8] (A.G. Jeetoo, Jawaharlal Nehru Hospital, and Brown Sequard Mental Health Care Centre), and it is important to mention that very often, these facilities are in operation due to break down and poor maintenance. The data for incinerated waste for these three incinerators was provided by the Ministry of Health and Wellness. It was observed that the data provided for the period of

[8] https://environment.govmu.org/Documents/eia/eiareports/2019/3005%20-%20VEOLIA/chap%204.pdf

2017 to 2022 was considerably less than the reported data in the last National Inventory Report for the period of 2000-16.

Open burning of waste is not permitted by law in RoM. Henceforth, GHG emissions from open burning of solid waste are considered negligible and have not been accounted for.

6.4.2. Methodology adopted for GHG emission calculation

Emissions from waste incineration without energy recovery are reported in the Waste Sector, while emissions from incineration with energy recovery are reported in the Energy Sector, both with a distinction between fossil and biogenic carbon dioxide (CO_2) emissions.

However, according to the 2006 IPCC Guidelines, the Tier 1 approach for emissions from clinical waste incineration was adopted.

6.4.2.1 Calculation

The methodology adopted for GHG emissions estimation consist of multiplying activity data (AD) by the relevant appropriate emission factor (EF).

$$CO_2\ Emissions\ (E) = \Sigma\ (SWi\ x\ dmi\ x\ CFi\ x\ FCFi\ x\ OFi) * 44/12$$

Where:

CO_2 Emissions	=	*CO_2 emissions in inventory year, Gg/yr*
SW_i	=	*total amount of solid waste of type i (wet weight) incinerated or open-burned, Gg/yr*
dm_i	=	*dry matter content in the waste (wet weight) incinerated or open-burned, (fraction)*
CF_i	=	*fraction of carbon in the dry matter (total carbon content), (fraction)*
FCF_i	=	*fraction of fossil carbon in the total carbon, (fraction)*
OF_i	=	*oxidation factor, (fraction)*
44/12	=	*conversion factor from C to CO_2*
i	=	*type of waste incinerated*

6.4.2.2 Activity Data

The total activity data for clinical waste was collected from Ministry of Health and Wellness for 2017 to 2022 and is shown in Table 117.

Table 117: Total activity data for clinical waste in RoM

Year	Clinical waste (tons)
2017	138.6
2018	143.1
2019	115.3
2020	27.5
2021	12.2
2022	132.0

CO_2 emission factor for waste incineration category was taken from 2006 IPCC Guidelines default emission factors. The parameters and factors are given in Table 118.

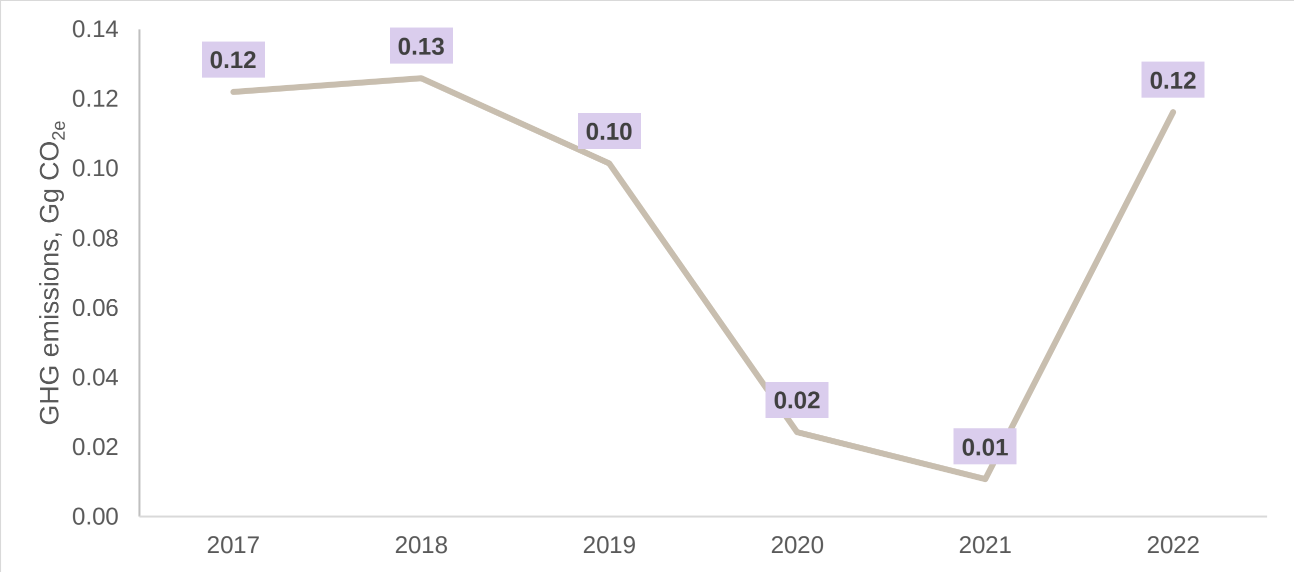
Table 118: CO_2 emission factor parameters for clinical waste incineration

Default Emission Factors for CO_2 emissions for incineration of clinical waste	
Clinical waste	fraction value
Dry matter content of wet weight (fraction)	NA
Total carbon content of dry weight (fraction)	0.6
Fossil carbon fraction of total carbon content	0.4
Oxidation factor of carbon input	1

6.4.3. Results:

The GHG emissions from incineration of clinical waste for the period of 2017-2022 are presented in Figure 43.

Figure 43: GHG emissions from clinical waste incineration, Gg CO_{2e}



6.4.4. Quality Control

The activity data for composting have been obtained from Ministry of Health and Wellness. Some quality control activities were implemented to ensure the use of right data in the inventory. The QC implemented during the data collection and GHG emission estimation is listed below:

- Consistency of the overall generating waste balance
- Comparison between the GHG emissions estimated in the current inventory for clinical waste incineration activity and the results obtained in the last reported national inventory of the RoM.
- Cross verification carried out by key stakeholders once emissions were estimates.

6.4.5. Uncertainty Assessment and Time Series Consistency:

The uncertainty analysis results for waste incineration category burning are reported in the following table for 2000 as base year.

Table 119: Uncertainty Analysis of the waste incineration category (4C) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
4C – Waste Incineration	CO_2	10.00	40.00	41.23

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
	CH_4	10.00	100.00	100.50
	N_2O	10.00	100.00	100.50

There is no time series correction required for incineration of clinical waste category because CO_2 emissions have been directly reported with GWP of 1.

6.4.6. Planned Improvement:

The activity data reported in the last national inventory report for the period 2000-2016 was very high compared to the activity data provided for waste incineration for the period of 2017-2022. RoM would work on cross verifying this data and provide any corrections if necessary. RoM would cross verify the data collected for the year 2017 to 2022 and continue working on collecting all the information regarding the technology that every incinerator uses. In line with this improvement, the activity data should be collected split by each technology.

6.5. Wastewater treatment (Category 4D)

Wastewater can be a source of methane (CH_4) when treated or disposed anaerobically. It can also be a source of nitrous oxide (N_2O) emissions. Carbon dioxide (CO_2) emissions from wastewater are not considered in the IPCC Guidelines because these are of biogenic origin and should not be included in national total emissions.

Wastewater originates from a variety of domestic, commercial and industrial sources and may be treated on site (uncollected), sewered to a centralized plant (collected) or disposed untreated nearby or via an outfall. Domestic wastewater is defined as wastewater from household water use, while industrial wastewater is from industrial practices only.

Wastewater is one of the major categories of emissions under the waste sector, typically being the second largest contributors in waste sector. In Republic of Mauritius (RoM), category 4D includes two categories – 4.D.1. Domestic Wastewater treatment encompassing domestic and commercial activities and 4.D.2. Industrial Wastewater from industrial wastewater.

6.5.1. Background of the wastewater treatment in Mauritius

The Wastewater Management Authority (WMA) which operates under the aegis of the Ministry of Energy and Public Utilities is responsible for managing the public wastewater system. WMA conducts the collection and treatment of domestic, commercial and industrial wastewaters for disposal to an environmentally acceptable quality. WMA manages the public wastewater system, which consists of 755 km of sewer network, 70 pumping stations and 9 treatment plants, including 4 main treatment plants which are located at St Martin, Grand Baie, Baie-du-Tombeau, and Montagne Jacquot.[9]

The domestic and commercial wastewater in the Republic of Mauritius for nearly 27% of the population is treated by centralized aerobic treatment plants which are well managed and emit very low quantities of methane. However, majority of the population's wastewater is being treated through anaerobic digesters which treat the sludge from wastewater having a share of nearly 62% in 2017. As RoM is moving towards improving the share of centralized treatment for wastewater, the share of anaerobic digestion of sludge has been on a downward trend since 2017. Other treatment categories include septic systems and latrines whereas the wastewater for Rodrigues Island is reported to be uncollected as of now with direct discharge to lakes, seas and rivers.

[9] https://publicutilities.govmu.org/Pages/Wastewater%20Sector/WastewaterSector.aspx

Figure 44: Disaggregation of domestic/commercial wastewater by type of treatment (in %)

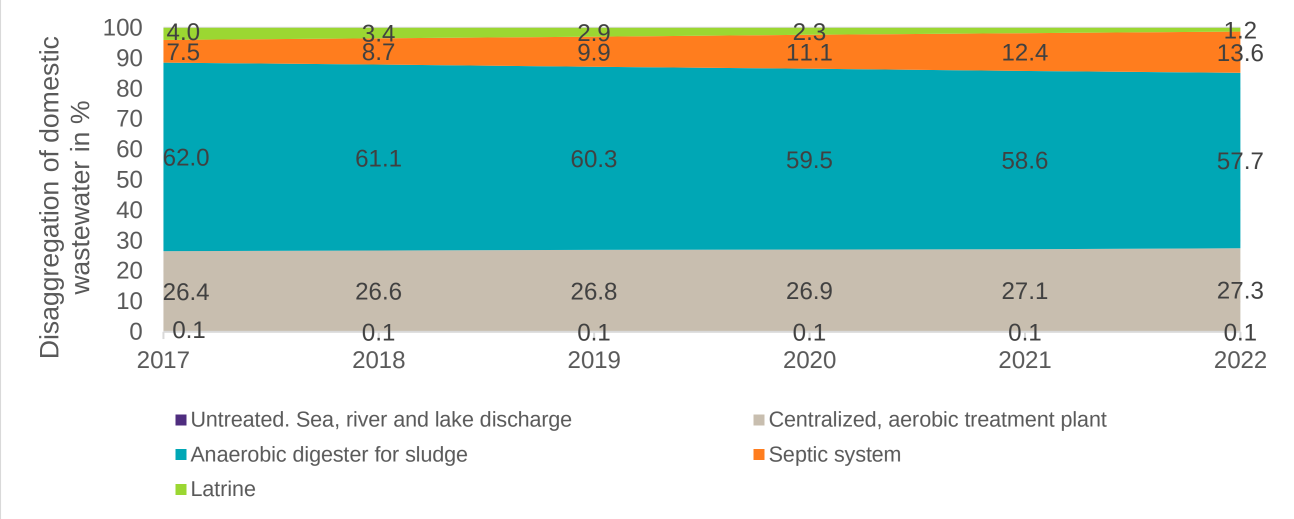
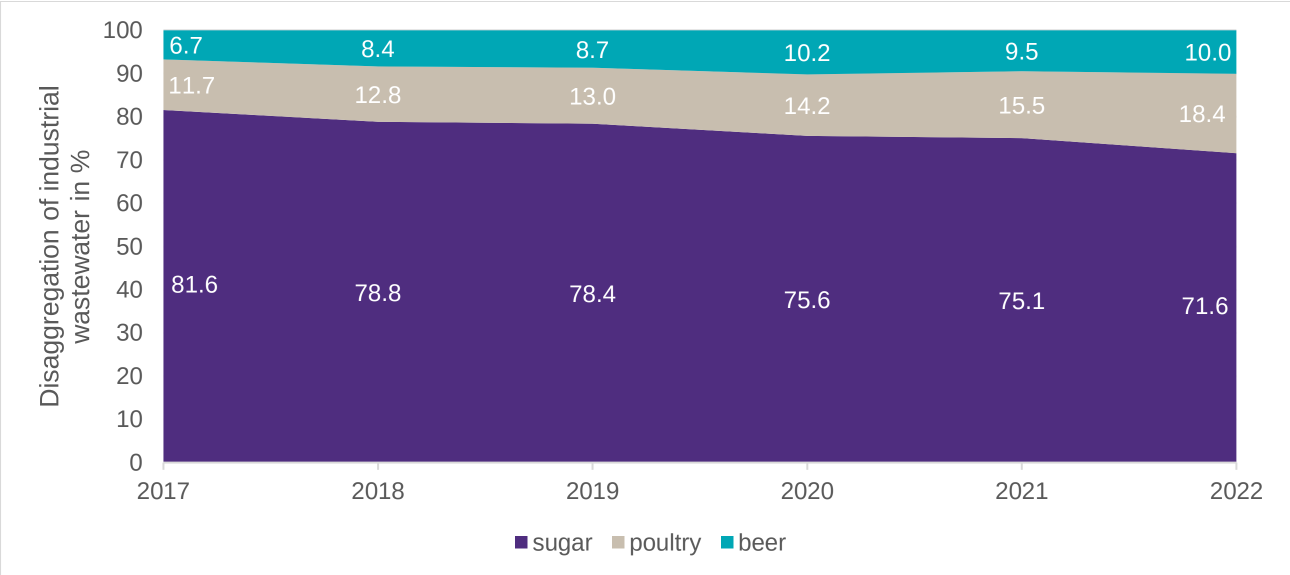


Figure 45: Disaggregation of industrial wastewater by type of treatment (in %)



6.5.2. Methodology adopted for GHG emission calculation:

The activity data for calculation of emissions was collected from the Wastewater Management Authority from 2017 till 2022. Tier 1/2 activity data has been provided by the Wastewater Management Authority for domestic, commercial, and industrial wastewater on a country level for the period of 2017 – 2022. The emission factors and other factors considered are default values given for relevant categories in IPCC 2006 guidelines and the 2019 refinement.

As reported in the IPCC Guidelines, CO_2 emissions of biogenic nature are not accounted. Methane (CH_4) emissions are considered as per the methodology given in IPCC guidelines. Nitrous Oxide (N_2O) emissions are also significant from domestic and commercial wastewater, therefore have been calculated as per IPCC methodology and included in the national inventory. The non-CO_2 emissions from wastewater have been converted to the equivalent CO_2 emissions and subsequently accounted using the IPCC AR5 GWP values.

The IPCC methodology for estimating CH_4 emissions from SWDS is based on the First Order Decay (FOD) method. This method assumes that the degradable organic component (degradable organic carbon, DOC) in waste decays slowly throughout a few decades, during which CH_4 and CO_2 are formed. If conditions are constant, the rate of CH_4 production depends solely on the amount of carbon remaining in the waste. As a result, emissions of CH_4 from waste deposited in a disposal site are highest in the first few years after deposition, then gradually decline as the degradable carbon in the waste is consumed by the bacteria responsible for the decay.

Half-lives for different types of waste vary from a few years to several decades or longer. The FOD method requires data to be collected or estimated for historical disposals of waste over a period of 3 to 5 half-lives to achieve an acceptably accurate result. As per IPCC methodology, It is therefore good practice to use disposal data for at least 50 years as this time frame provides an acceptably accurate result for most typical disposal practices and conditions.

The Activity Data (AD), Emission Factors (EF) and other parameters for each of the category were entered in the latest IPCC Inventory Software for the computation of GHG emissions. The emission results for each fuel type have been aggregated to obtain the total amount of emissions.

6.5.2.1 Calculation

CH_4 emissions

Domestic Wastewater: Domestic/commercial wastewater emits CH4. Emissions are a function of the amount of organic waste generated and an emission factor that characterize the extent to which this waste generates CH4.

The general equation to estimate CH4 emissions from industrial wastewater is as follows:

$$CH_4\ emissions = \Sigma\left[\left(U_i \times T_{ij} \times EF_j\right) \bullet \left(TOW_j - S_j\right) - R_j\right]$$

Where:

CH_4 Emissions	=	*CH_4 emitted in year T, kg CH_4/yr*
TOW_j	=	*organics in wastewater of treatment/discharge pathway or system, j, in inventory year, kg BOD/yr*
S_j	=	*organic component removed from wastewater (in the form of sludge) from treatment/discharge pathway or system, j, in inventory year, kg BOD/yr.*
j	=	*each treatment/discharge pathway or system*
EF_j	=	*emission factor for treatment/discharge pathway or system, j, kg CH_4 / kg BOD*
R_j	=	*amount of CH4 recovered or flared from treatment/discharge pathway or system, j, in inventory year, kg CH4/yr. Default value is zero*
U_i	=	*fraction of population in income group i in inventory year*
T_{ij}	=	*degree of utilization of treatment/discharge pathway or system, j, for each income group*

The activity data for this source category is the total amount of organically degradable material in the wastewater (TOW). This parameter is a function of human population and BOD generation per person. It is expressed in terms of biochemical oxygen demand (kg BOD/year). The equation for TOW is:

$$TOW = P \bullet BOD \bullet 0.001 \bullet 365$$

Where:

TOW = *total organics in wastewater in inventory year, kg BOD/yr*

P	=	*country population in inventory year, (person)*
BOD	=	*country-specific per capita BOD in inventory year, g/person/day*
0.001	=	*conversion from grams BOD to kg BOD*

The emission factor for a wastewater treatment and discharge pathway and system is a function of the maximum CH_4 producing potential (B_o) and the methane correction factor (MCF) for the wastewater treatment and discharge system. The B_o is the maximum amount of CH_4 that can be produced from a given quantity of organics (as expressed in BOD or COD) in the wastewater. The MCF indicates the extent to which the CH_4 producing capacity (B_o) is realized in each type of treatment and discharge pathway and system. Thus, it is an indication of the degree to which the system is anaerobic.

$$EF_j = B_o \bullet MCF_j$$

Where:

EF_j	=	*emission factor, kg CH4/kg BOD*
j	=	*each treatment/discharge pathway or system*
B_o	=	*maximum CH4 producing capacity, kg CH4/kg BOD*
MCF_j	=	*methane correction factor (fraction)*

Industrial Wastewater: Industrial wastewater emits CH_4 emissions. The method presented in the 2006 IPCC Guidelines for calculation of CH_4 emissions from industrial wastewater is given below.

$$CH_4\ emissions = \Sigma\,[(EF_i) \bullet (TOW_i - S_i) - R_i] \bullet 10^{-6}$$

Where:

CH_4 Emissions	=	*CH_4 emitted in year T, Gg CH_4/yr*
TOW_i	=	*total organically degradable material in wastewater from industry i in inventory year, kg COD/yr*
S_i	=	*organic component removed from wastewater (in the form of sludge) in inventory year, kg COD/yr*
i	=	*Industrial sector*
EF_i	=	*emission factor for industry i, kg CH4/kg COD for treatment/discharge pathway or system(s) used in inventory year*
R_i	=	*amount of CH4 recovered or flared in inventory year, kg CH4/yr*
10^{-6}	=	*conversion of kg to Gg*

The activity data for this source category is the amount of organically degradable material in the wastewater (TOW). The equation for TOW is:

$$TOW_i = P_i \bullet W_i \bullet COD_i$$

Where:

TOW_i	=	*total organically degradable material in wastewater for industry i, kg COD/yr*
i	=	*Industrial sector*
P_i	=	*total industrial product for industrial sector i, t/yr*
W_i	=	*wastewater generated, m^3/t product*
COD_i	=	*chemical oxygen demand (industrial degradable organic component in wastewater), kg COD/m^3*

As stated in the *2006 IPCC Guidelines*, there are significant differences in the CH4 emitting potential of different types of industrial wastewater dependent on the type and form of constituents present in the wastewater. To the extent possible, data should be collected to determine the maximum CH4 producing capacity (Bo) in each industry.

As mentioned before, the MCF indicates the extent to which the CH4 producing potential (Bo) is realised in each type of treatment method. Thus, it is an indication of the degree to which the system is anaerobic. See below equation:

$$EF_j = B_o \bullet MCF_j$$

Where:

EF_j	=	*emission factor for each treatment/discharge pathway or system, kg CH4/kg COD*
j	=	*each treatment/discharge pathway or system*
B_o	=	*maximum CH4 producing capacity, kg CH_4/kg COD*
MCF_j	=	*methane correction factor (fraction)*

N_2O emissions

In keeping with the method proposed by the 2006 IPCC Guidelines, the total emissions of nitrous oxide that are produced via domestic/commercial wastewater are determined as a combination of the direct nitrous oxide emissions (N_2O Plants) and indirect nitrous oxide emissions (N_2O Effluent).

Currently, RoM only has indirect emissions, so following equations proposed by 2006 IPCC Guidelines have been applied:

$$N_2O\ Emission = (EF_j \times N_{Effluent}) \bullet \frac{44}{28}$$

Where:

N_2O Emission	=	*N_2O emissions from wastewater treatment plants in inventory year, kg N_2O/yr*
$N_{Effluent}$	=	*nitrogen in the effluent discharged to aquatic environments, kg N/yr*
EF_j	=	*emission factor for treatment/discharge pathway or system j, kg N2O-N/kg N*
44/28	=	*conversion of kg N_2O-N into kg N_2O*

Nitrogen in domestic wastewater is calculated as per the equation below:

$$N_{Effluent} = (P_{treatment,j} \bullet Protein \bullet F_{NPR} \bullet N_{HH} \bullet F_{NON-CON} \bullet F_{IND-COM})$$

Where:

TN_{DOM_j}	=	*total annual amount of nitrogen in domestic wastewater for treatment pathway j, kg N/yr*
$P_{treatment\_j}$	=	*human population who are served by the treatment pathway j, person/yr*
Protein	=	*annual per capita protein consumption, kg protein/person/yr*
F_{NPR}	=	*fraction of nitrogen in protein, default = 0.16 kg N/kg protein*
$F_{NON-CON}$	=	*factor for nitrogen in non-consumed protein disposed in sewer system, kg N/kg N*
$F_{IND-COM}$	=	*factor for industrial and commercial co-discharged protein into the sewer system, kg N/kg N*
N_{HH}	=	*additional nitrogen from household products added to the wastewater, default is 1.1*

6.5.2.2 Activity Data

The total activity data for wastewater treatment was collected from Wastewater Management Authority. The activity data used for calculation of methane emissions from wastewater treatment in republic of Mauritius is shown in below tables.

Table 120: Total activity data for domestic & commercial wastewater treatment in RoM

Year	Population (Capita)	BOD (kg/person/year)	TOW (kg BOD/yr)	Number of tourists (capita)	Number of average days of stay	Protein consumption (kg/cap/year)
2017	1,265,035	13.505	5,081	1,341,860	10.3	34.35
2018	1,265,363	13.505	4,592	1,399,408	10.4	34.79
2019	1,265,201	13.505	1,929	1,383,488	11.4	35.31
2020	1,265,756	13.505	5,074	308,980	11.4	34.99
2021	1,263,614	13.505	5,091	179,780	13.5	34.95
2022	1,260,922	13.505	2,875	997,290	11.5	36.45

The Disaggregation of domestic/commercial wastewater by type of treatment in Mauritius in Table 121.

Table 121: Total activity data for Disaggregation of domestic/commercial wastewater by type of treatment in Island of Mauritius, data in percentage

Year	Centralized, aerobic treatment plant	Anaerobic digester for sludge	Septic system	Latrine	Total
2017	27.34	62.54	7.48	2.63	100
2018	27.56	61.53	8.73	2.18	100
2019	27.75	60.53	9.99	1.72	100
2020	27.90	59.58	11.25	1.26	100
2021	28.08	58.60	12.50	0.81	100
2022	28.35	57.56	13.73	0.36	100

Table 122: Total activity data for Disaggregation of domestic/commercial wastewater by type of treatment in Island of Rodrigues, data in percentage

Year	Untreated. Sea, river and lake discharge	Anaerobic digester for sludge	Septic system	Latrine	Total
2017	3.40	46.79	7.13	42.68	100
2018	3.40	49.97	7.47	39.16	100
2019	3.40	53.16	7.82	35.62	100
2020	3.40	56.34	8.16	32.10	100
2021	3.40	59.52	8.50	28.58	100
2022	3.40	62.70	8.84	25.06	100

The industrial sector also emits CH_4 and N_2O emissions. The activity data is presented in below tables.

Table 123: Activity data for wastewater from sugar industry

Year	Production (t)	W (m^3/t produced)	Wastewater produced (m^3)	COD (kg/m^3)	TOW (kg COD/yr)
2017	355,213	8	2,841,704	5	14,208,520
2018	323,406	8	2,587,248	5	12,936,240
2019	331,105	8	2,648,840	5	13,244,200
2020	270,875	8	2,167,000	5	10,835,000
2021	255,818	8	2,046,544	5	10,232,720
2022	232,707	8	1,861,656	5	9,308,280

Table 124: Activity data for wastewater from poultry industry

Year	Production (t)	W (m^3/t produced)	Wastewater produced (m^3)	COD (kg/m^3)	TOW (kg COD/yr)
2017	47,500	8.6	408,500	3.5	1,429,750
2018	49,000	8.6	421,400	3.5	1,474,900
2019	51,000	8.6	438,600	3.5	1,535,100
2020	47,500	8.6	408,500	3.5	1,429,750
2021	49,100	8.6	422,260	3.5	1,477,910
2022	55,700	8.6	479,020	3.5	1,676,570

Table 125: Activity data for wastewater from beer industry

Year	Production (t)	W (m^3/t produced)	Wastewater produced (m^3)	COD (kg/m^3)	TOW (kg COD/yr)
2017	37,144	6.3	234,007	2.9	678,621
2018	43,546	6.3	274,340	2.9	795,585
2019	46,409	6.3	292,377	2.9	847,892
2020	46,409	6.3	292,377	2.9	847,892
2021	40,938	6.3	257,909	2.9	747,937
2022	41,367	6.3	260,609	2.9	755,766

The disaggregation of industrial wastewater treated by type of treatment (for all three sectors Sugar, Poultry, and Beer) is given in Table 126.

Table 126: Disaggregation of industrial wastewater treated by type of treatment in percentage figures (for all three sectors Sugar, Poultry, and Beer)

Year	Aerobic treatment plant	Anaerobic digester for sludge
2017	25	75
2018	25	75
2019	25	75
2020	25	75

Year	Aerobic treatment plant	Anaerobic digester for sludge
2021	25	75
2022	25	75

There is no methane recovered for the period of 2017 to 2022 as per WMA.

6.5.2.3 Emission factors and parameters required

The calculation of methane emissions is done based on various parameters as stated above. The values for maximum CH_4 producing capacity (B_O) for domestic wastewater are taken from IPCC 2006 guidelines and updated with 2019 refinement of IPCC guidelines for the calculation of emissions as provided in below tables.

Table 127: Default Maximum CH_4 producing capacity (B_O) for domestic wastewater

Default Maximum CH_4 Producing Capacity (B_O) For Domestic Wastewater	
Unit	B_o value
kg CH_4/kg BOD	0.6
kg CH_4/kg COD	0.25

Table 128: IPCC Default MCF values for Domestic Wastewater

IPCC Default MCF values for Domestic Wastewater	
Type of treatment	MCF value, IPCC 2006
Untreated system: Sea, river and lake discharge	0.1
Centralized, aerobic treatment plant	0
Anaerobic digester for sludge	0.8
Septic System	0.5
Latrine	0.1

The default MCF values for industrial wastewater are presented in Table 129.

Table 129: IPCC Default MCF values for industrial wastewater

IPCC Default MCF values for industrial wastewater	
Type of treatment	MCF value, (New) Refinement 2019
Aerobic treatment plant	0
Anaerobic digester for sludge	0.8

For N_2O emissions, IPCC default emission factors are taken as per the Table 130 as per IPCC 2019 new refinement for wastewater.

Table 130: IPCC Default emission factor value N2O from domestic & industrial wastewater

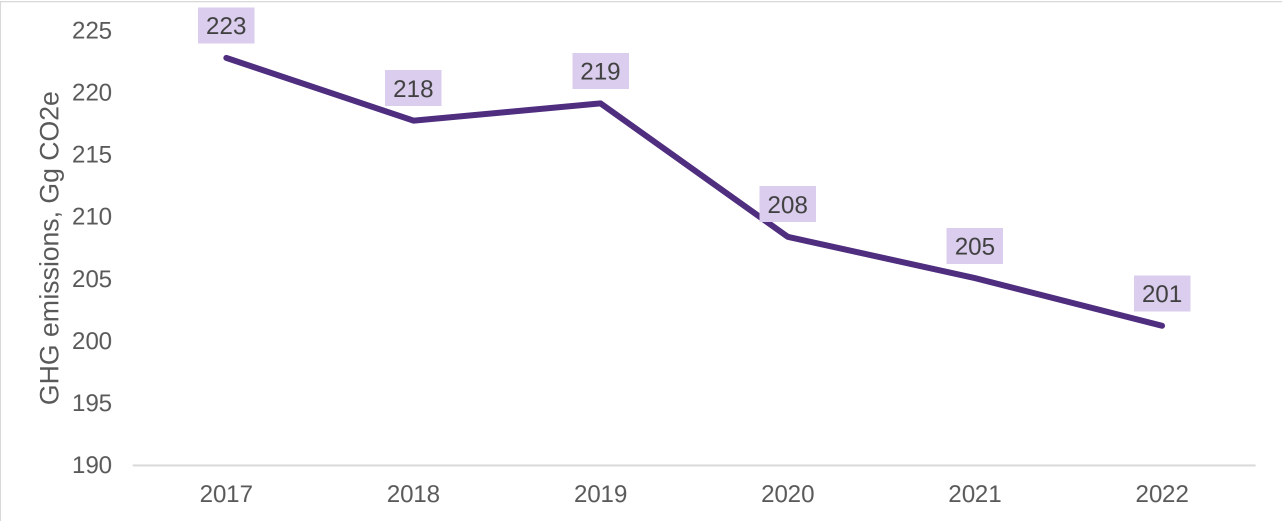
IPCC Default emission factor value N_2O from domestic & industrial wastewater	
Default Emission factor, $EF_{EFFLUENT}$ (kg N_2O-N/kg–N)	0.005
factor for non-consumed protein added to the wastewater, F_{NPR} (kg N/kg protein)	0.16

IPCC Default emission factor value N_2O from domestic & industrial wastewater	
factor for nitrogen in non-consumed protein disposed in sewer system, $F_{NON-CON}$	1.1
factor for industrial and commercial co-discharged protein into the sewer system, $F_{IND-CON}$	1.25
nitrogen removed with sludge, kg N/yr	0

6.5.3. Results

The results of the GHG emission estimation from 2017 to 2022 is shown in Figure 46.

Figure 46: GHG emission from wastewater treatment from 2017 to 2022 (Gg CO_{2e}/year)



The GHG emissions from domestic and commercial wastewater (including tourists) has decreased slightly over the years from 2017 to 2022, with values ranging from 154.3 Gg CO_{2e} in 2017 to 151.9 Gg CO_{2e} in 2022. Methane emissions from industrial wastewater has seen a sharp decline from 68.5 Gg CO_{2e} in 2017 to 49.3 Gg CO_{2e} in 2022, majorly due to decreasing production of sugar industry over the years.

The N_2O emissions from domestic and commercial wastewater has comparatively lesser emissions with 0.075 Gg CO_{2e} in 2017 to 0.079 Gg CO_{2e} in 2022, increasing slightly over the years. The total emissions have seen a decline mostly due to decreased production of sugar industry as seen in **Error! Reference source not found.**.

Table 131: GHG emissions from domestic and commercial wastewater

Year	CH_4 (Gg CO_{2e})	N_2O (Gg CO_{2e})	TOTAL (Gg CO_{2e})
2017	154.28	0.075	154.35
2018	153.90	0.076	153.97
2019	153.52	0.077	153.60
2020	153.34	0.077	153.42
2021	152.74	0.076	152.82
2022	151.93	0.079	152.01

Table 132: GHG emissions from industrial wastewater

Year	CH_4 (Gg CO_{2e})
2017	68.5
2018	63.9
2019	65.6
2020	55.1
2021	52.3
2022	49.3

6.5.4. Quality Control

The activity data for wastewater for domestic, commercial, and industrial sectors have been obtained from Wastewater Management Authority. To ensure the use of right data in the inventory, some of the quality check (QC) implemented during the data collection and emission estimation are listed below:

- Cross verification between data provided via mail by institutional authorities (Wastewater Management Authority) and data reported in the national Statistics Mauritius and Food and Agriculture Organization.
- Cross verification between the GHG emissions estimated in the current inventory for wastewater activity and the results obtained in the last reported national inventory of the RoM
- Cross verification carried out by key stakeholders once emissions were estimates.

6.5.5. Uncertainty Assessment and Time Series Consistency

The uncertainty analysis results for wastewater treatment category are reported in the following table for 2000 as base year.

Table 133: Uncertainty Analysis of the Wastewater Treatment and Discharge (4D) for the period 2000 – 2022

Category	Gas	Activity Data Uncertainty (%)	Emission Factor Uncertainty (%)	Combined Uncertainty (%)
4D – Solid Waste Disposal	CH_4	107.35	42.43	115.43
	N_2O	95.00	0.00	95.00

The previous inventory considered Global Warming Potential (GWP) of CH_4 and N_2O as mentioned in the Second Assessment Report (AR2) of IPCC. For the period 2017 to 2022, as per IPCC guidelines, the GWP values provided in AR5 are to be used. A comparison of the GWP values of CH_4 and N_2O in AR2 and AR5 is given in Table 22. To maintain time series consistency, the GHG emission data from 1960 to 2016 was recalculated and aligned with AR5 GWP values and 2019 new refinement parameters for IPCC methodology. The previous inventory data and the recalculated values are given in **Error! Reference source not found.**.

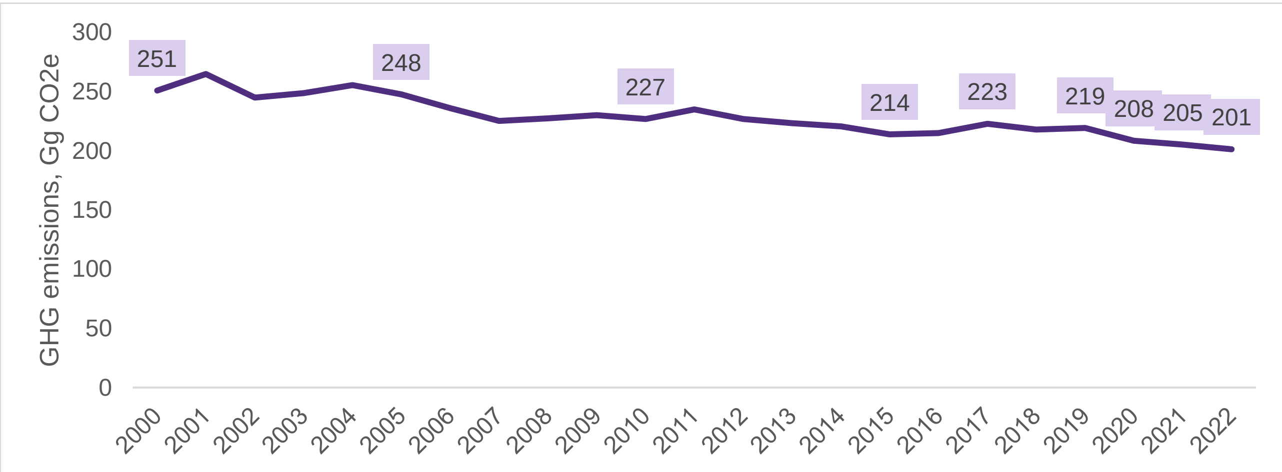
Table 134: GHG emission data from 2000 to 2016 as reported in previous inventory and recalculated as per AR5 GWP

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP & 2019 refinement, Gg CO_{2e}	Percentage change
2000	188.1	250.8	33.33%
2001	198.6	264.8	33.33%

Year	GHG emission as per AR2 GWP, Gg CO_{2e}	Recalculated emission as per AR5 GWP & 2019 refinement, Gg CO_{2e}	Percentage change
2002	183.7	244.9	33.33%
2003	186.5	248.7	33.33%
2004	191.7	255.6	33.33%
2005	185.7	247.6	33.33%
2006	176.9	235.9	33.33%
2007	168.9	225.2	33.33%
2008	170.5	227.4	33.33%
2009	172.6	230.1	33.33%
2010	170.2	226.9	33.33%
2011	176.2	235.0	33.33%
2012	170.2	226.9	33.33%
2013	167.5	223.4	33.33%
2014	165.5	220.7	33.33%
2015	160.4	213.8	33.33%
2016	161.1	214.9	33.33%

The Figure 47 shows the GHG emission trend of wastewater from 2000 to 2022.

Figure 47: GHG emission trend from energy industries of RoM from 2000 to 2022



After time series correction as per IPCC AR5 report. it was observed that emissions from wastewater treatment were on a slightly decreasing trend throughout the period from 2000 to 2022, mostly because of the huge decrease in sugar industry production.

6.4.6 Planned Improvement:

BOD value considered is a default value from 2006 IPCC Guidelines. It is known that the Wastewater Management Authority has worked to get a country-specific value. The Wastewater Management Authority will continue actively working on country-specific BOD and COD values for wastewater.

Currently, the calculations of N2O emissions from industrial wastewater have not been included in the national inventory due to lack of available country specific data and absence of IPCC default values for relevant industrial sectors in Mauritius. WMA will actively work on developing country specific data for calculation of N_2O emissions from industrial wastewater.

The methane capture and recovery data are only available from 2009 to 2016. The data for capture is not available since the gas generator has broken down and the methane is not getting flared or converted into energy since then. Once the machinery is in operation, RoM will continue tracking this data and report in inventory for more accuracy.

Appendix 1: Key Category Analysis

Level Assessment

Category	Activity data	Gases	Eq CO2	Modulus	Lx,t	Cumulative
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	CO2	1402.38	1402.38	0.21	0.21
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	CO2	1358.19	1358.19	0.21	0.42
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	CO2	966.04	966.04	0.15	0.57
4.A SOLID WASTE MANAGEMENT		CH4	744.52	744.52	0.11	0.68
2.F.1.a. REFRIGERATION AND STATIONARY AIR CONDITIONING	HFCs	CO2	465.50	465.50	0.07	0.75
3.B.1 FOREST LAND	All	CO2	-427.46	427.46	0.06	0.81
1.A.4 Energy others	Gaseous Fuel	CO2	235.28	235.28	0.04	0.85
4.D WASTEWATER TREATMENT		CH4	201.32	201.32	0.03	0.88
3.C.4 Direct N2O from managed soils		N2O	152.29	152.29	0.02	0.90
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	CO2	138.47	138.47	0.02	0.92
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	CO2	81.69	81.69	0.01	0.94
3.C.6 Indirect N2O from manure management		N2O	47.86	47.86	0.01	0.94
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	CO2	41.25	41.25	0.01	0.95
1.A.4 Energy others	Liquid Fuel	CO2	40.42	40.42	0.01	0.96
2.C.1. IRON AND STEEL PRODUCTION	Iron and steel production	CO2	31.63	31.63	0.00	0.96
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	CO2	27.99	27.99	0.00	0.96
1.A.2.m. OTHER	Liquid Fuel	CO2	26.89	26.89	0.00	0.97
1.A.2.k. CONSTRUCTION	Liquid Fuel	CO2	25.98	25.98	0.00	0.97
1.A.2.m. OTHER	Solid Fuel	CO2	18.66	18.66	0.00	0.98
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	N2O	18.00	18.00	0.00	0.98
3.A.1 ENTERIC FERMENTATION	All	CH4	16.24	16.24	0.00	0.98
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	CO2	13.29	13.29	0.00	0.98
1.A.2.c. CHEMICALS	Liquid Fuel	CO2	12.00	12.00	0.00	0.98
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	N2O	11.27	11.27	0.00	0.99
2.F.1.b. MOBILE AIR CONDITIONING	HFCs	CO2	10.26	10.26	0.00	0.99

Category	Activity data	Gases	Eq CO2	Modulus	Lx,t	Cumulative
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	CH4	9.81	9.81	0.00	0.99
1.A.2.c. CHEMICALS	Solid Fuel	CO2	9.33	9.33	0.00	0.99
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	CO2	9.33	9.33	0.00	0.99
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	CO2	9.29	9.29	0.00	0.99
3.A.2 MANURE MANAGEMENT	All	N2O	6.97	6.97	0.00	0.99
2.D.1. LUBRICANT USE	Consumption of lubricant	CO2	5.22	5.22	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	CO2	4.55	4.55	0.00	1.00
3.C.5 Indired N2O from managed soils		N2O	4.19	4.19	0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	CO2	2.07	2.07	0.00	1.00
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	N2O	1.99	1.99	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	CO2	1.78	1.78	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	CO2	1.24	1.24	0.00	1.00
1.A.4 Energy others	Solid Fuel	CH4	1.22	1.22	0.00	1.00
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	CH4	1.21	1.21	0.00	1.00
3.A.2 MANURE MANAGEMENT	All	CH4	1.21	1.21	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	CO2	1.14	1.14	0.00	1.00
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	CH4	1.05	1.05	0.00	1.00
1.A.5.a NON-SPECIFIED	Gaseous Fuel	CO2	0.87	0.87	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	CO2	0.76	0.76	0.00	1.00
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	N2O	0.62	0.62	0.00	1.00
1.A.2.m. OTHER	Solid Fuel	N2O	0.53	0.53	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	CO2	0.52	0.52	0.00	1.00
1.A.4 Energy others	Gaseous Fuel	CH4	0.52	0.52	0.00	1.00
1.A.2.m. OTHER	Solid Fuel	CH4	0.42	0.42	0.00	1.00
3.C.1 BURNING	Forest Land	CO2	0.41	0.41	0.00	1.00
1.A.2.k. CONSTRUCTION	Gaseous Fuel	CO2	0.39	0.39	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	N2O	0.29	0.29	0.00	1.00
1.A.4 Energy others	Liquid Fuel	CH4	0.28	0.28	0.00	1.00
1.A.4 Energy others	Solid Fuel	N2O	0.27	0.27	0.00	1.00
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	CH4	0.23	0.23	0.00	1.00

Category	Activity data	Gases	Eq CO2	Modulus	Lx,t	Cumulative
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	CH4	0.15	0.15	0.00	1.00
4.C INCENARATION OF WASTE		CO2	0.12	0.12	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	N2O	0.12	0.12	0.00	1.00
1.A.4 Energy others	Gaseous Fuel	N2O	0.10	0.10	0.00	1.00
1.A.4 Energy others	Liquid Fuel	N2O	0.09	0.09	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	N2O	0.09	0.09	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	CH4	0.08	0.08	0.00	1.00
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	N2O	0.07	0.07	0.00	1.00
1.A.2.k. CONSTRUCTION	Liquid Fuel	N2O	0.07	0.07	0.00	1.00
1.A.2.m. OTHER	Liquid Fuel	N2O	0.06	0.06	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	CH4	0.05	0.05	0.00	1.00
1.A.2.c. CHEMICALS	Solid Fuel	N2O	0.04	0.04	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	N2O	0.04	0.04	0.00	1.00
1.A.2.k. CONSTRUCTION	Liquid Fuel	CH4	0.03	0.03	0.00	1.00
1.A.2.m. OTHER	Liquid Fuel	CH4	0.03	0.03	0.00	1.00
1.A.2.c. CHEMICALS	Solid Fuel	CH4	0.03	0.03	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	CH4	0.03	0.03	0.00	1.00
1.A.2.c. CHEMICALS	Liquid Fuel	N2O	0.03	0.03	0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	N2O	0.01	0.01	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	CH4	0.01	0.01	0.00	1.00
1.A.2.c. CHEMICALS	Liquid Fuel	CH4	0.01	0.01	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	CH4	0.01	0.01	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	N2O	0.01	0.01	0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	CH4	0.01	0.01	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	N2O	0.00	0.00	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	N2O	0.00	0.00	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	CH4	0.00	0.00	0.00	1.00

Category	Activity data	Gases	Eq CO2	Modulus	Lx,t	Cumulative
1.A.5.a NON-SPECIFIED	Gaseous Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	CH4	0.00	0.00	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Gaseous Fuel	CH4	0.00	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00
1.A.4 Energy others	Solid Fuel	CO2	0.00	0.00	0.00	1.00
1.A.5.a NON-SPECIFIED	Gaseous Fuel	N2O	0.00	0.00	0.00	1.00

Trend Assessment

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	CO2	528.44	1402.38	0.15	1.65	0.87	0.12	0.16	0.16
3.B.1 FOREST LAND	All	CO2	458.89	427.46	0.13	0.07	0.87	0.10	0.14	0.30
2.F.1.a. REFRIGERATION AND STATIONARY AIR CONDITIONING	HFCs	HFC	54.98	465.50	0.02	7.47	0.87	0.10	0.14	0.44
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	CO2	561.54	1358.19	0.16	1.42	0.87	0.09	0.12	0.55
4.D WASTEWATER TREATMENT		CH4	250.88	201.32	0.07	-0.20	0.87	0.08	0.10	0.65
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	CO2	166.03	138.47	0.05	-0.17	0.87	0.05	0.07	0.72

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	CO2	597.72	966.04	0.17	0.62	0.87	0.04	0.06	0.78
1.A.4 Energy others	Liquid Fuel	CO2	70.88	40.42	0.02	-0.43	0.87	0.03	0.04	0.81
4.A SOLID WASTE MANAGEMENT		CH4	351.12	744.52	0.10	1.12	0.87	0.02	0.03	0.85
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	CO2	46.53	41.25	0.01	-0.11	0.87	0.01	0.02	0.86
3.C.6 Indirect N2O from manure management		N2O	5.04	47.86	0.00	8.49	0.87	0.01	0.01	0.88
3.C.5 Indired N2O from managed soils		N2O	20.49	4.19	0.01	-0.80	0.87	0.01	0.01	0.89
3.A.1 ENTERIC FERMENTATION	All	CH4	25.94	16.24	0.01	-0.37	0.87	0.01	0.01	0.90
3.C.4 Direct N2O from managed soils		N2O	64.24	152.29	0.02	1.37	0.87	0.01	0.01	0.92
1.A.2.k. CONSTRUCTION	Liquid Fuel	CO2	0.13	25.98	0.00	201.52	0.87	0.01	0.01	0.93
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	CO2	30.49	81.69	0.01	1.68	0.87	0.01	0.01	0.93
1.A.2.m. OTHER	Liquid Fuel	CO2	27.18	26.89	0.01	-0.01	0.87	0.01	0.01	0.94
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	CO2	25.76	27.99	0.01	0.09	0.87	0.01	0.01	0.95
1.A.2.m. OTHER	Solid Fuel	CO2	17.18	18.66	0.00	0.09	0.87	0.00	0.01	0.96
1.A.2.c. CHEMICALS	Liquid Fuel	CO2	13.46	12.00	0.00	-0.11	0.87	0.00	0.01	0.96
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	CH4	6.98	1.21	0.00	-0.83	0.87	0.00	0.00	0.97
2.F.1.b. MOBILE AIR CONDITIONING	HFCs	HFC	0.43	10.26	0.00	22.59	0.87	0.00	0.00	0.97
3.A.2 MANURE MANAGEMENT	All	CH4	4.83	1.21	0.00	-0.75	0.87	0.00	0.00	0.97

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.1.a.i. ELECTRICITY GENERATION	Solid Fuel	N2O	10.02	11.27	0.00	0.12	0.87	0.00	0.00	0.98
1.A.2.m. OTHER	Solid Fuel	N2O	4.10	0.53	0.00	-0.87	0.87	0.00	0.00	0.98
3.A.2 MANURE MANAGEMENT	All	N2O	7.38	6.97	0.00	-0.06	0.87	0.00	0.00	0.98
1.A.2.c. CHEMICALS	Solid Fuel	CO2	8.59	9.33	0.00	0.09	0.87	0.00	0.00	0.98
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	CO2	8.59	9.33	0.00	0.09	0.87	0.00	0.00	0.99
1.A.2.m. OTHER	Solid Fuel	CH4	3.25	0.42	0.00	-0.87	0.87	0.00	0.00	0.99
2.D.1. LUBRICANT USE	Consumption of lubricant	CO2	5.56	5.22	0.00	-0.06	0.87	0.00	0.00	0.99
2.C.1. IRON AND STEEL PRODUCTION	Iron and steel production	CO2	19.57	31.63	0.01	0.62	0.87	0.00	0.00	0.99
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	N2O	6.98	18.00	0.00	1.58	0.87	0.00	0.00	0.99
1.A.3.b. ROAD TRANSPORT	Liquid Fuel	CH4	3.49	9.81	0.00	1.81	0.87	0.00	0.00	0.99
1.A.4 Energy others	Solid Fuel	CH4	2.17	1.22	0.00	-0.44	0.87	0.00	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	CO2	1.68	1.24	0.00	-0.26	0.87	0.00	0.00	1.00
1.A.4 Energy others	Gaseous Fuel	CO2	124.94	235.28	0.04	0.88	0.87	0.00	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	CO2	1.77	1.78	0.00	0.00	0.87	0.00	0.00	1.00
4.C INCENARATION OF WASTE		CO2	0.56	0.12	0.00	-0.79	0.87	0.00	0.00	1.00
3.C.1 BURNING	Forest Land	CO2	0.56	0.41	0.00	-0.26	0.87	0.00	0.00	1.00

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	CO2	7.41	13.29	0.00	0.79	0.87	0.00	0.00	1.00
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	CO2	4.77	9.29	0.00	0.95	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	N2O	0.35	0.29	0.00	-0.16	0.87	0.00	0.00	1.00
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	N2O	1.24	1.99	0.00	0.61	0.87	0.00	0.00	1.00
1.A.4 Energy others	Liquid Fuel	CH4	0.28	0.28	0.00	0.00	0.87	0.00	0.00	1.00
1.A.4 Energy others	Solid Fuel	N2O	0.27	0.27	0.00	0.00	0.87	0.00	0.00	1.00
1.A.4 Energy others	Liquid Fuel	N2O	0.16	0.09	0.00	-0.42	0.87	0.00	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	CO2	2.54	4.55	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Liquid Fuel	CH4	0.18	0.15	0.00	-0.16	0.87	0.00	0.00	1.00
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	N2O	0.23	0.62	0.00	1.66	0.87	0.00	0.00	1.00
1.A.1.a.i. ELECTRICITY GENERATION	Liquid Fuel	CH4	0.65	1.05	0.00	0.61	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	N2O	0.10	0.09	0.00	-0.11	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	N2O	0.11	0.12	0.00	0.09	0.87	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Liquid Fuel	N2O	0.08	0.07	0.00	-0.13	0.87	0.00	0.00	1.00
1.A.3.d.ii WATER-BORNE NAVIGATION	Liquid Fuel	CH4	0.09	0.23	0.00	1.66	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Solid Fuel	CH4	0.08	0.08	0.00	0.09	0.87	0.00	0.00	1.00

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Liquid Fuel	CH4	0.05	0.05	0.00	-0.11	0.87	0.00	0.00	1.00
1.A.2.m. OTHER	Liquid Fuel	N2O	0.06	0.06	0.00	-0.01	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	CO2	0.64	1.14	0.00	0.79	0.87	0.00	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	CO2	0.25	0.52	0.00	1.06	0.87	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Liquid Fuel	CH4	0.04	0.03	0.00	-0.13	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	CO2	0.42	0.76	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Solid Fuel	N2O	0.04	0.04	0.00	0.09	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	N2O	0.04	0.04	0.00	0.09	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Liquid Fuel	N2O	0.03	0.03	0.00	-0.11	0.87	0.00	0.00	1.00
1.A.2.m. OTHER	Liquid Fuel	CH4	0.03	0.03	0.00	-0.01	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Solid Fuel	CH4	0.03	0.03	0.00	0.09	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Solid Fuel	CH4	0.03	0.03	0.00	0.09	0.87	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Gaseous Fuel	CO2	0.22	0.39	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Liquid Fuel	CH4	0.02	0.01	0.00	-0.11	0.87	0.00	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	N2O	0.00	0.00	0.00	-0.26	0.87	0.00	0.00	1.00
1.A.4 Energy others	Gaseous Fuel	CH4	0.28	0.52	0.00	0.88	0.87	0.00	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	N2O	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	N2O	0.04	0.07	0.00	0.95	0.87	0.00	0.00	1.00
1.A.2.d. PULP, PAPER AND PRINT	Liquid Fuel	CH4	0.00	0.00	0.00	-0.26	0.87	0.00	0.00	1.00
1.A.2.a. IRON AND STEEL	Liquid Fuel	CH4	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	CH4	0.01	0.01	0.00	1.06	0.87	0.00	0.00	1.00
1.A.4 Energy others	Gaseous Fuel	N2O	0.05	0.10	0.00	0.88	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	CH4	0.00	0.01	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	CH4	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00
1.A.2.l. TEXTILE AND LEATHER	Gaseous Fuel	N2O	0.00	0.01	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.e. FOOD PROCESSING, BEVERAGES AND TOBACCO	Gaseous Fuel	N2O	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	CH4	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00
1.A.2.c. CHEMICALS	Gaseous Fuel	N2O	0.00	0.00	0.00	0.00	0.87	0.00	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	CH4	0.00	0.00	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.m. OTHER	Gaseous Fuel	N2O	0.00	0.00	0.00	0.79	0.87	0.00	0.00	1.00
1.A.3.a.ii. CIVIL AVIATION	Jet Kerosene - Liquid Fuel	CH4	0.00	0.00	0.00	0.95	0.87	0.00	0.00	1.00
1.A.3.b. ROAD TRANSPORT	Gaseous Fuel	N2O	0.00	0.00	0.00	1.06	0.87	0.00	0.00	1.00

Category	Activity data	Gases	Abs (2000)	Abs (2022)	Level assessment of base year	Trend assessment of individual category	Trend assessment of overall emissions	Tx,t ,Trend Assessment	% Contribution	Cumulative
1.A.2.k. CONSTRUCTION	Gaseous Fuel	CH4	0.00	0.00	0.00	0.79	0.87	0.00	0.00	1.00
1.A.2.k. CONSTRUCTION	Gaseous Fuel	N2O	0.00	0.00	0.00	0.79	0.87	0.00	0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	CO2	0.00	2.07	0.00		0.87		0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	CH4	0.00	0.01	0.00		0.87		0.00	1.00
1.A.3.e Other transportation	Liquid Fuel	N2O	0.00	0.01	0.00		0.87		0.00	1.00
1.A.4 Energy others	Solid Fuel	CO2	0.00	0.00	0.00		0.87		0.00	1.00
1.A.5.a NON-SPECIFIED	Gaseous Fuel	CO2	0.00	0.87	0.00		0.87		0.00	1.00
1.A.5.a NON-SPECIFIED	Gaseous Fuel	CH4	0.00	0.00	0.00		0.87		0.00	1.00
1.A.5.a NON-SPECIFIED	Gaseous Fuel	N2O	0.00	0.00	0.00		0.87		0.00	1.00

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