

**First Biennial Update Report (BUR1) to the United Nations Framework Convention on Climate Change**

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**Ministry of Environment, Solid Waste Management and Climate Change**

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**CONTENTS**

[Acronyms and Abbreviations 6](#_Toc59092470)

[Executive Summary 8](#_Toc59092471)

[1 National Circumstances 14](#_Toc59092472)

[2 Institutional Arrangements Related to MRV 15](#_Toc59092473)

[2.1 Government structure relevant to MRV 15](#_Toc59092474)

[2.2 Overall coordination of MRV 16](#_Toc59092475)

[2.3 MRV for GHG inventory system 17](#_Toc59092476)

[2.4 MRV of mitigation actions 18](#_Toc59092477)

[2.5 MRV of support needed and support received 18](#_Toc59092478)

[2.6 Constraints, needs and gaps 19](#_Toc59092479)

[3 The National GHG Inventory (Greenhouse Gas Emissions and Removals) 20](#_Toc59092480)

[3.1 Inventory overview 20](#_Toc59092481)

[3.2 Energy sector 29](#_Toc59092482)

[3.3 Industrial processes and product use (IPPU) 35](#_Toc59092483)

[3.4 Agriculture, forestry and other land use (AFOLU) 39](#_Toc59092484)

[3.5 Waste 50](#_Toc59092485)

[3.6 Gaps, constraints and needs 53](#_Toc59092486)

[3.7 Improvement plans 53](#_Toc59092487)

[3.8 Suggestions and needs for improvement of reporting 54](#_Toc59092488)

[4 Mitigation Actions 55](#_Toc59092489)

[4.1 Overview 55](#_Toc59092490)

[4.2 Mitigation Actions for the Energy sector 56](#_Toc59092491)

[4.3 Mitigation Actions for the IPPU sector 80](#_Toc59092492)

[4.4 Mitigation Actions for the AFOLU sector 82](#_Toc59092493)

[4.5 Mitigation Actions for the Waste sector 92](#_Toc59092494)

[4.6 Constraints and barriers to mitigation 96](#_Toc59092495)

[5 Finance, Technology and Capacity Building Needs and Support Received 98](#_Toc59092496)

[5.1 Support needed 99](#_Toc59092497)

[5.2 Financial support received 101](#_Toc59092498)

[5.3 Technology and capacity building support received 105](#_Toc59092499)

[5.4 Data/information gaps 109](#_Toc59092500)

[5.5 Suggestions and needs for improvement of reporting 109](#_Toc59092501)

[References 110](#_Toc59092502)

[Technical Annex to the BUR: GHG Inventory 111](#_Toc59092503)

[Annex 1: Methodology Applied in 2000 – 2016 series 112](#_Toc59092504)

[Annex 2: Summary Report for GHG Emissions Inventory 114](#_Toc59092505)

[Annex 3: Key Category Analysis 138](#_Toc59092506)

### Tables

Table 1. Executive summary – Summary table 8

Table 2. Key Categories analysis for the year 2016 – Level Assessment 22

Table 3. Key Categories analysis for the period 2000 – 2016 – Approach 1 – Trend Assessment 22

Table 4. GWP values for 100-year time horizon according to the Second Assessment Report of IPCC (SAR) 23

Table 5. Completeness of the 2000-2016 National GHG Emission Inventory 24

Table 6. Total aggregate GHG emissions and removals by year and gas (Gg GHG) 27

Table 7. GHG Emissions and removals by year and sector (Gg CO2eq) 27

Table 8. GHG Emissions for Energy sector (Gg CO2eq) 30

Table 9. Methodology used for the Energy sector 30

Table 10. Uncertainty analysis of the Energy sector for the trend 2000 – 2016. 32

Table 11. GHG Emissions for IPPU sector (Gg CO2eq) 36

Table 12. Methodology used for the IPPU sector 36

Table 13. Uncertainty analysis of the IPPU sector for the trend 2000 – 2016 38

Table 14. Harvested and production area of crops for years 2014 to 2016 39

Table 15. Area harvested in agricultural crops, 2014 – 2016 41

Table 16. Production of agro-industrial products, 2013 – 2016 41

Table 17. Area of forest in 2016 for each category type 43

Table 18. Area of forest in 2016 for each category type 45

Table 19. Imports and value (c.i.f) of forest products, 2013 – 2016 45

Table 20. Domestic exports and value (f.o.b) of forest products, 2013 – 2016 46

Table 21. GHG emission from enteric fermentation of livestock and manure management, 2014 – 2016 47

Table 22. GHG removals by AFOLU sector 48

Table 23. Direct and indirect N2O emissions on land 49

Table 24. GHG Emissions for Waste sector (Gg CO2eq) 51

Table 25. Methodology used for the Waste sector 51

Table 26. Uncertainty analysis of the IPPU sector for the trend 2000 – 2016 52

Table 27. List of support needs 99

Table 28. List of financial support received 101

Table 29. List of climate finance from international donors 103

Table 30. List of capacity building and technology transfer activities developed in the country 105

Table 31. List of capacity building and technology transfer activities developed in the country under cooperation 108

Table 32. Methodology applied for the GHG emission inventory 2000-2016 112

Table 33. Summary Report for GHG Emissions Inventory, Year 2000 114

Table 34. Summary Report for GHG Emissions Inventory, Year 2005 118

Table 35. Summary Report for GHG Emissions Inventory, Year 2010 122

Table 36. Summary Report for GHG Emissions Inventory, Year 2014 126

Table 37. Summary Report for GHG Emissions Inventory, Year 2015 130

Table 38. Summary Report for GHG Emissions Inventory, Year 2016 134

Table 39. Key Category Analysis, Approach 1 – Level Assessment 138

Table 40. Key Category Analysis, Approach 1 – Trend Assessment 145

### Figures

Figure 1. Sustained institutional arrangement for Biennial Update Report 16

Figure 2. Government structure relevant to MRV 16

Figure 3. Institutions involved in the preparation of BUR 17

Figure 4. GHG emission inventory development cycle 20

Figure 5. National GHG emissions by sector 27

Figure 6. National GHG emission shares by sector for years 2014, 2015 and 2016 28

Figure 7. Evolution of the GHG Emissions for Energy sector (Gg CO2eq) 29

Figure 8. Evolution of the GHG Emissions for IPPU sector (Gg CO2eq) 35

Figure 9. Evolution of the area harvested from 2007 to 2016 41

Figure 10. Forest types in Mauritius 44

Figure 11. Import of forest products, 2013 – 2016 46

Figure 12. Emissions from enteric fermentation of livestock and manure management, 2014 – 2016 48

Figure 13. GHG Trend of GHG Removals from Forest Land (Gg CO2eq) 49

Figure 14. Evolution of the GHG Emissions for Waste sector (Gg CO2eq) 50

# Acronyms and Abbreviations

|  |  |
| --- | --- |
| AAP | Africa Adaptation Programme |
| AD | Activity Data |
| AFOLU | Agriculture, Forestry and Other Land Use (2006 IPCC Guidelines) |
| Annex I | Parties included in Annex I to the United Nations Framework Convention on Climate Change |
| AR4 | Fourth Assessment Report |
| BAU | Business as Usual |
| BESS | Battery Energy Storage System |
| BUR | Biennial Update Report |
| CCIC | Climate Change Information Centre |
| CDM | Clean Development Mechanism |
| CEB | Central Electricity Board |
| CER | Certified Emission Reduction |
| CPEIR | Climate public expenditure and institutional review |
| DOWA | Deep Ocean Water Application |
| EE | Energy Efficiency |
| EEBCCS | Energy Efficiency Building Code Compliance Scheme |
| EF | Emission Factor |
| EST | Environmentally Sound Technologies |
| FAREI | Food and Agricultural Research & Extension Institute |
| GCF | Green Climate Fund |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GHG | Greenhouse Gas |
| GNI | Gross National Income |
| GVA | Gross Value Added |
| GWP | Global Warming Potential |
| ICT | Information and Communication Technology |
| ICZM | Integrated Coastal Zone Management |
| IEF | Implicit Emission Factor |
| IOC | Indian Ocean Commission |
| IPCC | Intergovernmental Panel on Climate Change |
| IPM | Integrated Pest Management |
| IPPs | Independent Power Producers |
| IPPU | Industrial Processes and Product Use |
| JCA | Japan International Cooperation Agency |
| LNG | Liquified Natural Gas |
| LPG | Liquid Petroleum Gas |
| LTO | Landing and Take-Offs |
| LULUCF | Land Use, Land-Use Change and Forestry |
| MIC | Upper-middle-income Country |
| MoESWMCC | Ministry of Environment, Solid Waste Management and Climate Change |
| MEPU | Ministry of Energy and Public Utilities |
| MRC | Mauritius Research Council |
| MRV | Measurement, Reporting and Verification |
| MSDG | Medium-Scale Distributed Generation |
| MUR | Mauritian Rupee |
| NAI | National Accounts and Investment |
| NAMA | Nationally Appropriate Mitigation Action |
| NCV | Net Calorific Value |
| NDC | Nationally Determined Contributions |
| NDRRMC | National Disaster Risk Reduction and Management Centre |
| NIR | National Inventory Report |
| NIS | National Inventory System |
| Non-Annex I | Parties not included in Annex I to the United Nations Framework Convention on Climate Change |
| NTA | National Transport Authority |
| ODS | Ozone Depleting Substances |
| OEP | Outline Energy Policy |
| PV | Photovoltaic |
| QA | Quality Assurance |
| QC | Quality Control |
| R&D | Research and Development |
| RCMRD | Regional Centre for Mapping of Resources for Development |
| RE | Renewable Energy |
| RoM | Republic of Mauritius |
| SIDS | Small Island Development States |
| SLM | Sustainable Land Management |
| TAP | Technology Action Plans |
| TEU | Twenty-foot Equivalent Unit |
| TNA | Technology Needs Assessment |
| TNC | Third National Communication |
| UNEP | United Nations Environment Program |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | United States Dollar |
| WB | World Bank |
| WTE | Waste-to-Energy |

# Executive Summary

Table 1. Executive summary – Summary table[[1]](#footnote-2)

|  |  |
| --- | --- |
| 1. **National Circumstances** | |
| **Name of Party** | Republic of Mauritius |
| **Year** | 2000 – 2016 |
| **Most recent national report to UNFCCC and year of submission** | Third National Communication reported in 2016  National GHG Inventory Report submitted in 2017 |
| **Description of economy-wide and/or sectoral mitigation pledges, if any** |  |
| **Description of long-term mitigation goals and the timeline they relate to, if any** |  |
| **Sectors (or sub-sectors) covered by pledge, if any** |  |

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| 1. **Institutional Arrangements related to MRV** |
| The Climate Change Division leads the process of institutional reorganization and, depending on the sector to which the GHG relates, involves one of the following institutions to provide experts for the review of the monitoring plan:   * Ministry of Environment, Solid Waste Management and Climate Change (MoESWMCC) * Ministry of Energy and Public Utility (MEPU) * Ministry of Agro Industry and Food Security * Ministry of Land Transport and Light Rail * Ministry of National Infrastructure and Community Department * Ministry of Blue Economy, Marine Resources, Fisheries and Shipping * Ministry of Commerce and Consumer Protection * Ministry of Industrial Development, SMEs and Cooperatives * Ministry of Housing and Land Use Planning * Ministry of Health and Wellness   These Ministries will be involved in the whole process of institutional arrangement to provide technical resources to shape the sectoral technical working groups    To date, RoM has relied upon a system of temporary, ad hoc institutional arrangements to undertake National Communications and their associated inventories, whereby ministries and other institutions have supplied staff members to technical working groups for limited periods of time. A lack of systematic data archiving and a heavy reliance upon short-term consultants. There is a need to develop a sustainable solution for archiving the data collected; currently, data is fragmented across multiple computers, is not readily accessible and is difficult to reconstruct for the purposes of building time-series.  The result is an increasingly stressed MRV system that is struggling, and will continue to struggle, in the face of growing demands, notably the increasing frequency of reporting (BURs) and the growing need for GHG data to inform national policies and to track NDC progress.    Mauritius is in the process of developing a framework which ensures MRV approaches for individual mitigation actions are developed using a uniform process, using common sectoral assumptions to provide comparability with existing projections, are aligned with data and emission factors in the national GHG inventory where feasible, avoid double counting and are reported using standardized reports on implementation and impacts.  The responsibility of the MRV of support will be taken by the Ministry of Finance in close collaboration with the Environment and Sustainable Development Division or the institutional body responsible for the Environmental Funds.  Considering the current progress of the MRV system, it is challenging to ensure a regular and smooth data transfer between institutions and organizations. |

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| 1. **National GHG Inventory** | |
| **Time series (years covered by the inventory)** | 2000 – 2016 |
| **Overview: Development of GHG emissions and removals throughout the time series** | |
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| The total GHG emission trend is ascendant along the whole inventory period (2000 – 2016), with a brief decrease in 2009 and 2015, mainly motivated by the energy sector. Emissions in the RoM show an increase of 75.4% in the total amount of emissions between 2000 and 2016. Emissions from Energy sector present an increase along the whole period of 80.0% between 2000 and 2016. For Waste sector, between 2001 and 2008 it presents an increase of 14.33% with a maximum in 2008, followed by a minimum in 2009 and a subsequent increase until 2011 (7.12%) with a following reduction of the emissions until 2016. Between 2000 and 2016 the overall increase is 5.8% for the GHG emissions from waste sector. Emissions from IPPU sector present an increase along the 2000 – 2016 period of 342.53%. Emissions from AFOLU sector are negative (absorptions or removals) from 2000 to 2013 and positive (emissions) between 2014 and 2016. Along the 3 last years, emissions of AFOLU sector present a decrease of 7.3%.  The total GHG emissions in 2016 are estimated in 5,137.78 Gg CO2eq. | |

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| 1. **Mitigation Actions** | | | | | |
| **Sectors prioritized for mitigation actions (if any)** | Energy, AFOLU and Waste | | | |
| **Key mitigation actions** | | | | | |
| **Title of mitigation action** | **Sector a** | **Status (planned, adopted, or implemented)** | **Estimated GHG emissions impact b** | **Estimated sustainable development impacts c** |
| Energy Efficiency Measures | Energy Industries | Under implementation | Reduction of 734 GgCO2e by 2030 and 2,117 by 2050 relative to BAU scenario | Deployment of appropriate technologies and awareness-raising on energy conservation. |
| Wind Energy Penetration | Energy Industries | Under implementation | Reduction of 64 Gg CO2e by 2030, and 64 by 2050 relative to BAU scenario | Increasing of the energy generation through wind power. |
| Solar Energy Penetration | Energy Industries | Under implementation | Reduction of 119 Gg CO2e by 2030, and 118 by 2050 relative to BAU scenario | Increasing of the energy generation through photovoltaic plants. |
| Waste to Energy (WtE) Penetration | Energy Industries | Under implementation | Reduction of 207 Gg CO2e by 2030, and 208 by 2050 relative to BAU scenario | Use of landfill gas generated in the decomposition of the solid wastes as energy source. |
| Biomass Energy Penetration | Energy Industries | Under implementation | Reduction of 104 Gg CO2e by 2030, and 103 by 2050 relative to BAU scenario | Increasing of the energy generated from biomass sources such as bagasse, a by-product of sugarcane. |
| Additional Renewable Energy (RE) Penetration | Energy Industries | Planning phase | Reduction of 77 Gg CO2e by 2030, and 261 by 2050 relative to BAU scenario | Implementation of additional renewable energy sources beyond 2030. |
| Improved fuel intensity | Road Transport | Under implementation | Reduction of 19 Gg CO2e by 2030 and 25 Gg CO2e by 2050 relative to BAU scenario | Improvement of the fuel intensity. |
| Improved vehicle inspection | Road Transport | Under implementation | Reduction of 64 Gg CO2e by 2030 and 82 Gg CO2e by 2050 relative to BAU scenario | Improvement of the vehicle inspection centres. |
| Low-carbon options | Road Transport | Under implementation | Reduction of 42 Gg CO2e by 2030 and 180 Gg CO2e by 2050 relative to BAU scenario | Combine different low-carbon technologies. |
| Light rail system | Railway Transport | Under implementation  Phase 1 implemented | Reduction of 26 Gg CO2e by 2030 and 27 Gg CO2e by 2050 relative to BAU scenario | Generate modal shift away from private cars and buses along the Curepipe – Port Louis corridor.  Phase 1 – Port Louis to Rose Hill |
| Bus Modernisation Programme | Road Transport | Under implementation | Reduction of 10,950t CO2e by 2030 relative to BAU scenario | Modernisation of the bus fleet of the country by substituting the current operational buses for electric e-buses |
| Standards for treated manure from animal waste | Agriculture, Livestock | Under implementation | Reduction of CH4 and N2O to be assessed during implementation | Developing treated manure standards using proven locally adapted technology. |
| Promotion of small livestock projects at back yard level | Agriculture, Livestock | Under implementation | Reduction GHGs gases by controlled rearing of livestock animals | Reduce emissions through small livestock rearing. |
| Training of farmers and officers on climate smart agriculture under GCCA+ | Agriculture | Planning phase (funding disbursement awaited) | To be assessed | Developing the technical, policy and investment conditions so as to achieve sustainable agricultural development for food security under climate change. |
| Assessing aerobic and anaerobic methods for treating livestock waste and waste recycling | Agriculture, Livestock | Under implementation | To be assessed during implementation phase | Monitoring of biogas units to assess the GHG emission reduction. |
| Model Eco-Village project  Implementing a biomass to electricity chain in Rodrigues Island | Energy, Agriculture, Biomass | Under implementation | To be assessed during implementation phase | Facilitate the conditions of access to development, investment and sustainable management of renewable energies; Increase the energy efficiency of the various economic sectors. |
| Strategy and action plan for a new solid waste management and resource recovery system for Mauritius | Waste | Under implementation | To be assessed during implementation phase | Preparation of strategy and action plan, including a baseline review and an analysis of strategic options and recommendations; Feasibility of the selected option(s) and preparation of ToR for subsequent studies. |
| Rochie Bios WWTP on built operate transfer mode | Wastewater Treatment | Under implementation | To be assessed during implementation phase | To comply with ocean discharge standards and prevent pollution of sea water and to maintain the health and surrounding environment clean; To improve the technology as initially only primary treatment plant was present. |
| The Baie deu Tombieu phase III | Sewage and Liquid Waste Treatment | Under implementation | To be assessed during implementation phase | Provide proper sewer lines to 5,900 houses and industrial areas at Le Hochet, Riche Tere, Tere Rouge, Bois Marchand and Bois Pignolet. |

a*E.g. energy, transport, industry, agriculture, forestry, waste, cross-cutting. Parties should feel free to further define sectors as necessary, e.g. cross-cutting – energy efficiency in dwellings.*

b*Relative to a baseline scenario (e.g. tCO2e), annual and cumulative over a defined time period; whether the estimate is ex-ante or ex-post; description of methodology and assumptions used*

c*Over a defined time period (for each social, economic, environmental impact of interest); description of methodology and assumptions used*

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| 1. **Finance, Technology and Capacity-Building Needs and Support**   **Received** | |
| **International financial resources received in the reporting period (2000-2016) [USD]** | *To be developed by National Consultant* |
| **Main international technology transfer, capacity-building and technical support received in the reporting period (2000-2016)** | *To be developed by National Consultant* |
| **Main international support needed (qualitative description with quantitative estimate of corresponding financial needs, where applicable)** | *To be developed by National Consultant* |
| Financial resources represent the funds that need to be (needs) or have been mobilized (finance received) which can come from public, private or alternative financing sources. On the other hand, the capacity building, is understood as a process that seeks to increase the capacity of individuals, organizations and institutions in developing/economies in transition countries by identifying, planning and implementing ways to mitigate and adapt to climate change (UNFCCC, 2019). Technology transfer is defined as processes developed for knowledge, financing and goods exchange among the different parties involved leading to the technology dissemination for the adaptation or the mitigation of climate change. This includes the process that encompasses the technologies dissemination – hardware and software - and technological cooperation through and within countries.  During the process of preparation of the present First BUR, various constraints and gaps and the related financial, technical and capacity needs were identified. As indicated in the NDC of the country, “The RoM imperatively needs international technical and financial support to enable it to abate its GHG emissions by 30%, by the year 2030, relative to the BaU scenario of 7 M tCO2eq.”. To this end, it will require international support in its efforts to transition towards a low-carbon development path through greater utilisation of renewable sources of energy.  The financial support received for climate change activities in the RoM is differenced into domestic public finance and private sector finance.  The domestic public finance for climate change activities, specifically mitigation activities, as reported in the Mauritius Public Environmental Expenditure Review 2011 – 2014, the percentage of climate change expenditures are 7.6% of the total government expenditures for 2014 which are accounted in 106,693 MUR m, where the 22% are related to mitigation activities. The major part of the mitigation-related expenditures is from solid waste sector, local authorities (most of the bulk related to waste management) and livestock production (TNC Report, 2016).  Mauritius has previously benefited from technical assistance financed by the GEF to implement the Technology Needs Assessment (TNA) project, that provides a robust methodology approach to developing mitigation action plans in the form of Technology Action Plans (TAPs) to support the transfer and diffusion of Environmentally Sound Technologies (ESTs).  Capacity-building for climate action is, at the core of Article 11 of the Paris Agreement, fundamental in preparing communities for climate change and protecting them against its possible impacts. Various capacity building initiatives have been undertaken by the RoM to move forward with sustainable development and climate change agendas. Increased emphasis is being placed on institutional strengthening and enhancement of human capital. Capacity building for the mitigation of climate change and adaptation is being promoted in most socio-economic and environmental sectors. | |

# National Circumstances

*To be developed by National Consultant*

# Institutional Arrangements Related to MRV

## Government structure relevant to MRV

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| In order to integrate the MRV system in the organizational structure of Mauritius Government, an institutional arrangement must be developed to ensure assigned responsibilities, enough capacity and manpower, as well as a smooth connection and regular exchange of information between the administrations/institutions involved in MRV activities.  In this context, a sustained institutional arrangement for Biennial Update Reports is proposed to create an appropriate working framework. This working framework should cover management and coordination of the parties involved in the MRV system. In addition, sectoral experts should be part of the working framework to provide technical knowledge and data.  Based on the proposed institutional arrangement, a Climate Change Committee from the existing Climate Change Division (CCD) in the Department of Environment of the Ministry of Environment, Solid Waste Management and Climate Change (MoESWMCC) has been created. This Committee also needs a Steering Committee that manages and coordinates the entire working group responsible of the MRV system.  National sectoral experts must be involved in this working framework. Consequently, a Technical Committee divided in six main pillars has been setting up: Energy Industries Sub-TWG, Transport Sub-TWG, Energy Other Sector Sub-TWG, Industrial Processes and Product Use Sub-TWG, Agriculture, Forestry and Other Land Use (AFOLU) Sub-TWG and Waste (Solid and Liquid) Sub-TWG. These pillars represent the Technical Working Groups (TWG) for the First BUR.  The Climate Change Division leads the process of institutional reorganization and, depending on the sector to which the GHG relates, involves one of the following institutions to provide experts for the review of the monitoring plan:   * Ministry of Environment, Solid Waste Management and Climate Change (MoESWMCC) * Ministry of Energy and Public Utility (MEPU) * Ministry of Agro Industry and Food Security * Ministry of Land Transport and Light Rail * Ministry of National Infrastructure and Community Department * Ministry of Blue Economy, Marine Resources, Fisheries and Shipping * Ministry of Commerce and Consumer Protection * Ministry of Industrial Development, SMEs and Cooperatives * Ministry of Housing and Land Use Planning * Ministry of Health and Wellness   These Ministries will be involved in the whole process of institutional arrangement to provide technical resources to shape the sectoral technical working groups  Figure 1. Sustained institutional arrangement for Biennial Update Report |

## Overall coordination of MRV

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| To date, RoM has relied upon a system of temporary, ad hoc institutional arrangements to undertake National Communications and their associated inventories, whereby ministries and other institutions have supplied staff members to technical working groups for limited periods of time. This has led to coordination challenges (over 75 such institutions are usually involved), as well as limited institutional memory (as it is rarely the same staff members who work on successive National Communications), a lack of systematic data archiving and a heavy reliance upon short-term consultants. There is a need to develop a sustainable solution for archiving the data collected; currently, data is fragmented across multiple computers, is not readily accessible and is difficult to reconstruct for the purposes of building time-series.  Presently, the Climate Change Division (CCD) is responsible for coordinating data collection. Input of data into the 2006 IPCC inventory Software is either undertaken by Consultants. Data processing – i.e. converting data into the form required for the IPCC Software – is a laborious process that varies from sector to sector according to data availability and individual institutional capacities.  The result is an increasingly stressed MRV system that is struggling, and will continue to struggle, in the face of growing demands, notably the increasing frequency of reporting (BURs) and the growing need for GHG data to inform national policies and to track NDC progress.  Figure 2. Government structure relevant to MRV |

## MRV for GHG inventory system

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| RoM has an obligation to submit BUR as well as NC on a regular basis, including GHG emissions inventory. It is vital that the process be strengthened, and a system is developed and maintained in a robust manner to ensure that it functions on a continuous basis to meet Republic’s reporting requirements. There is a need to strengthen the existing institutional arrangements or establish new ones to ensure that national capacity is available to yield more technically robust reports and meet the frequency of submissions.  CCD together with the support of the MoESWMCC, acting as the coordinating institution for GHG inventory, is responsible for coordinating the activities related to data collection, identification of relevant stakeholders, and the organisation of capacity building exercises. The data collection is led by the Team Leader (TL) of each sectoral working group, under the guidance of consultants.  The MoESWMCC is the focal point for the UNFCCC and is responsible for the coordination of the BUR and NIR development. The CCD, as responsible for the coordination of data collection and responsible for the formulation of Low Carbon Development Strategy and a Nationally Appropriate Mitigation Actions (NAMAs) for RoM, should support the MoESWMCC in the development of the documents to be reported to the UNFCCC. However, under the CCD, there is no permanent staff having attribution to follow day to day activities related to GHG Inventories.  Figure 3. Institutions involved in the preparation of BUR    The institutional arrangements used for the elaboration of the GHG emission inventory for the first Biennial Update Report are in line with the institutional arrangements used for the NIR. Six sub-technical working groups formed by assigned experts have been established to oversee the technical implementation of data collection, quality control and GHG Inventory.  The CCD, as focal point of the data collection is responsible for the data gathering from the responsible data providers. For this request of information, it is necessary the development of a correct institutional arrangement. The institutional arrangement should assure the smooth and regular development of the GHG Inventory. In addition, it is recommendable to establish a responsible for each of the data that has to be collected for the development of the national inventory. This responsible should have identified the different responsible from whom data must be requested. |

## MRV of mitigation actions

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| A Measuring, Reporting and Verification (MRV) System is required for GHG mitigation/sequestration actions to support NAMAs and the regular submission of BURs.  There is no completed formal recording system for tracking mitigation actions within the RoM institutions, which would be used to report conveniently about the status and progress of activities implemented. Nevertheless, RoM is in the process of developing a framework which ensures MRV approaches for individual mitigation actions are developed using a uniform process, using common sectoral assumptions to provide comparability with existing projections, are aligned with data and emission factors in the national GHG inventory where feasible, avoid double counting and are reported using standardized reports on implementation and impacts. The reported data will provide quality information for political decision-making and reporting on implementation of mitigation action at the national level as well as input for next Biennial Update Reports (BUR) compilation.  RoM continues to build and improve its system for measuring, reporting and verifying mitigation actions and their effects while tracking support received in implementing these. The institutional arrangements follow closely those described above for the GHG inventory, involving many of the same institutions collaborating for the MRV of emissions but with somewhat different responsibilities for the MRV mitigation and support systems. The Mitigation Working Groups (MWG), with representatives responsible for collecting and reporting data, should have well-developed procedures and these arrangements must be reviewed and upgraded to be fully operational and to deliver for meeting reporting standards.  For making the appropriate linkages on funding, the Ministry of Finance, Economic Planning and Development will be fully fledged member of the MRV mitigation and support systems. Ministries/Institution/Agencies implementing mitigation actions will automatically join the mitigation working group to provide data collected. |

## MRV of support needed and support received

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| The MRV of support will not completely be dissociated from the MRV of mitigation. However, the operational framework will have to be different from the one proposed for MRV of mitigation due to the different roles and responsibilities of various ministries.  Therefore, the responsibility of the MRV of support could be taken by the Ministry of Finance in close collaboration with the Environment and Sustainable Development Division or the institutional body responsible for the Environmental Funds.  The main ministries and institutions identified to be part of the MRV of support are:   * Ministry of Finance, Economic Planning and Development * Ministry of Energy and Public Utility (MEPU) * Ministry of Agro Industry and Food Security * Ministry of Land Transport and Light Rail * Central Electricity Board (CEB)   Climate Change Division is in the process of developing user-friendly templates that the Ministries and other organizations will complete once annually, and send back for analysis, compilation and reporting. RoM is in the process of design but the information collected could be handed over to Statistics Mauritius for databasing and archiving. Then, Statistics Mauritius would send back a copy of the quality-controlled data to Climate Change Division for storage. However, this is something to be agreed at the topmost managerial level for appropriate action to guarantee a consistent system for the MRV of support. |

## Constraints, needs and gaps

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| Current situation in RoM shows that the MRV design and implementation is still in process, it is at the beginning of the whole process. In addition, there are certain gaps in several areas that might prevent the timely and successful implementation of the MRV system in the country.  Developing and making the MRV system fully functional face serious challenges. First and foremost is the inadequacy of the present institutional arrangements for the components of the MRV system. While significant progress has been made, there is still a long way to go for the MRV of mitigation, and still more for the MRV of support. Existing institutional arrangements will have to be constantly reviewed, strengthened and/or even initiated where still inexistent. Institutional arrangement also needs to be formalised to ensure ongoing and sustainable domestic MRV. The development and implementation of the proposed MRV system will demand for additional staff or a review of service’s conditions of staff members of Climate Change Division of the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development.  Considering the current progress of the MRV system, it is challenging to ensure a regular and smooth data transfer between institutions and organizations. MRV system management and coordination should guarantee efficient data structuring, analysis, use and re-use which also could be consider as a constraint. Besides, data structuring should be aligned with a QA/QC system. Developing an efficient and easy-to-produce reports should be considered before the MRV implementation to avoid useless productive work which does not add extra value, and this is in progress.  A relevant need has been identified. There is a gap identified related to national knowledge in terms of design and implement MRV systems. And, this gap determines a relevant need, which is that RoM needs more financial resources to be invest in capacity building for its national team in terms related to MRV systems, which could allow the Party to establish the technical bases and transfer of knowledge required for conclude the design and implementation of the MRV system. |

# The National GHG Inventory (Greenhouse Gas Emissions and Removals)

## Inventory overview

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| Overview Under Article 4.1 (a) of the United National Framework Convention on Climate Change (UNFCCC), each party has to develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all GHG not controlled by the Montreal Protocol, using comparable methodologies to be agreed by the Conference of the Parties.  Undertaking an Inventory is a cyclical task and is built on the results of the previous cycle. The following figure shows the example of the implementation cycle of a GHG Inventory, as shown in the 2006 IPCC Guidelines. This cycle has been applied to obtain the necessary inputs for the development of the GHG inventory and Mitigation Actions.  Figure 4. GHG emission inventory development cycle    ***Source:*** *Volume 1, Chapter 1 of the IPCC 2006 Guidelines.* [*https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1\_Volume1/V1\_1\_Ch1\_Introduction.pdf*](https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_1_Ch1_Introduction.pdf) |

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| The RoM submitted its first National GHG Emission Inventory as part of its First National Communication in April 1999. An improvement in the national inventory was made during the Second National Communication in November 2010 and reported in the National Inventory Report (NIR). Country’s last national inventory was developed in 2017 and reported in the NIR as part of Third National Communication (TNC)[[2]](#footnote-3). Institutional arrangements and inventory preparation The institutional arrangements used for the elaboration of the GHG emission inventory for the first Biennial Update Report is in line with the institutional arrangement used for the NIR. Six sub-technical working groups contain assigned experts and have been established to oversee the technical implementation of data collection, quality control and GHG Inventory. These sub-technical working groups are namely: energy industries, transport and energy other sectors, AFOLU and waste.  For the inventory preparation, the Climate Change Division of the ESDD was responsible of coordinating the data collection, identification of stakeholders and organising capacity buildings. More information is available in section 2 Institutional Arrangements Related to MRV of this document. Key category analysis 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 IPCC 2006 guidelines (Volume 1, Chapter 4).  Source Category Level Assessment = Source Category Estimate / Total Estimate  Lx,t = Ex,t / Et  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 sign, the total contribution/level can be larger than a country’s total emissions less removal.  The key category analysis was conducted using 2006 IPCC Software. The results from the software were interpreted as follow:   * 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 results for the level assessment for the year 2016 are presented in the Table 2 below:  Table 2. Key Categories analysis for the year 2016 – Level Assessment   | **IPCC Category code** | **IPCC Category** | **GHG** | **2016 Ex,t (Gg CO2eq)** | **│Ex,t│ (Gg CO2eq)** | **Lx,t** | **Cumulative Total of Column Lx,t** | | --- | --- | --- | --- | --- | --- | --- | | 1.A.1 | Energy Industries - Solid Fuels | CO2 | 1694,13 | 1694,13 | 0,33 | 0,33 | | 1.A.3.b | Road Transportation | CO2 | 1071,80 | 1071,80 | 0,21 | 0,54 | | 1.A.1 | Energy Industries - Liquid Fuels | CO2 | 703,03 | 703,03 | 0,14 | 0,67 | | 4.A | Solid Waste Disposal | CH4 | 403,30 | 403,30 | 0,08 | 0,75 | | 2.F.1 | Refrigeration and Air Conditioning | HFCsPFCs | 282,10 | 282,10 | 0,05 | 0,81 | | 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | CO2 | 261,45 | 261,45 | 0,05 | 0,86 | | 1.A.4 | Other Sectors - Liquid Fuels | CO2 | 245,73 | 245,73 | 0,05 | 0,91 | | 4.D | Wastewater Treatment and Discharge | CH4 | 161,14 | 161,14 | 0,03 | 0,94 | | 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | CO2 | 77,35 | 77,35 | 0,02 | 0,95 |   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 IPCC 2006 Guidelines (IPCC, 2006).    Where,  Tx,t = trend assessment of source or sink category x in year t as compared to the base year  │Ex,t│= absolute value of emission or removal estimate of source or sink category x in base year  Ex,t and Ex,0 = real values of estimates of source or sink category x in year t and base year, respectively  and = total inventory estimates in year t and base year, respectively  The trend assessment for the period 2000-2016 resulted in the following gases and sectors as key sources/sinks of GHGs:  Table 3. Key Categories analysis for the period 2000 – 2016 – Approach 1 – Trend Assessment   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | IPCC Category code | IPCC Category | GHG | 2000 Year Estimate Ex0 (Gg CO2eq) | 2016 Year Estimate Ext (Gg CO2eq) | Trend Assessment (Txt) | % Contribution to Trend | Cumulative Total | | 1.A.1 | Energy Industries - Solid Fuels | CO2 | 561,54 | 1694,13 | 0,24 | 0,30 | 0,30 | | 1.A.1 | Energy Industries - Liquid Fuels | CO2 | 597,72 | 703,03 | 0,12 | 0,15 | 0,45 | | 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | CO2 | 303,60 | 261,45 | 0,09 | 0,12 | 0,57 | | 4.A | Solid Waste Disposal | CH4 | 352,65 | 403,30 | 0,07 | 0,09 | 0,66 | | 2.F.1 | Refrigeration and Air Conditioning | HFCs, PFCs | 47,99 | 282,10 | 0,07 | 0,09 | 0,75 | | 4.D | Wastewater Treatment and Discharge | CH4 | 188,70 | 161,14 | 0,06 | 0,07 | 0,82 | | 1.A.3.b | Road Transportation | CO2 | 528,48 | 1071,80 | 0,05 | 0,06 | 0,88 | | 1.A.4 | Other Sectors - Liquid Fuels | CO2 | 195,81 | 245,73 | 0,03 | 0,04 | 0,93 | | 3.C.4 | Direct N2O Emissions from managed soils | N2O | 0,00 | 37,04 | 0,01 | 0,02 | 0,94 | | 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | CO2 | 60,11 | 77,35 | 0,01 | 0,01 | 0,95 | | 1.A.1 | Energy Industries - Solid Fuels | CO2 | 561,54 | 1694,13 | 0,24 | 0,30 | 0,30 |   The whole key category analysis is shown in the Annex 3: Key Category Analysis. Methodological issues To meet the reporting requirements of UNFCCC the GHG national inventory is divided into 4 main sectors (Energy, IPPU, AFOLU and Waste) and each of which are further subdivided into sub-categories.  The methodology followed for the development of the national inventory is recommended by IPCC in their 2006 Guidelines for GHG emission estimation to be in line with Good Practices.  Generally, the methodology adopted for GHG emissions estimation consist on 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.   * **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 chapter 3 to 6 of the IPCC 2006 Guidelines, and in the sections below.  To use a common unit for GEI emissions, the IPCC recommends the use of Global Warming Potentials (GWP) to convert GHG emissions other than CO2 to the latter equivalent, CO2 equivalent (CO2e). The GWP values used in the current inventory are those adopted from the Second Assessment Report (SAR) as collected in the following table for each GHG reported in the National Inventory.  Table 4. GWP values for 100-year time horizon according to the Second Assessment Report of IPCC (SAR)   |  |  |  | | --- | --- | --- | | **Common name** | **Chemical formula** | **Second Assessment Report (SAR)** | | Carbon dioxide | CO2 | 1 | | Methane | CH4 | 21 | | Nitrous oxide | N2O | 310 | | HFC-23 | CHF3 | 11,700 | | HFC-32 | CH2F2 | 650 | | HFC-125 | CHF2CF3 | 2,800 | | HFC-134a | CH2FCF3 | 1,300 | | HFC-152a | CH3CHF2 | 140 | | HFC-143a | CH3CF3 | 3,800 | | HFC-227ea | CF3CHFCF3 | 2,900 | | HFC-236fa | CF3CH2CF3 | 6,300 |   ***Source:*** *Second Assessment Report (SAR).*  The GHG Inventory for the BUR1 includes the trend of emissions over the period 2000 – 2016. Quality assurance and Quality control (QA/QC) The IPCC 2006 Guidelines recommend that quality control be exercised by comparing emission results using alternative approaches, comparing results and investigating anomalies. They also recommend that control 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.  More information is collected in the specific sectorial sections below. Uncertainty assessment IPCC 2006 Guidelines consider the Uncertainty Analysis 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 IPCC 2006 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 emission 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 last inventory period estimated by RoM was 2000-2013, where the base year considered was the year 2000. For this BUR1, the period 2000-2016 has been estimated. In some cases, the activity data for some of the new year’s included were not available, so these were estimated by using the best adjustment which best fits the trend, and these could lead to a bigger uncertainty of the data used. For that reason, two base years have been established, and two uncertainty analysis have been developed.  More information is collected in the specific sectorial sections below. Completeness assessment The following table provides the completeness of the inventory.  Table 5. Completeness of the 2000-2016 National GHG Emission Inventory   | **Category** | **CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | | --- | --- | --- | --- | --- | --- | --- | | 1 - Energy |  |  |  |  |  |  | | 1.A – Fuel Combustion Activities |  |  |  |  |  |  | | 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 – Non-specified | X | X | X |  |  |  | | 1.B – Fugitive emissions from fuels |  |  |  |  |  |  | | 1.B.1 – Solid Fuels | NA | NA | NA |  |  |  | | 1.B.2 – Oil and Natural gas | NA | NA | NA |  |  |  | | 1.B.3 – Other emissions from Energy production | NA | NA | NA |  |  |  | | 1.C – Carbon dioxide Transport and Storage |  |  |  |  |  |  | | 1.C.1 – Transport of CO2 | NO |  |  |  |  |  | | 1.C.2 – Injection and Storage | NO |  |  |  |  |  | | 1.C.3 – Other | NO |  |  |  |  |  | | 2 – Industrial Processes and Product Use (IPPU) |  |  |  |  |  |  | | 2.A – Mineral Industry |  |  |  |  |  |  | | 2.A.1 – Cement production | NO |  |  |  |  |  | | 2.A.2 – Lime production | X |  |  |  |  |  | | 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 | | 2.B.10 – Other | NO | NO | NO | NO | NO | NO | | 2.C – Metal Industry |  |  |  |  |  |  | | 2.C.1 – Iron and steel production | X | NA |  |  |  |  | | 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 | | 2.D – Non-Energy products from Fuels and Solvent Use |  |  |  |  |  |  | | 2.D.1 – Lubricant Use | X | NA | NA |  |  |  | | 2.D.2 – Paraffin Wax Use | NO | NO | NO |  |  |  | | 2.D.3 – Solvent Use | NO | NO | NO |  |  |  | | 2.D.4 – Other | NO | NO | NO |  |  |  | | 2.E – Electronics Industry |  |  |  |  |  |  | | 2.E.1 – Integrated Circuit or Semiconductor |  |  |  | NO | NO | NO | | 2.E.2 – TFT Flat Panel Display |  |  |  | NO | NO | NO | | 2.E.3 – Photovoltaics |  |  |  | NO | NO | NO | | 2.E.4 – Heat Transfer Fluid |  |  |  | NO | NO | NO | | 2.E.5 - Other |  |  |  | NO | NO | NO | | 2.F – Product Uses as Substitutes for Ozone Depleting Substances |  |  |  |  |  |  | | 2.F.1 – Refrigeration and Air Conditioning |  |  |  | X | NO | NO | | 2.F.2 – Foam Blowing Agents |  |  |  | NA | NA | NA | | 2.F.3 – Fire Protection |  |  |  | NA | NA | NA | | 2.F.4 – Aerosols |  |  |  | NA | NA | NA | | 2.F.5 – Solvents |  |  |  | NA | NA | NA | | 2.F.6 – Other |  |  |  | NO | NO | NO | | 2.G – Other Product Manufacture and Use |  |  |  |  |  |  | | 2.G.1 – Electrical Equipment |  |  |  |  | NA | NA | | 2.G.2 – SF6 and PFCs from Other Product Uses |  |  |  |  | NA | NA | | 2.G.3 – N2O from Product uses |  |  | NA |  |  |  | | 2.G.4 – Other | NA | NA | NA | NA | NA | NA | | 2.H – Other |  |  |  |  |  |  | | 2.H.1 – Pulp and paper Industry | NO | NO | NO | NO | NO | NO | | 2.H.2 – Food and Beverages Industry | NO | NO | NO | NO | NO | NO | | 2.H.3 – Other | NO | NO | NO | NO | NO | NO | | 3 – Agriculture, Forestry, and Other Land Use (AFOLU) |  |  |  |  |  |  | | 3.A – Livestock |  |  |  |  |  |  | | 3.A.1 – Enteric Fermentation |  | X |  |  |  |  | | 3.A.2 – Manure Management |  | X | X |  |  |  | | 3.B – Land |  |  |  |  |  |  | | 3.B.1 – Forest land | NE |  |  |  |  |  | | 3.B.2 – Cropland | NE |  |  |  |  |  | | 3.B.3 – Grassland | NE |  |  |  |  |  | | 3.B.4 – Wetlands | NE |  | NE |  |  |  | | 3.B.5 – Settlements | NE |  |  |  |  |  | | 3.B.6 – Other land | NE |  |  |  |  |  | | 3.C – Aggregate sources and non-CO2 emissions sources on land |  |  |  |  |  |  | | 3.C.1 – Emissions from biomass burning |  | NE | NE |  |  |  | | 3.C.2 – Liming | NE |  |  |  |  |  | | 3.C.3 – Urea application | X |  |  |  |  |  | | 3.C.4 – Direct N2O emissions from managed soils |  |  | X |  |  |  | | 3.C.5 – Indirect N2O emissions from managed soils |  |  | X |  |  |  | | 3.C.6 – Indirect N2O emissions from Manure soils |  |  | NE |  |  |  | | 3.C.7 – Rice Cultivations |  | NE |  |  |  |  | | 3.C.8 – Other |  |  |  |  |  |  | | 3.D – Other |  |  |  |  |  |  | | 3.D.1 – Harvested Wood products | X | NO |  |  |  |  | | 3.D.2 – Other |  | NO |  |  |  |  | | 4 – Waste |  |  |  |  |  |  | | 4.A – Solid Waste Disposal |  | X |  |  |  |  | | 4.B – Biological Treatment of Solid Waste |  | X | X |  |  |  | | 4.C – Incineration and Open Burning of Waste | X | NA | NA |  |  |  | | 4.D – Wastewater Treatment and Discharge |  | X | X |  |  |  | | 5 – Other |  |  |  |  |  |  | | 5.A – Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3 |  |  | NA |  |  |  | | 5.B – Other | NA | NA | NA |  |  |  |   X = Estimated; NA = Not Applicable; NO = Not Occurring; NE = Not Estimated Recalculations Recalculations made in the current inventory cycle are detailed in each sections’ category below and in the NIR. Time series consistency This section summarises the GHG emissions trends from 2000 to 2016. Despite the results of GHG emissions from the NIR under the TNC were taken as valid, the GHG emissions have been calculated for all the period 2000-2016 in the current national inventory under the first BUR.  Furthermore, activity data for all period has been abstracted from the same data source has been used throughout the full time series. This enabled a consistent time series to be built with a good level of confidence in the trends of emissions.  More information is collected in the specific sectorial sections below.  Table 6. Total aggregate GHG emissions and removals by year and gas (Gg GHG)   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Gas | 2000 | 2005 | 2010 | 2014 | 2015 | 2016 | Percentage change between 2000 and 2016 | | CO2 | 2,281.43 | 2,820.66 | 3,686.70 | 3,980.40 | 4,026.25 | 4,164.29 | 82.5% | | CH4 | 26.38 | 29.17 | 29.66 | 29.07 | 28.16 | 27.95 | 5.9% | | N2O | 0.15 | 0.17 | 0.19 | 0.33 | 0.22 | 0.34 | 125.6% | | HFCs[[3]](#footnote-4) | 47.99 | 88.26 | 114.58 | 264.64 | 269.03 | 282.10 | 487.8% | | PFCs | - | - | - | - | - | - | - | | SF6 | - | - | - | - | - | - | - |   Table 7. GHG Emissions and removals by year and sector (Gg CO2eq)   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Sector | 2000 | 2005 | 2010 | 2014 | 2015 | 2016 | Percentage change between 2000 and 2016 | | Energy | 2,323.15 | 2,874.17 | 3,715.96 | 3,990.89 | 4,043.99 | 4,182.62 | 80.0% | | IPPU | 70.32 | 113.16 | 151.71 | 300.78 | 300.96 | 311.18 | 342.5% | | AFOLU | -23.98 | -34.11 | -16.26 | 55.20 | 17.99 | 51.18 | -31.4% | | Waste | 560.25 | 619.70 | 631.44 | 610.35 | 590.73 | 592.81 | 5.8% | | Total | 2,929.74 | 3,572.92 | 4,482.85 | 4,957.23 | 4.953.67 | 5,137.78 | 75.4% |   Figure 5. National GHG emissions by sector    The total GHG emission trend is ascendant along the whole inventory period (2000 – 2016), with a brief decrease in 2009 and 2015, mainly motivated by the energy sector. Emissions in the RoM show an increase of 75.4% in the total amount of emissions between 2000 and 2016. Emissions from Energy sector present an increase along the whole period of 80.0% between 2000 and 2016. For Waste sector, between 2001 and 2008 it presents an increase of 14.33% with a maximum in 2008, followed by a minimum in 2009 and a subsequent increase until 2011 (7.12%) with a following reduction of the emissions until 2016. Between 2000 and 2016 the overall increase is 5.8% for the GHG emissions from waste sector. Emissions from IPPU sector present an increase along the 2000 – 2016 period of 342.53%. Emissions from AFOLU sector are negative (absorptions or removals) from 2000 to 2013 and positive (emissions) between 2014 and 2016. Along the 3 last years, emissions of AFOLU sector present a decrease of 7.3%.  Figure 6. National GHG emission shares by sector for years 2014, 2015 and 2016    As seen in the figure above, the sector that most contribute to the total GHG emissions in the country, is the energy sector, which correspond to an 81.41% of the total GHG emissions (year 2016). |

## Energy sector

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| --- |
| Trends of GHG Emissions The trend of the CO2eq emissions is clearly rising along the last 17 years, from 2000 to 2016. The biggest emitter of the sector are the energy industries, which represent the 57.9% of the total emissions of the sector in 2016, followed by the transport sector, leaded by the road transport representing the 28.0%. Manufacturing industries and construction, and "Other sectors", represent the 8.2% and the 5.9% of the total emissions of the sector in 2016 respectively.  The total amount of GHG emissions increased in 80.0% from 2000 to 2016. Energy industries show a constant increase of CO2eq emissions from 2000 to 2016, specially motivated by the use of coal, the highest emitter of the energy industries category, responsible for the 37.5% of the sector’s emissions (2016). In terms of electricity generation by energy industries, the fuel that generates the highest amounts of electricity is the coal (corresponding to the highest amounts of CO2eq emissions), followed by fuel oil which is responsible for the 15.4% 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 CO2 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 2016, transport represents the 28.0% of the total emissions of the energy sector, and the 93.6% of those emissions corresponds to the road transport category, while water-borne navigation represents the 5.6% of the category’s emissions and the civil aviation the remaining 0.8%. This category showed an exponential grow in terms of emissions all over the time analysed.  The emissions from manufacturing industries and construction experimented lots of variations. From 2000 to 2003, the trend of emissions was ascendant, from 2004 to 2009 the emissions varied a lot and, from 2010 to 2016, the emission decreased. The fluctuations in the period 2004-2009 were especially due to the variable use of coal.  **Figure 7. Evolution of the GHG Emissions for Energy sector (Gg CO2eq)** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 8. GHG Emissions for Energy sector (Gg CO2eq)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Category | 2000 | 2005 | 2010 | 2016 | | 1 – Energy | 2,323.15 | 2,874.17 | 3,715.96 | 4,182.62 | | 1.A – Fuel Combustion Activities | 2,323.15 | 2,874.17 | 3,715.96 | 4,182.62 | | 1.A.1 – Energy Industries | 1,177.61 | 1,587.64 | 2,220.34 | 2,422.16 | | 1.A.1.a.i – Electricity generation by Energy Industries | 1,177.61 | 1,587.64 | 2,220.34 | 2,422.16 | | 1.A.2 – Manufacturing Industries and Construction | 372.22 | 343.71 | 362.68 | 342.18 | | 1.A.2.a – Iron and Steel | 1.77 | 1.78 | 1.78 | 1.78 | | 1.A.2.c – Chemicals | 22.57 | 21.72 | 23.36 | 20.64 | | 1.A.2.d – Pulp, Paper and Print | 1.68 | 1.60 | 1.56 | 1.38 | | 1.A.2.e – Food processing, Beverages and Tobacco | 55.97 | 54.26 | 58.21 | 51.65 | | 1.A.2.k – Construction | 36.01 | 19.45 | 22.05 | 30.33 | | 1.A.2.l – Textile and Leather | 199.94 | 193.12 | 203.00 | 184.60 | | 1.A.2.m – Other | 54.23 | 51.78 | 52.71 | 51.80 | | 1.A.3 – Transport Sector | 574.91 | 715.66 | 896.85 | 1,169.30 | | 1.A.3.a – Civil Aviation | 4.81 | 5.43 | 5.87 | 9.79 | | 1.A.3.b – Road Transport | 539.27 | 675.42 | 849.86 | 1,093.96 | | 1.A.3.d – Water-borne Navigation | 30.83 | 34.81 | 41.13 | 65.55 | | 1.A.4 – Other Sector | 198.41 | 227.16 | 236.09 | 248.10 | | 1.A.4.a – Commercial / Institutional | 12.45 | 20.94 | 32.74 | 48.16 | | 1.A.4.b – Residential | 144.91 | 161.93 | 139.20 | 149.75 | | 1.A.4.c – Agriculture | 41.05 | 44.28 | 64.15 | 50.18 | | 1.A.4.c.ii – Off-road Vehicles and Other Machinery | 7.92 | 9.66 | 10.56 | 7.31 | | 1.A.4.c.iii – Fishing (mobile combustion) | 33.13 | 34.62 | 53.59 | 42.87 | | 1.A.4.d – Other | NA | NA | NA | 0.87 | | Memo Items | 1,308.99 | 1,336.73 | 1,480.64 | 1,997.25 | | 1.A.a.i – International Aviation | 610.74 | 728.44 | 728.44 | 925.66 | | 1.A.d.i – International Water-borne Navigation | 698.25 | 608.29 | 752.21 | 1,071.59 |   NA: Not Applicable Sectoral Methodology The methodology used to estimate the GHG emissions of the Energy sector are highlighted in the table below. This table contains information about the tier level used in each energy sector category, conversion factor used, and the source of activity data used for the development of the National Inventory.  Table 9. 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 | ESDD, Commerce Division and Manufacturing Statistics Mauritius | | **1.A.3 – Transport Sector** | | | | | | 1.A.3.a.i – International Aviation | T1 | D/T1 | D | International Energy Agency | | 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 | National Transport Authority and Transport Toolkit v17.1 | | 1.A.3.d.i – International Water-borne Navigation | T1 | D/T1 | D | International Energy Agency | | 1.A.3.d.ii – Water-borne Navigation | T1 | D/T1 | CS | Tourism Authority, Water-borne navigation | | **1.A.4 – Other Sector** | | | | | | 1.A.4.a – Commercial / Institutional | T1 | D/T1 | CS | Ministry of Environment (MoESWMCC), Data for Energy Other Sectors | | 1.A.4.b – Residential | T1 | D/T1 | CS | Ministry of Environment (MoESWMCC), Data for Energy Other Sectors | | 1.A.4.c – Agriculture | T1 | D/T1 | CS | Ministry of Environment (MoESWMCC), Data for Energy Other Sectors | | 1.A.4.d – Other | T1 | D/T1 | CS | Ministry of Environment (MoESWMCC), Data for Energy Other Sectors | | **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  More detailed information on activity data, emission factors, methodology used, and assumptions considered is available in the NIR.  The efforts to estimate GHG emissions have been focused on those categories identified as key during the key category analysis developed at the beginning of the preparation of the Inventory.  Different activity data have been received from diverse sources for the categories under the Energy sector, for the development of the national inventory, those that present less uncertainty, those that seemed to be more consistent and have data for a greater number of years, have been considered. Quality Assurance / Quality Control (QA/QC) Some quality control activities were implemented in order to ensure the use of right data in the inventory. The QC implemented during the data collection and GHG emission estimation is listed below:   * Cross verification between data provided via mail by institutional authorities 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 sector. * Cross verification between 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 sector and the results obtained in the las reported national inventory of the RoM. * The reference approach has been developed. The results of the reference approach can be analysed in the NIR document.  Recalculations Some recalculations have been made to improve the GHG emission calculation. For that purpose, some of the most relevant recalculations developed for this emission inventory range from updates in the EF and NCV values to the use of new activity data or modifications in the methodologies used. Some of them are listed below:   * EFs updated for some fuels used in Manufacturing Industries and Construction, Water-borne navigation and Residential (Energy other sector). * NCV values were modified considering the data availability improvements made by the country for the coal and bagasse fuels, as the country set annual NCV values for those fuels. * For civil aviation and water-borne navigation categories the activity data used differs from the data used in the last national GHG emission inventory. The activity data used in the current inventory better reflect the national situation and are also more consistent. * Improvements in methodology used for road transport. This improvement corresponds to specific tools that were developed during the elaboration of the TNC, which contains more transparent, consistent, and accurate country specific values.   More detailed information on the recalculations made in the Energy sector are available in the NIR. Challenges During the elaboration of this national inventory different challenges have been identified:  The Net Calorific Value (NCV) for the different fuels used in the country, may vary slightly from year to year. The country has start considering in the current inventory the annual value of the NCV for coal and bagasse, and they will continue working for the rest of the fuels.  The activity data used for most of the categories are quite detailed and obtained at plant level, however, this is not the case for EFs. To achieve higher tier levels in the estimation of GHG emissions, it is necessary to obtain specific plant EF, RoM will work on this aspect for the future.  During the elaboration of the national inventory for the TNC, a road transport toolkit was developed able to calculate GHG emissions and projections for different scenarios proposed in the TNC of the country. The elaborated toolkit turns out to be a very useful instrument for the GHG emission calculation for the road transport category since the methodology used is close to a tier 2 approach. Despite this, the toolkit presents some challenges:   1. The toolkit only takes into consideration the Island of Mauritius, not the Island of Rodrigues. 2. The parameters used for the GHG emission estimates are not set for all vehicles and fuel types 3. The calculations made for the GHG estimates cannot be tracked in the tool which results in difficulties when recreating GHG emissions and its inclusion into reports to improve their transparency. 4. There are inconsistencies between data included into the toolkit, data available in the Statistics of Mauritius, and data facilitated by the stakeholders. 5. As a result of the quality control developed for the energy sector analysing the reference approach, it has been identified the necessity of an improvement of the energy balance and the analysis of its consistency with the activity data and data sources considered for the inventory.  Sectoral Uncertainties The uncertainty analysis results for the Energy sector categories obtained from the IPCC software are reported in the following table for 2000 as base year:  Table 10. Uncertainty analysis of the Energy sector for the trend 2000 – 2016.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **IPCC Category** | **Gas** | **Activity Data Uncertainty (%)** | **Emission Factor Uncertainty (%)** | **Combined Uncertainty (%)** | | 1.A.1 - Energy Industries - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.1 - Energy Industries - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.1 - Energy Industries - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.1 - Energy Industries - Solid Fuels | CO2 | 5.00 | 12.41 | 13.38 | | 1.A.1 - Energy Industries - Solid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.1 - Energy Industries - Solid Fuels | N2O | 5.00 | 222.22 | 222.28 | | 1.A.1 - Energy Industries - Biomass | CO2 | 5.00 | 18.69 | 19.35 | | 1.A.1 - Energy Industries - Biomass | CH4 | 5.00 | 245.45 | 245.51 | | 1.A.1 - Energy Industries - Biomass | N2O | 5.00 | 304.55 | 304.59 | | 1.A.2.a - Iron and Steel - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.2.a - Iron and Steel - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.2.a - Iron and Steel - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.2.c - Chemicals - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.2.c - Chemicals - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.2.c - Chemicals - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.2.c - Chemicals - Solid Fuels | CO2 | 5.00 | 12.46 | 13.43 | | 1.A.2.c - Chemicals - Solid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.2.c - Chemicals - Solid Fuels | N2O | 5.00 | 222.22 | 222.28 | | 1.A.2.d - Pulp, Paper and Print - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.2.d - Pulp, Paper and Print - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.2.d - Pulp, Paper and Print - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Solid Fuels | CO2 | 5.00 | 12.46 | 13.43 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Solid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.2.e - Food Processing, Beverages and Tobacco - Solid Fuels | N2O | 5.00 | 222.22 | 222.28 | | 1.A.2.k - Construction - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.2.k - Construction - Liquid Fuels | CH4 | 5.00 | 228.79 | 228.84 | | 1.A.2.k - Construction - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.2.l - Textile and Leather - Liquid Fuels | 5.00 | 5.00 | 6.14 | 7.92 | | 1.A.2.l - Textile and Leather - Liquid Fuels | 5.00 | 5.00 | 228.79 | 228.84 | | 1.A.2.l - Textile and Leather - Liquid Fuels | 5.00 | 5.00 | 228.79 | 228.84 | | 1.A.2.l - Textile and Leather - Solid Fuels | 5.00 | 5.00 | 12.46 | 13.43 | | 1.A.2.l - Textile and Leather - Solid Fuels | 5.00 | 5.00 | 200.00 | 200.06 | | 1.A.2.l - Textile and Leather - Solid Fuels | 5.00 | 5.00 | 222.22 | 222.28 | | 1.A.2.m - Non-specified Industry - Liquid Fuels | 5.00 | 5.00 | 6.14 | 7.92 | | 1.A.2.m - Non-specified Industry - Liquid Fuels | 5.00 | 5.00 | 228.79 | 228.84 | | 1.A.2.m - Non-specified Industry - Liquid Fuels | 5.00 | 5.00 | 228.79 | 228.84 | | 1.A.2.m - Non-specified Industry - Solid Fuels | 5.00 | 5.00 | 12.46 | 13.43 | | 1.A.2.m - Non-specified Industry - Solid Fuels | 5.00 | 5.00 | 200.00 | 200.06 | | 1.A.2.m - Non-specified Industry - Solid Fuels | 5.00 | 5.00 | 222.22 | 222.28 | | 1.A.2.m - Non-specified Industry - Biomass | 5.00 | 5.00 | 18.69 | 19.35 | | 1.A.2.m - Non-specified Industry - Biomass | 5.00 | 5.00 | 245.45 | 245.51 | | 1.A.2.m - Non-specified Industry - Biomass | 5.00 | 5.00 | 281.82 | 281.86 | | 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels | CO2 | 5.00 | 4.17 | 6.51 | | 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels | CH4 | 5.00 | 100 | 100.12 | | 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels | N2O | 5.00 | 150 | 150.08 | | 1.A.3.a.ii - Domestic Aviation - Liquid Fuels | CO2 | 5.00 | 4.17 | 6.51 | | 1.A.3.a.ii - Domestic Aviation - Liquid Fuels | CH4 | 5.00 | 100.00 | 100.12 | | 1.A.3.a.ii - Domestic Aviation - Liquid Fuels | N2O | 5.00 | 150.00 | 150.08 | | 1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels | CO2 | 5.00 | 3.07 | 5.87 | | 1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels | CH4 | 5.00 | 244.69 | 244.74 | | 1.A.3.b.i.1 - Passenger cars with 3-way catalysts - Liquid Fuels | N2O | 5.00 | 209.94 | 210.00 | | 1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels | CO2 | 5.00 | 3.07 | 5.87 | | 1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels | CH4 | 5.00 | 244.69 | 244.74 | | 1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts - Liquid Fuels | N2O | 5.00 | 209.94 | 210.00 | | 1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels | CO2 | 5.00 | 5.00 | 7.07 | | 1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels | CH4 | 5.00 | 25.00 | 25.50 | | 1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts - Liquid Fuels | N2O | 5.00 | 60.00 | 60.21 | | 1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels | CO2 | 5.00 | 5.00 | 7.07 | | 1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels | CH4 | 5.00 | 25.00 | 25.50 | | 1.A.3.b.iii - Heavy-duty trucks and buses - Liquid Fuels | N2O | 5.00 | 60.00 | 60.21 | | 1.A.3.b.iv - Motorcycles - Liquid Fuels | CO2 | 5.00 | 5.00 | 7.07 | | 1.A.3.b.iv - Motorcycles - Liquid Fuels | CH4 | 5.00 | 5.00 | 7.07 | | 1.A.3.b.iv - Motorcycles - Liquid Fuels | N2O | 5.00 | 5.00 | 7.07 | | 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | CO2 | 5.00 | 4.30 | 6.60 | | 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | CH4 | 5.00 | 50 | 50.25 | | 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | N2O | 5.00 | 140 | 140.09 | | 1.A.3.d.ii - Domestic Water-borne Navigation - Liquid Fuels | CO2 | 5.00 | 4.30 | 6.60 | | 1.A.3.d.ii - Domestic Water-borne Navigation - Liquid Fuels | CH4 | 5.00 | 50.00 | 50.25 | | 1.A.3.d.ii - Domestic Water-borne Navigation - Liquid Fuels | N2O | 5.00 | 140.00 | 140.09 | | 1.A.4.a - Commercial/Institutional - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.4.a - Commercial/Institutional - Liquid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.4.a - Commercial/Institutional - Liquid Fuels | N2O | 5.00 | 228.79 | 228.84 | | 1.A.4.a - Commercial/Institutional - Biomass | CO2 | 5.00 | 18.69 | 19.35 | | 1.A.4.a - Commercial/Institutional - Biomass | CH4 | 5.00 | 227.27 | 227.33 | | 1.A.4.a - Commercial/Institutional - Biomass | N2O | 5.00 | 297.73 | 297.77 | | 1.A.4.b - Residential - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.4.b - Residential - Liquid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.4.b - Residential - Liquid Fuels | N2O | 5.00 | 236.36 | 236.42 | | 1.A.4.b - Residential - Biomass | CO2 | 5.00 | 18.69 | 19.35 | | 1.A.4.b - Residential - Biomass | CH4 | 5.00 | 227.27 | 227.33 | | 1.A.4.b - Residential - Biomass | N2O | 5.00 | 297.73 | 297.77 | | 1.A.4.c.ii - Off-road Vehicles and Other Machinery - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.4.c.ii - Off-road Vehicles and Other Machinery - Liquid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.4.c.ii - Off-road Vehicles and Other Machinery - Liquid Fuels | N2O | 5.00 | 236.36 | 236.42 | | 1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels | CO2 | 5.00 | 6.14 | 7.92 | | 1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels | CH4 | 5.00 | 200.00 | 200.06 | | 1.A.4.c.iii - Fishing (mobile combustion) - Liquid Fuels | N2O | 5.00 | 236.36 | 236.42 | | 1.A.5.a - Stationary - Liquid Fuels | CO2 | 5.00 | 5.00 | 7.07 | | 1.A.5.a - Stationary - Liquid Fuels | CH4 | 5.00 | 5.00 | 7.07 | | 1.A.5.a - Stationary - Liquid Fuels | N2O | 5.00 | 5.00 | 7.07 |   It is concluded from the tables above, that the greatest source of uncertainty corresponds to the emission factors due to the use of default factors and therefore to the absence of country specific factors. |

## Industrial processes and product use (IPPU)

|  |
| --- |
| Trends of GHG Emissions As represented in the following figure and table, the GHG emissions from IPPU Sector has experiment an increase along the time series from 2000 to 2016.  The most significant category, in terms of GHG emissions, that represent 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.  GHG emissions of this sector have increase annually, more moderately between 2000 and 2004 (15.54%) and more pronounced from 2004 to 2016 (283%). The category that most contribute to the increase of the emissions in the last 10 years is the product uses as substitutes for ODS.  Product Uses as Substitutes for ODS represent the 90.7% of the total GHG emissions of the sector in 2016, corresponding to the Refrigeration and Air conditioning category, stationary and mobile. Stationary sources are responsible for the 97% of this category, while the mobile sources represent the remaining 3% by 2016. This category experienced an exponential increase throughout the studied 2000-2016 period of 90.7%, from 47.99 GgCO2eq in 2000 to 282.10 GgCO2eq in 2016.  In stationary air conditioning and refrigeration sub-category, the most used substances are HFC-125, HFC-134a, HFC-143a, HFC-32 and HFC-23 which correspond to the 43.2%,27.7%.27.4%,1.6% and 0.1% of the total amount of ODS substances used in the sub-category by 2016. For the mobile air conditioning sub-category, the only HFC substance used correspond to HFC-134a.  The Metal Industry, represented by the Iron and Steel Production Industries, contribute to the 6.9% of the total GHG emissions of the IPPU sector in 2016. The iron and steel production show some variations along the time series, increasing from 2000 to 2011 in a 89.6% and following decreasing until 2016. The decrease in the emissions from 2011 to 2016 is estimated in 42.3%. From 2000 to 2016 the sector experiments an overall increase of 9.4%.  GHG emissions from Mineral Industry, more specifically from Lime production, represent the 0.3% of the total GHG emissions of the IPPU sector in 2014 when the lime production stopped. The GHG emission trend in this category experiments variations along the time series but with a general decreasing trend of 70.9% between 2000 and 2014.  RoM also has emissions due to the use of lubricants in the industrial sector, as non-energy products, since 2011. The emissions from this category represent the 2.5% of the total emissions of IPPU sector. The emissions present a decrease of a 18% between 2011 and 2016.  **Figure 8. Evolution of the GHG Emissions for IPPU sector (Gg CO2eq)** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 11. GHG Emissions for IPPU sector (Gg CO2eq)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Category | 2000 | 2005 | 2010 | 2016 | | 2 – Industrial Processes and Product Use (IPPU) | 70.32 | 113.16 | 151.71 | 311.18 | | 2.A – Mineral Industry | 2.75 | 1.97 | 2.16 | 0.00 | | 2.A.2 – Lime production | 2.75 | 1.97 | 2.16 | 0.00 | | 2.C – Metal Industry | 19.57 | 22.92 | 34.98 | 21.41 | | 2.C.1 – Iron and steel production | 19.57 | 22.92 | 34.98 | 21.41 | | 2.D - Non-Energy Products from Fuels and Solvent Use | 0.00 | 0.00 | 0.00 | 7.66 | | 2.D.1 - Non-Energy Products from Fuels and Solvent Use | 0.00 | 0.00 | 0.00 | 7.66 | | 2.F – Product Use as Substitutes for ODS | 47.99 | 88.26 | 114.58 | 282.10 | | 2.F.1.a – Stationary Refrigeration and Air Conditioning | 47.56 | 86.32 | 108.58 | 282.10 | | 2.F.1.b – Mobile Air Conditioning | 0.43 | 1.94 | 6.00 | 8.95 |   More detailed information on activity data, emission factors, methodology used, and assumptions considered is available in the NIR.  The efforts to estimate GHG emissions have been focused on those categories identified as key during the key category analysis developed at the beginning of the preparation of the Inventory Sectoral Methodology The methodology used to estimate the GHG emissions of the IPPU sector are highlighted in the table below. This table contains information about the tier level used in each IPPU sector category, conversion factor used, and the source of activity data used for the development of the National Inventory.  Table 12. Methodology used for the IPPU sector   |  |  |  |  | | --- | --- | --- | --- | | **Category** | **Activity Data** | **Emission Factor** | **Activity Data Source** | | **2.A – Mineral Industry** | | | | | 2.A.2 – Lime production | T2 | D (CO2) | Statistics Unit of the ESDD[[4]](#footnote-5), institutional authority which facilitated the collection of data/information | | **2.B – Chemical Industry** | | | | | 2.B – Chemical Industry | NO | NO | - | | **2.C – Metal Industry** | | | | | 2.C.1 – Iron and Steel production | T2 | D (CO2) | Statistics Unit of the ESDD, institutional authority which facilitated the collection of data/information | | **2.D – Non-Energy Products from Fuels and Solvent Use** | | | | | 2.D.1 – Non-Energy Products from Fuels and Solvent Use | T1 | D (CO2) | International Energy Agency (IEA) | | **2.E – Electronics Industry** | | | | | 2.E – Electronics Industry | NO | NO | - | | **2.F – Product Uses as Substitutes for Ozone Depleting Substances (ODS)** | | | | | 2.F.1 – Refrigeration and Air Conditioning | | | | | 2.F.1.a – Refrigeration and Stationary Air Conditioning | T1 | D (HFCs) | Statistics Unit of the ESDD, institutional authority which facilitated the collection of data/information | | 2.F.1.b – Mobile Air Conditioning | T1 | D (HFCs) | Statistics Unit of the ESDD, institutional authority which facilitated the collection of data/information | | **2.G – Other Product Manufacture and Use** | | | | | 2.G – Other Product Manufacture and Use | NO | NO | - | | **2.H – Other** | | | | | 2.H – Other | NO | NO | - |   T1: Tier 1; D: Default; CS: Country Specific; NO: Not Occurring; NA: Not Applicable; NE: Not Estimated  The efforts to estimate GHG emissions have been focused on those categories identified as key during the key category analysis developed at the beginning of the preparation of the Inventory.  Different activity data have been received from diverse sources for the categories under the IPPU sector, for the development of the national inventory, those that present less uncertainty, those that seemed to be more consistent and have data for a greater number of years, have been considered. Quality Assurance / Quality Control (QA/QC) Some quality control activities were implemented in order to ensure the use of right data in the inventory. The QC implemented during the data collection and GHG emission estimation is listed below:   * Cross verification between data provided via mail by institutional authorities 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 IPPU sector. * Cross verification between the GHG emissions estimated in the current inventory for IPPU sector and the results obtained in the las reported national inventory of the RoM.  Recalculations Some recalculations have been made to improve the GHG emission calculation. For that purpose, some of the most relevant recalculations developed for this emission inventory range from updates in the EF and NCV values to the use of new activity data or modifications in the methodologies used. Some of them are listed below.   * EFs updated for Metal Industry category to reflect real national circumstances in terms of the technology used. * For Lime production and Iron and Steel production, the activity data have been updated. Data used for current inventory have been obtained from more accurate and consistent data sources. * Improvements in methodology used for Product Uses as Substitutes for Ozone Depleting Substances (ODS) category to be aligned with the IPCC 2006 Guidelines.   More detailed information on the recalculations made in the IPPU sector are available in the NIR. Challenges During the elaboration of this national inventory different challenges have been identified for all IPPU categories:  The activity data used for most of the categories are quite detailed and obtained at plant level, however, this is not the case for EFs. To achieve higher tier levels in the estimation of GHG emissions, it is necessary to obtain specific plant EF, RoM will work on this aspect for the future.  In addition, a review of the activity data for category 2D and its alignment to the national energy balance should be carried out for next inventory cycle, in order to ensure whether emissions from paraffin and solvents are occurring or not. Sectoral Uncertainties The results of both uncertainty analysis for the categories considered in the IPPU sector are reported in the following table:  Table 13. Uncertainty analysis of the IPPU sector for the trend 2000 – 2016   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **IPCC Category** | **Gas** | **Activity Data Uncertainty (%)** | **Emission Factor Uncertainty (%)** | **Combined Uncertainty (%)** | | 2.A.2 - Lime production | CO2 | 15.00 | 0.00 | 15.00 | | 2.C.1 - Iron and Steel Production | CO2 | 10.00 | 0.00 | 10.00 | | 2.D.1 - Non-Energy Products from Fuels and Solvent Use | CO2 | 10,00 | 0,00 | 10,00 | | 2.F.1.a - Refrigeration and Stationary Air Conditioning | CHF3 | 0.00 | 0.00 | 0.00 | | 2.F.1.a - Refrigeration and Stationary Air Conditioning | CH2F2 | 0.00 | 0.00 | 0.00 | | 2.F.1.a - Refrigeration and Stationary Air Conditioning | CHF2CF3 | 0.00 | 0.00 | 0.00 | | 2.F.1.a - Refrigeration and Stationary Air Conditioning | CH2FCF3 | 0.00 | 0.00 | 0.00 | | 2.F.1.a - Refrigeration and Stationary Air Conditioning | CF3CH3 | 0.00 | 0.00 | 0.00 | | 2.F.1.b - Mobile Air Conditioning | CH2FCF3 | 5.00 | 0.00 | 5.00 | |

## Agriculture, forestry and other land use (AFOLU)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Agriculture**  In 2015, the land area occupied by agriculture was around 41.87 % of the total land area of Mauritius. The agricultural sector is considered to be of significant importance to the Mauritian economy, employing some 7.3% of total working population and representing 38% of overall exported commodities, but contributing only 3.6 % to national GDP in 2017. Nonetheless, the sector still plays a vital, multi-functional role within the economy. It contributes significantly to GDP in absolute terms, and has significant economic, social and environmental impacts. In addition, agriculture provides direct employment to some 45,300 persons. Land under agriculture is mainly used for sugarcane, tea, food crops and fruit production (Litchi & Mango, Banana and pineapple) and other crops.  **Non-sugar sector**  Food crop production is dominated by small scale farming and covers a wide range of crops including potatoes, onion, tomatoes, chillies, crucifers, cucurbits, leafy vegetables, garlic and ginger which are cultivated on commercial scale whereas fruits come mainly from backyard production. Over the last decade, production of selected crops namely tomato, green pepper and cucumber have started under soil-less, protected structures. Generally, some 8,000 small producers cultivating about 8,200 hectares of land produce on average some 110,000 tonnes of food crops annually. Except in cases of drought, cyclones and heavy rains, fresh vegetable production amply satisfies the local consumption.  However, Mauritius imports its entire requirement in terms of the main staples, namely some 166,000 tonnes of wheat and 66,000 tonnes of rice. Fruit production which consists of mainly banana, pineapple, and seasonal fruits such as litchi and mangoes is estimated at 42,660 tonnes annually, over an equivalent of 3,065 ha of land. Fruits are produced mainly in backyards. Moreover, there is some corporate sector involvement in the production of pitaya, litchi, jujube and citrus. Among the backyard fruits, litchi has achieved some prominence. Exports draw heavily on backyard production and some existing or newly established orchards.  Since the 1990’s the area under tea production has wound down from 3,028 ha due to lack of competitiveness and quality for the export market, to reach 622 ha for season 2016/2017, with a production of around 7,309 tonnes of green leaf. There were around 1,205 registered tea growers in 2017 and 3 major tea factories in the country. With recent favourable economic situation of the tea sector Government policy is now to revive this sector, and some 600 acres of land has been earmarked for new plantations.  An annual food crop production of 102,633 tonnes was harvested in 2015 over a harvest area of 8077 ha. Table indicates, the annually area harvested and production of crops.  Table 14. Harvested and production area of crops for years 2014 to 2016   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Years** | **2014** | | **2015** | | **2016** | | |  | **Area harvested (hectares)** | **Prod. (tons)** | **Area harvested (hectares)** | **Prod. (tons)** | **Area harvested (hectares)** | **Prod. (tons)** | | Sugarcane | 50,694 | 4,044,422 | 52,387 | 4,009,232 | 51,477 | 3,798,448 | | Tea | 672 | 7,607 | 574 | 6,732 | 622 | 7,301 | | Potato | 821 | 19,404 | 707 | 16,427 | 765 | 16,236 | | Pumpkin | 477 | 6,980 | 423 | 5,713 | 526 | 7,002 | | Rice (paddy) | 412 | 1,186 | 340 | 657 | 161 | 352 | | Squash | 79 | 659 | 92 | 702 | 76 | 554 | | Sweet potato | 59 | 780 | 52 | 686 | 35 | 446 | | Tomato | 857 | 10,997 | 740 | 8,525 | 730 | 10,137 | | Pineapple | 450 | 10,788 | 523 | 11,693 | 417 | 9,707 |   ***Source:*** *Digest of Agriculture 2014, 2015, and 2016*  Present policy is to develop bio farming activities in the food crop and fruit production, and several schemes are in place to support such initiatives. Agroforestry systems are also being encouraged and pilot/demonstration plots are being developed.  **Status of Agriculture and Livestock**  The activities in this sector are: Industrial crops (sugar cane and tea), Food crops, fruits and flowers, Plant propagation, Livestock, poultry and related products, Forestry and hunting, Fishing & Government services.  **Sugarcane**  There has been significant change in the agriculture practices in Mauritius in last couple of years. The production of sugar cane went down by 15% from 3,713,331 tonnes in 2017 to 3,154,516 tonnes in 2018. The area harvested decreased by 4.6% from 49,974 hectares in 2017 to 47,678 hectares in 2018. The average yield has decreased by 11% from 74.31 tonnes per hectare in 2017 to 66.16 in2018. The production of sugar went down by 9% from 355,213 tonnes in 2017 to 323,406 tonnes in 2018. Compared to 9.57% in 2017, the average extraction rate was 10.26% in 2018, representing an increase of 7.2%.  **Tea**  The area under tea plantation in 2018 was 656 hectares, representing an increase of 5.5% over the figure of 622 hectares in 2017. The production of green tea leaves went up by 10.2% from 7,309 tonnes in 2017 to 8,056 tonnes in 2018. Production of manufactured tea increased by 6.6% from 1,379 tonnes in 2017 to 1,470 tonnes in 2018.  **Food crops**  Data on food crops (except paddy rice) production, are supplied by the Food and Agricultural Research and Extension Institute (FAREI). Figures are, thereafter, adjusted to take into account backyard production of banana, eddoes, manioc and sweet potato. Data on paddy rice was obtained from concerned establishment.  The area under food crops harvested decreased by 1.7% from 7,780 hectares in 2017 to 7,646 hectares in 2018. Production of food crops decreased by 9.2% from 106,621 tonnes to 96,847 tonnes in 2018, mainly explained by unfavourable climatic conditions. It is to be noted that area under rice cultivation harvested declined by 76.8% from 56 hectares in 2017 to 13 hectares in 2018. The production of paddy rice went down by 88.1% from 160 tonnes to 19 tonnes during the same period.  **Livestock**  Data on production of beef, goat meat, mutton and pork are supplied by the Mauritius Meat Authority. It is to be noted that these data represent only animals slaughtered by the Central Abattoir, including live animals imported from Rodrigues and other countries for slaughter.  In 2018, the production of beef from live cattle was 2,053 tonnes, which is 1.2% lower than the figure of 2,078 tonnes registered in 2017. Beef production from the slaughter of imported cattle, accounting for 96.2% of the total production, decreased by 0.9% from 1,992 tonnes to 1,975 tonnes. Local beef production went down by 9.3% from 86 tonnes to 78 tonnes.  The production of goat meat and mutton went up by 8.9% from 56 tonnes in 2017 to 61 tonnes in 2018.The share of local production, inclusive of Rodrigues stood at 57.4 %.  The production of pork decreased by 10.4% from 606 tonnes in 2017 to 543 tonnes in 2018.  **Poultry**  The production of poultry increased by 3.2% from 47,500 tonnes in 2017 to 49,000 tonnes in 2018.  **Fish**  Total fish production went up by 28.7% from 22,732 tonnes in 2017 to 29,255 tonnes in 2018. This increase was attributable to a rise of 29.7% in the production of other catch (tuna, bank etc) from 20,974 tonnes in 2017 to 27,205 tonnes in 2018, coupled with an increase of 16.6% in the production of fresh coastal fish catch from 1,758 tonnes in 2017 to 2,050 tonnes in 2018.  **The Sugar Industry**  There are three categories of growers in the sugar industry, namely “miller”, “metayer” and “owner” planters. Millers are owners of sugar factors and large plots of land around these factories. Metayers are normally employees of the millers who are allowed to grow sugarcane on their lands.  Value added generated by the sugar industry is attributed, for national accounting purposes, to the following industrial activity groups: Agriculture: the final product is sugarcane. Both millers and planters are engaged in its production.  **Figure 9. Evolution of the area harvested from 2007 to 2016**    Manufacturing: the final product is sugar and its by-products, molasses, scums and electricity, which excludes Independent Power Producers (IPPs). Only millers are engaged in this activity. Transport: includes only the millers’ own account transport of sugarcane, sugar and other inputs.  Table 15. Area harvested in agricultural crops, 2014 – 2016   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Years** | **2014** | | **2015** | | **2016** | | |  | **Area harvested (hectares)** | **Prod. (tonnes)** | **Area harvested (hectares)** | **Prod. (tonnes)** | **Area harvested (hectares)** | **Prod. (tonnes)** | | Sugarcane | 50,694 | 4,044,422 | 52,387 | 4,009,232 | 51,477 | 3,798,448 | | Tea | 672 | 7,607 | 574 | 6,732 | 622 | 7,301 | | Potato | 821 | 19,404 | 707 | 16,427 | 789 | 16,854 | | Pumpkin | 477 | 6,980 | 423 | 5,713 | 526 | 7,002 | | Rice (paddy) | 412 | 1,186 | 340 | 657 | 161 | 352 | | Squash | 79 | 659 | 92 | 702 | 76 | 554 | | Sweet potato | 59 | 780 | 52 | 686 | 41 | 471 | | Tomato | 857 | 10,997 | 740 | 8,525 | 730 | 10,137 | | Pineapple | 450 | 10,788 | 523 | 11,693 | 417 | 9,707 |   ***Source:*** *Digest of Agriculture 2014, 2015, and 2016*  Table 16. Production of agro-industrial products, 2013 – 2016   | **Production of agro-industrial products - Island of Mauritius, 2013 - 2014** | | | | | | | --- | --- | --- | --- | --- | --- | | **Agro-Industrial Products** | **Unit** | **2013** | **2014** | **2015** | **2016** | | Sugar | Tonnes | 404,713 | 400,173 | 366,070 | 386,277 | | Tea (manufactured) | " | 1,563 | 1,504 | 1,295 | 1,353 | | Beef | " | 1,946 | 1,956 | 2,013 | 1,956 | | Local including imports from Rodrigues | " | (90) | (61) | (85) | (54) | | Imported | " | (1,856) | (1,895) | (1,928) | (1,902) | | Goat meat and mutton | " | 46 | 45 | 42 | 42 | | Pork | " | 615 | 557 | 560 | 632 | | Poultry meat | " | 46,700 | 47,500 | 46,400 | 45,800 | | Milk | '000 Litres | 5,000 | 5,000 | 4,500 | 4,000 | | Fish | Tonnes | 5,795 | 12376 | 12,650 | 16,698 | | Coastal | " | (1,749) | (1,409) | (1,559) | (1,804) | | Other | " | (4,046) | (10967) | (11,091) | (14,895) |   ***Source:*** *Digest of Agriculture, 2014, 2015 & 2016*  **National Strategic plan for Organic farming 2017-2018 for Mauritius**  Increased competitiveness of organic products and the development of export potential are expected to improve farmers’ income through safe trade of high-value products, both within and outside the country. An FAO Organic Farming Project has been implemented in recent years, achieving excellent results, and, Mauritius in November 2017 hosted an Indian Ocean Small Islands Developing States (SIDS) Workshop on Climate Smart Agriculture, which highlighted the importance of producing organic products.  FAO assistance in Mauritius is shaped by the Country Programming Framework (CPF)2014-2017, which is centered on three priority areas:   * Support to agribusiness development, with a focus on strengthening the legal and management frameworks and institutional capacities to support the development of strategic value chains. * Promoting sustainable agriculture for food security by enabling projects related to land use management, early warning systems for animal and plant diseases and pests and agricultural statistics.   Promoting sustainable fisheries by enhancing the capacity of the Ministry of Fisheries to formulate aquaculture development and management policies, and by strengthening the capacity of key stakeholders in the sustainable development of off-lagoon fisheries. CPF priorities are built on the earlier National Medium-Term Priority Framework, formulated in 2007. Jointly developed with the Government and in close collaboration with key divisions, institutions and parastatals under the aegis of the Ministry of Agro-Industry and Food Security and the Ministry of Fisheries, the CPF is also aligned with FAO’s Strategic Objectives and regional priorities.  **Forest**  The total extent of forest cover in Mauritius is estimated at 47066 Hectares representing about 25% of the total land area. There are only two types of forest ownership: public and private.  Total forest area decreased by 3 hectares from 47,069 hectares in 2015 to 47,066 hectares in 2016. Some 22,066 hectares (47%) of the total forest area in 2016 was state-owned and the remaining 25,000 hectares (53%) was privately-owned.  Out of the 22,066 hectares of state-owned forest area, 12012 hectares (54.4%) 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. “Pas Geometriques” covered about 623 hectares (2.8%), other nature parks, 906 hectares (4.1%) and other forest lands, 1,366 hectares (6.2%).  Approximately 14605 ha of land are covered with planted forests including some 2593 ha of privately-owned land, are covered with planted forests. The remaining are natural forests, most of which are badly degraded. Only around 2% of the land area of Mauritius is considered to be covered with good quality native forests.  Table 17. Area of forest in 2016 for each category type   |  |  | | --- | --- | | **Forest Types Category** | **Area (Hectares)  in 2016** | | **State - owned** | **22,066** | | Plantations | 11,798 | | Nature reserves | 799 | | *on mainland* | *200* | | *islets* | *599* | | Black River Gorges National Park | 6,574 | | Bras D'Eau National Park 1 | 497 | | Islet National Parks 2 | 134 | | Vallee d' Osterlog Endemic Garden 3 | 275 | | Other forest lands | 1,366 | | Pas Geometriques | 623 | | *Plantations* | *214* | | *Leased for grazing and tree planting* | *230* | | *Others (mostly rocky)* | *179* | | **Privately - owned lands** 4 | **25,000** | | Reserves | 6,553 | | *Mountain reserves* | *3,800* | | *River reserves* | *2,740* | | *Private reserves* | *13* | | Other 5 | 18,447 | | **Total** | **47,066** |   **Source:** Forestry Service, Ministry of Agro-Industry and Food Security   1. Bras D'Eau National Park was proclaimed in 2011. From 2002 to 2010 was known as Bras D'Eau & Poste La Fayette Reserves. 2. Islet National Parks were proclaimed in 2004. 3. Valee D'Osterlog Endemic Garden was proclaimed in 2007 4. Current figures for privately-owned lands are crude estimates based on expert knowledge from Forestry Service 5. Includes plantations, forest lands, scrub and grazing lands.     **Figure 10. Forest types in Mauritius**    The forests of the Republic of Mauritius are small in area but perform vital functions, the most important of them being soil and water conservation. Where water is scarce, all activities, be they agriculture, tourism or manufacturing, are seriously affected. The environmental function of forests far outweighs their direct economic function in small island developing state. The roles of forests in reducing soil erosion, carbon sequestration, conservation of biodiversity & genetic resources, recreation & ecotourism are now widely recognized and valued. Consequently, conservation, protection and development of the remaining native forests through sustainable management are priority objectives of the overall national policy of Mauritius. In fact, the forests of the Republic of Mauritius are now managed more for these environmental functions rather than for the production of timber.  Mauritius has a rich heritage of indigenous and endemic plants. There are 58 families consisting of both indigenous and endemic plants. There are around 711 native plant species in Mauritius, including 246 that are endemic.  **Mangrove Plantation**  The area of mangrove forest in Mauritius was only 45 ha in 1980. A mangrove rehabilitation and propagation programme were initiated in 1995 by the Albion Fisheries Research Centre of the then the Ministry of Fisheries and Co-operatives and is still ongoing with the active involvement of NGOs. The mangrove area has increased quite significantly.  There has been consistent increase in mangrove plantation by the Albion Fisheries Research Centre of the Ministry of Blue Economy, Marine Resources, Fishing and Shipping in the last decade. The table below provides the number of mangroves propagules planted and area covered during the period of 2012-2016.  Table 18. Area of forest in 2016 for each category type   |  |  |  |  | | --- | --- | --- | --- | | **Number of mangroves planted, and area covered, 2012 – 2016** | | | | | **Period** | **No. of seedlings** | **Area covered (m2)** | **Area in Ha** | | 2012 | 291,215 | 147,730 | 14.773 | | 2013 | 62,450 | 30,618 | 3.0618 | | 2014 | 30,160 | 15,080 | 1.508 | | 2015 | 925 | 463 | 0.0463 | | 2016 | 1,200 | 3,672 | 0.3672 | | **Cumulative  total No of** | **385,950** | **197,563** | 19.7563 |   **The Forestry Service**, under the aegis of the Ministry of Agro Industry and Food Security, is responsible for the management of the State Forest Lands in Mauritius. The overall mandate, roles and responsibilities of the Forestry Service are defined primarily in the Forest and Reserves Act of 1983 and the Forestry Policy of 2006.  The Vision Statement of the Forestry Service is: “To ensure a healthy forest environment that will satisfy the needs and aspirations of present and future generations for goods and services derived from our forests in a sustainable manner”.  The Mission Statement of the Forestry Service is: “To sustainably manage our forest resources for, with and on behalf of the people of Mauritius”.  **Forestry and Conservation Services[[5]](#footnote-6)**  Some 30 km of firebreaks were created/maintained in fire prone areas.  Protected Area Network Expansion strategy (2017 -2026) and National Biodiversity strategy and Action Plan (2017 -2025) finalised  Management Plans for Bras d’Eau National Park and Black River Gorges National Parks ready for public consultation and for Government endorsement.  About 75,000 trees have been planted under the National Tree Planting Programme.  Table 19. Imports and value (c.i.f) of forest products, 2013 – 2016   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **SITC** | **Category** | **Unit** | **2013** | **2014** | **2015** | **2016** | | 245 | Fuel wood (excluding wood waste) and wood charcoal | Kg | 91,233 | 134,369 | 132,895 | 191,629 | | Rs | 1,831,402 | 2,664,482 | 3,176,937 | 3,722,656 | | 246 | Wood in chips or particles and wood waste | Kg | 7,050 | 25,603 | 6,721 | 8,192 | | Rs | 546,770 | 593,223 | 390,069 | 757,728 | | 247 | Wood in the rough, whether or not stripped of bark or sapwood or roughly squared | m3 | 58,791 | 184,778 | 147,051 | 364,366 | | Rs | 127,478,339 | 155,900,555 | 92,852,991 | 138,013,543 | | 248 | Wood simply worked and railway sleepers of wood | Kg | 1,035,993 | 725,921 | 545,704 | 647,558 | | Rs | 54,870,722 | 42,389,983 | 34,810,713 | 33,118,214 |     **Figure 11. Import of forest products, 2013 – 2016**    Table 20. Domestic exports and value (f.o.b) of forest products, 2013 – 2016   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **SITC** | **Category** | **Unit** | **2013** | **2014** | **2015** | **2016** | | 245 | Fuel wood (excluding wood waste) and wood charcoal | Kg | 4,040 | - | - | - | | Rs | 426,398 | - | - | - | | 246 | Wood in chips or particles and wood waste | Kg | - | 290 | - | - | | Rs | - | 13,720 | - | - | | 247 | Wood in the rough, whether or not stripped of bark or sapwood or roughly squared | m3 | 16 | 48 | 9 | - | | Rs | 295,992 | 228,716 | 41,280 | - | | 248 | Wood simply worked and railway sleepers of wood | Kg | - | 429 | 7,349 | - | | Rs | - | 25,000 | 1,077,863 | - | | m3 | 8 | 108 | 150 | 184 | | Rs | 33,774 | 25,000 | 27,201 | 41,595 |   SITC - Standard International Trade Classification - Rev. 4 (United Nations)  c.i.f - Cost, insurance and freight  f.o.b: (freight on board)  **Forestry resources in Rodrigues Regional Assembly**  Rodrigues’ native forest was completely destroyed in the 19th century. However, a vast reforestation program was initiated at the end of the Second World War and today the island has more than 4,000ha of forest area (out of a total of 10,500 ha). The forest formations are all composed of fast growing "exotic" species: *Acacia nilotica, Casuarina equisetifolia, Eucalyptus tereticornis, Terminalia catappa,Syzygium jambos, Pongamia pinnata*. The forest inventory carried out in 2002 lists about 1600 ha of forests managed by the State. The Forest Service’s distinguish two main types of forest: Eucalyptus plantations (Eucalyptus ereticornis) and mature mixed forests. The forest inventory estimated standing stock (log) at 108 m3/ha in Eucalyptus stands and 128 m3/ha in mature forest. These forests are no longer exploited for their timber. Nevertheless, a small private production of charcoal and Eucalyptus poles for construction still exists. In the late 1980s, a program to combat deforestation and erosion of coastal areas created 90 ha of Acacia Nilotica plantation in various parts of the island. Today, due to agricultural abandonment and extensive farming (which disperses seeds), this species has spread widely in the lower parts of the island and it can be estimated that surfaces invaded are about 800 ha, to varying degrees.  **Types of Forests in Rodrigues Regional Assembly**  The table and map below give an indication of types of trees in the forest of Rodrigues    **Emission Trends**  Forestry sector is part of the AFOLU and particularly an important carbon sink and sequester carbon dioxide. The forests and a few other lands sequester carbon with an average of about 367 Gg yearly in total, with a contribution of 75.68 Gg from Rodrigues. Livestock, with enteric fermentation and manure management contributed in the emissions of CH4. Rodrigues, which has important livestock populations accounts for almost half of the total emissions. Total emission from agriculture and soil excluding forestry and other land use (that is source of carbon sinks) is 128 Gg CO2eq. Livestock The animal population as well as their housing system and waste management determine the amount of emissions. The GHG inventory in the livestock subsector considers only two of the six direct greenhouse gases, namely, methane and nitrous oxide emanating from Enteric Fermentation and Manure Management source categories  Table 21. GHG emission from enteric fermentation of livestock and manure management, 2014 – 2016   |  |  |  | | --- | --- | --- | | **Year** | **CO2eq. emission from enteric fermentation of Livestock** | **CO2eq. emission from  manure management** | | **2014** | 14.91 | 3.27 | | **2015** | 14.88 | 3.31 | | **2016** | 13.35 | 3.30 |       **Figure 12. Emissions from enteric fermentation of livestock and manure management, 2014 – 2016**   Lands The Net CO2 emissions resulting from: (i) the land remaining the same and (ii) the land converted to other land use was estimated for the period 2006 to 2013. The land use sector represented a net removal of CO2 for the period 2013 to 2016. Forestland remaining forestland represented a net carbon sink form living biomass during the period 2013-2016. Very little variation in the total CO2 removal was observed for this land category with the average being -367 Gg CO2-eq.  Under the category forestland, CO2 removal is limited to the subcategory category forestland remaining forestland (Table 22 and Figure 13). Over the period 2013 to 2016, CO2 removal from forestland remaining forest land fluctuated very slightly. The total variation observed for 4 years was -1.35%.  These changes were attributed primarily to changes in the growing stock. The evolution of emissions/removals by the forest sector reported for the time period from 2013 through 2016 was influenced by the low rate of deforestation (average rate of 0.02%) and application of the principles of the National Forest Policy (2006). The Policy prescribes the management of Mauritian Forests for environmental and ecological functions rather than for the production of timber. Timber exploitation is gradually being phased out on State Lands and exotic species are gradually being replaced by native species. The forest areas affected by disturbances (fire, pests and diseases) for the period 2013-2016 were negligible.  Table 22. GHG removals by AFOLU sector   |  |  | | --- | --- | | **Year** | **AFOLU – GHG removals** | | 2013 | -367.56 | | 2014 | -366.90 | | 2015 | -368.70 | | 2016 | -363.30 |       **Figure 13. GHG Trend of GHG Removals from Forest Land (Gg CO2eq)**   Agriculture Soils Direct and indirect N2O emissions on land produced a total of 70 Gg CO2-eq in 2014. There has been a slight decrease in emission for this sector between 2014 and 2016 to 68.4 Gg CO2-eq. Overall, there has not been any significant variation in GHG emissions over the inventory years, attributed mainly to stable acreage of land under cultivation and amount of fertilizer use.  Table 23. Direct and indirect N2O emissions on land   |  |  |  | | --- | --- | --- | | **Year** | **Direct N2O emissions from managed soils CO2eq.** | **Indirect Emission from managed soils CO2eq.** | | **2014** | 52.28 | 17.4 | | **2015** | 49.65 | 16.55 | | **2016** | 51.33 | 17.11 | |

## Waste

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Trends of GHG Emissions As represented in the following figure and table, the GHG emissions from Waste Sector has experiment an increase along the time series from 2000 to 2016.  The most significant category, in terms of GHG emissions, is the solid waste disposal at landfills, followed by the wastewater treatment and discharge category.  GHG emissions of this sector have two different trends over the inventory years (2000-2016). From 2000 to 2011 an upward trend can be observed, with a maximum in 2011. It is relevant to mention the notably downward observed in 2009, which was due to a combination of different factors all affecting the emissions from solid waste disposal. Since 2011, emissions are suffering a downward trend due to a decrease in emissions from solid waste disposal and from wastewater treatment, especially industrial wastewater. The category that most contribute to the increase of the emissions in the last 17 years is the solid waste disposal.  Solid waste disposal represents the 68.1% of the total GHG emissions of the sector in 2016, corresponding to the managed waste disposal sites category. This category experienced a slight increase throughout the studied 2000-2016 period of 5.15%, from 352.6 Gg CO2eq in 2000 to 404.4 Gg CO2eq in 2016.  Wastewater represents the 30.8% of the total GHG emissions of the sector in 2016, corresponding 21.5% to domestic/commercial wastewater and 9.3% to industrial wastewater. This category experienced a slight decrease throughout the studied 2000-2016 period of 11.8%, from 207.04 Gg CO2eq in 2000 to 182.69 Gg CO2eq in 2016.  Biological treatment of solid waste represents the 1.02% of the total GHG emissions of the sector in 2016, corresponding to the composting category, which started in RoM in 2011. This category experienced a notable increase throughout the 2011-2016 period of 643%, from 0.82 Gg CO2eq in 2011 to 6.07 Gg CO2eq in 2016.  Regarding the category related to incineration and open burning of waste, only clinical wastes have been incinerated in Rom over the inventory period (2000-2016), with an insignificant contribution. These emissions represent the 0.12% of the total GHG emissions of the sector in 2016. This category has remained broadly constant throughout the studied 2000-2016 period, from 0.56 Gg CO2eq in 2000 to 0.74 Gg CO2eq in 2016.  **Figure 14. Evolution of the GHG Emissions for Waste sector (Gg CO2eq)**    Table 24. GHG Emissions for Waste sector (Gg CO2eq)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Category | 2000 | 2005 | 2010 | 2016 | | 4 - Waste | 560.25 | 619.70 | 633.72 | 593.88 | | 4.A - Solid Waste Disposal | 352.65 | 413.28 | 440.99 | 404.37 | | 4.A.1 - Managed Waste Disposal Sites | 352.65 | 413.28 | 440.99 | 404.37 | | 4.B - Biological Treatment of Solid Waste | 0 | 0 | 0 | 6.07 | | 4.C - Incineration and Open Burning of Waste | 0.56 | 0.52 | 0.53 | 0.74 | | 4.C.1 - Waste Incineration | 0.56 | 0.52 | 0.53 | 0.74 | | 4.D – Wastewater Treatment and Discharge | 207.04 | 205.89 | 192.19 | 182.69 | | 4.D.1 - Domestic Wastewater Treatment and Discharge | 129.24 | 134.33 | 128.61 | 127.61 | | 4.D.2 - Industrial Wastewater Treatment and Discharge | 77.80 | 71.56 | 63.58 | 55.08 |   More detailed information on activity data, emission factors, methodology used, and assumptions considered is available in the NIR. Sectoral Methodology The methodology used to estimate the GHG emissions of the Waste sector are highlighted in the table below. This table contains information about the tier level used in each Waste sector category, conversion factor used, and the source of activity data used for the development of the National Inventory.  Table 25. 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, CS | Solid Waste Management Division, Statistics Mauritius | | **4.B - Biological Treatment of Solid Waste** | T1 | D | Solid Waste Management Division, Statistics Mauritius | | **4.C - Incineration and Open Burning of Waste** | | | | | 4.C.1 - Waste Incineration | T1 | D | Solid Waste Management Division, Statistics Mauritius | | **4.D – Wastewater Treatment and Discharge** | | | | | 4.D.1 - Domestic Wastewater Treatment and Discharge | T1/T2 | D, CS | Wastewater Management Authority, Statistics Mauritius | | 4.D.2 - Industrial Wastewater Treatment and Discharge | T1/T2 | D, CS | 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  The efforts to estimate GHG emissions have been focused on those categories identified as key during the key category analysis developed at the beginning of the preparation of the Inventory.  Different activity data have been received from diverse sources for the categories under the Waste sector, for the development of the national inventory, those that present less uncertainty, those that seemed to be more consistent and have data for a greater number of years, have been considered Quality Assurance / Quality Control (QA/QC) 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:   * Cross verification between data provided via mail by institutional authorities 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 Waste sector. * Cross verification between the GHG emissions estimated in the current inventory for Waste sector and the results obtained in the las reported national inventory of the RoM.  Recalculations Some recalculations have been made to improve the GHG emission calculation. Some of them are listed below.   * Solid waste disposal: 2006 IPCC Guidelines suggests that, based on FOD methodology, waste landfilled 50 years ago can produce CH4 emissions nowadays. Based on that aspect, this inventory edition has considered all the aspects required regarding of waste landfilled in RoM since 1960 (amount of waste, composition, etc) to obtain a more accurate emissions estimate. * Composting: N2O emissions have been estimated for all the inventory period (2000-2016). * Incineration: CO2 emissions have been updated due to a correction in the EF used for the previous Inventory. * Domestic/commercial wastewater: some adjustments regarding BOD and MCF values have been updated. * Industrial wastewater: a new relevant industry sector has been considered (beer production). CH4 emissions for this new industry has been estimated for the whole inventory period (2000-2016)   More detailed information on the recalculations made in the Waste sector are available in the NIR. Challenges During the elaboration of this national inventory, different challenges have been identified for Waste categories:  The activity data used for most of the categories are quite detailed for solid waste, however, this information is solely available for the period 2000-2016. To achieve a more accurate and complete inventory, a review of the assumptions considered for solid waste disposal for the period 1960-2000 would be necessary, and RoM should work on this aspect for the future.  In addition, data regarding wastewater need to be reviewed and adjusted, especially regarding the types of treatments applied to industrial wastewater over the years and the type of treatments applied to domestic/commercial wastewater for the 2000-2005 period.  More planned improvements by sector are available in the NIR. Sectoral Uncertainties The results for the uncertainty analysis (IPCC software) for the categories considered in the Waste sector are reported in the following table:  Table 26. Uncertainty analysis of the IPPU sector for the trend 2000 – 2016   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **IPCC Category** | **Gas** | **Activity Data Uncertainty (%)** | **Emission Factor Uncertainty (%)** | **Combined Uncertainty (%)** | | 4.A - Solid Waste Disposal | CH4 | 0.00 | 0.00 | 0.00 | | 4.B - Biological Treatment of Solid Waste | CH4 | 0.00 | 0.00 | 0.00 | | 4.B - Biological Treatment of Solid Waste | N2O | 0.00 | 0,00 | 0.00 | | 4.C - Incineration and Open Burning of Waste | CO2 | 0.00 | 0.00 | 0.00 | | 4.D - Wastewater Treatment and Discharge | N2O | 0.00 | 0.00 | 0.00 | | 4.D - Wastewater Treatment and Discharge | CH4 | 0.00 | 0.00 | 0.00 | |

## Gaps, constraints and needs

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| RoM, as a developing country, has its constraints and gaps that need to be addressed to produce betterqualityreportstotheConvention.Thisisstillabigchallengegiventhatnowthereporting standards have been raised and there is also a review of the inventory.  The following problems were encountered during the preparation of this national inventory of GHG:   * Information required for the inventory were obtained from various sources as no institution has yet been endorsed with the responsibility for collection of specific AD needed for the estimation of emissions according to IPCC on an annual basis * There were frequent inconsistencies when data were collected from different sources * Some of the AD are still not yet in the required format for feeding in the software to make the emission estimates * Lack of EFs to better represent national circumstances and provide for more accurate estimates even if this has started to be addressed for some key categories * National experts are not yet ready to take over the full inventory compilation process which dictated the collaboration of an international consultant; * National experts were provided with further capacity building and this will be pursued in the future until they are fully conversant with the whole process   **Agriculture Forestry and Other Land Use (AFLOU)**  **Constraints and gaps of GHG inventory and mitigation actions:**   * Limited access to new technology such as GIS and remote sensing for data capture for land acreage under food crops, tea and fruits. * For the TNC a Tier 1 methodology for the agricultural sector, default EF was used, that may not be appropriate for local conditions and carry large uncertainties. It is therefore important to develop local EF so the GHG emissions from agriculture can be accurately assessed as possible. * The potential of GHG sequestration in tea plantation and orchards have not been adequately accounted for in the GHG inventory. |

## Improvement plans

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| Based on the constraints, gaps and other challenges encountered during the preparation of the present inventory, a list of the most urgent improvements has been identified. These are listed below and will be addressed during the preparation of the next inventory.   * Upgrading of the National Inventory System (NIS). This NIS is responsible for the development periodically the country’s national GHG inventory as well as the projections of GHG emissions and absorptions to the atmosphere, which allows to evaluate the compliance of the acquired commitments entered by the country. Moreover, the system is the basis for the policy making and emission mitigation measures development, as well as for assessing their effectiveness in achieving the objectives. * Development of emission factors (EFs) more representative of the national context. * Develop a capacity building and strengthening of technical know-how and institutional arrangements within the National Inventory System to improve the coordination in the implementation of the GHG Inventory cycle. Capacity building and the development of technical know-how would improve the data collection, development of methodology, determine country specific EFs and reporting, among other. * Improve the existing QA/QC system in order to reduce uncertainty and improve inventory quality. * Make efforts to collect the data for the missing years until 1990 to complete the full time series from 1990. * Institutionalize the archiving system  Agriculture Forestry and Other Land Use (AFLOU) Data for agriculture and other land use can be developed through GIS mapping and remote sensing. Land use pattern data need to be of latest year to make the assessment for changes in emission pattern over the period of time. As Mauritius being SIDS country and limitation of land will always be an issue to be taken under improvement plan and to assess the land use pattern periodically and regularly to avoid any conflict at later stage.  More than fifty percent of forest area is under private control and it need to be accounted for the estimation of CO2 sequestration by the forest and to develop plans for conservation.  More detailed information on sectorial planned improvements is available in the NIR. |

## Suggestions and needs for improvement of reporting

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| Based on the proposals made in the previous section, a list of proposals for improvements that could be made under the reporting of the national GHG inventory for overcoming the data and/or information gaps are listed below:   * Reporting of NCV annual data for each type of fuel * Reporting of plant specific Implied Emission Factor (IEF) for energy industries to achieve higher tier levels * Reporting of consistent energy balance data and use this information as a quality control comparing its information with the specific data from each category and sub-category. * Reporting of fuel consumption for each manufacturing industries and construction industries operating in the RoM using information obtained directly from each industry. * Reporting of activity data used in the transport sector for road, water-borne and air transport. It will be advisable to specify if data reported for transport sector is related to national or international travels, especially for navigation and aviation. |

# Mitigation Actions

## Overview

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| This chapter provides the details concerning mitigation scenarios for RoM in energy sector (energy industries and transport); and non-energy sectors (waste; agriculture; and LULUCF).  RoM is implementing several measures and projects to meet its Nationally Determined Contribution (NDC) pledges made in the context of the Paris Agreement on climate change. With the implementation of the Green Climate Fund (GCF) project ‘Accelerating Transformational Shift to a Low Carbon Economy in the Republic of Mauritius’, RoM aims at reducing their carbon emission by 4.27 million tonnes from 2017 to 2025.  As far as practicable, the scenarios have been aligned to existing sectoral policies, strategies and action plans. The level of emission reductions was aligned for consistency with the national targets that have been set in NDC to 2030.  The mitigation scenarios are reported to:   * provide the methodology used to develop them, and * explain the underlying assumptions.   Based on its NDC information, RoM will promote and implement the following mitigation activities:   * smart use of marine resources; * expansion in solar, wind and biomass energy production and other renewable energy sources; * sustainable consumption and production in all sectors of the economy; * gradual shift towards the use of cleaner energy technologies, such as LNG, among others; * modernisation of the national electricity grid using smart technologies, which is a prerequisite to accelerate the uptake of renewable energy; * efficient use of energy through the deployment of appropriate technologies in all sectors of the economy and awareness raising on energy conservation; * sustainable transportation, including promotion of energy efficient mass transportation systems based on hybrid technologies and cleaner energy sources; * climate smart agriculture including bio-farming; * sustainable and integrated waste management, including waste to energy; * sustained tree planting programme within the context of the cleaner, greener and safer initiative; and * leapfrog to low global warming potential refrigerants.   The tables below present the Mauritian mitigation routes/actions according to the guidance established by Decision 2/CP17, Annex III, and includes: name, status of the action, implementing institution, period, sector/subsector, scope, quantitative targets, gases, general objective, description, methodology and assumptions, results, and progress indicators. |

## Mitigation Actions for the Energy sector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Mitigation policies for the Energy Industries sector considers 3 main objectives:   * Reduce dependency on fossil fuels * Encourage the use of renewable sources * Manage demand through energy efficiency measures while ensuring energy security   Mitigation policies planned by RoM for the energy industries sector propose to achieve the 35% of renewable energy target in 2025 and maintain it up to 2050. This target remains in the following plans developed by the RoM, like the Renewable Energy Roadmap 2030. The Renewable Energy Roadmap 2030 mentions an additional option, which is the improvement of that target to 40% by 2030.  These targets have been set within the energy policy framework of the Government stated in the Vision 2030 document: “Government will aim at ensuring energy security by promoting cleaner and sustainable energy through the development of renewable energy and energy efficient technologies”. In this sense, two main alternatives have been identified to achieve those targets, one related to the development of renewable energy plants to reduce the dependency on fossil fuels and, the other one, related to the development of energy efficiency measures.  Last official projections and mitigation scenarios were developed for last National Communication (TNC), which are still the official existing data used for this BUR. Those mitigation scenarios were developed based on different mitigation policies (i.e. energy efficiency measures, penetration of solar energy, wind energy, etc.). Each of these mitigation policies have a mitigation potential associated, which have been calculated by the difference of emissions respect to the BaU scenario. These mitigation potentials have been included in each sheet below, at the top of them, and correspond to mitigation potentials at policy level, not at specific mitigation actions level. In that sense, in order to achieve the mitigation policy targets and, by extension, to reach the mitigation potential calculated, specific projects (mitigation actions) have been developed. Some of these projects are currently ongoing or accomplished, while some others are still in the process of being implemented or have not yet been proposed, however, there is not enough information from them to have an accurate estimation on how that projects are contributing to achieve the mitigation potential estimated at policy level. The following sheets show all the information available.  The information has been obtained from the following sources:   * Energy Efficiency and Demand Side Management Master Plan * Renewable Energy Roadmap 2030 for the Electricity Sector * Renewable Energy Strategic Plan 2018-2023   In addition, the Republic of Mauritius has started the implementation of the project named “Accelerating the transformation shift to a low-carbon economy in the Republic of Mauritius”, financed by the Green Climate Fund (GCF), UNDP and government institutions such as MEPU, CEB, AFD and OIDC. The implementation of the project started in 2017 and it is planned to be completely implemented by 2025. The project is divided into 3 sub-components:   1. Institutional strengthening for renewable energy 2. Improving grid absorption capacity followed by PV deployment 3. PV mini-grids on the Outer Island of Agalega   The order of implementation of the proposed mitigation policies start with the implementation of the Mitigation Action 1, Energy Efficiency Measures, followed by the implementation of the RE technologies. Mitigation Action 1 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Energy Efficiency Measures | Under implementation | Ministry of Energy and Public Utilities - Government of Mauritius | 2016-2030 | Energy industries - Electricity Generation | National | Reduction of 734 Gg CO2e by 2030 relative to BAU scenario  Reduction of 2,117 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The main objective of the mitigation policy is to reduce energy use and costs, protecting the environment, improving productivity and contributing to the mitigation of the effects of climate change.  The quantitative targets of this overall mitigation policy are indicated below, representing the energy efficiency gains over the period 2010-2025 as compared to the electricity consumption of 2008.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Year | 2010 | 2015 | 2020 | 2025 | 2030 | | Target in % | 2 | 4 | 6 | 10 | 10 | | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | RoM has clearly identified the importance of promoting energy efficiency into key policy, regulatory and institutional frameworks and across key sectors.  The Government strategy is to remove all current barriers, namely, institutional, technical, economic and financial, so as to allow for the transformation of the economy into an energy efficient one.  Several strategies/projects have been promoted for the energy efficiency policy:   * Develop the Energy Efficiency act * Make energy auditing * Develop education and training materials * Develop a Demand Side Management strategy, where an efficient street lighting system using CFL and traffic lighting using LED would be promoted * Sustainable Building strategies, promoting that new buildings, both public and private, will have to be energy efficient in terms of the building envelope and equipment to be used * Promote energy efficiency in the Tourism Industry (main pillar in the economy of the country), with the objective of offering zero-carbon-footprint holidays * Develop the product labelling and efficiency standards, in order to catalogue the equipment according to their efficiency standards   In 2016, the Energy Efficiency (EE) and Demand Side Management (DSM) Master Plan and Action Plan 2016-2030 was developed.  **Specific projects carried out within the mitigation policy framework:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Project Title** | **Date** | **Objective** | **Description** | **Savings/Mitigation** | | Governmental Programme for financing EE interventions in residential buildings | It has not been implemented jet.  The duration of the project is estimated in 3 years. | Give incentives to the residential sector to implement EE interventions to the households and realise deep energy savings | Combination of individual EE interventions/actions proposed by the energy auditor that results in a 30% of final annual energy savings compared to the situation before the implementation of the interventions/actions.  EE Interventions:   * Replacement of windows and installation of shading systems * Installation of insulation to the walls, roofs and floor surfaces * Replacement of inefficient air conditioning units * Replacement of inefficient lighting * Installation of automated building energy control systems * Installation of solar water heaters * Installation of energy efficient cookers * Replacement of inefficient appliances with new ones having an energy label and belonging to higher energy classes | * Final energy consumption savings in households of 13.01 ktoe in 2030, 7.93% improvement compared to 2030 baseline scenario. * Final electricity consumption savings of 102.52 GWh in 2030, 9.47% improvement compared to 2030 baseline scenario. * Final fossil fuel consumption savings of 5.72 ktoe in 2030, 9.1% improvement compared to 2030 baseline scenario. | | Reduction in electrical energy consumption – Green Port initiative | 2016 - 2018 | The Mauritius Port Authority (MPA) has developed several specific projects in order to reduce their energy consumption. | Programme to replace all the lighting systems with LED and procurement of low energy consumption IT equipment and air conditioners, together with a reengineered of the lifts so they regenerate electricity when they are in movement.  In 2017 the total electrical energy consumption of the MPA amounted to 1.84 GWh while the amount was reduced to 1.78 GWh in 2018.  Solar panels have recently been installed at Oil Jetty and the lighthouse of Flat island is running with solar power.  A major solar power project for the buildings of the MPA has been planned. | Decrease of 3.26% of the energy consumption.  Reduction of 48.2 tCO2eq in 2 years | | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[6]](#footnote-7):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 216 | 459 | 734 | 1,102 | 1,490 | 1,836 | 2,117 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, a comparative analysis of three sector models has been made:   * System dynamics modelling * Mauritius 2050 Pathways calculator   The models provide reference or business-as-usual (BaU) scenarios up to the year 2050.  Although the MAED model has been carried out up to 2030 only, it provides useful information concerning the demand side energy efficiency over the period. Hence, the level of energy efficiency gains arising from the reduction of electricity demand was obtained from the MAED model with assumptions made on the evolution of energy efficiency up to 2050.  The simulations in required electricity generation obtained from the system dynamics model and from the Mauritius 2050 Pathways calculator are closely aligned up to 2045 but diverge by more than 25% in simulated results by 2050.  The baseline emissions analysis has been carried out using the results of the system dynamics model that is able to simulate electricity generation using either an endogenous or an exogenous calculation of GDP. By calibrating the model to replicate historical electricity generation, the simulation of electricity generation using a 3.8% GDP growth rate (the average GDP growth rate of the last 10 years) has been adopted for simulating the baseline GHG emissions. The system dynamics model has been used recently to simulate the electricity generation scenarios published by the CEB in its Integrated Electricity Plan 2013-2022 (Deenapanray and Bassi, 2015).  For the calculation of the GHG emissions for these mitigation actions related to energy industries, the following equations have been used:    For the emissions factor for the grid: | | | | | | |   In 2019, the Renewable Energy Roadmap 2030 was published with a target of 40% of renewable energy in the electricity mix by 2030.   |  |  | | --- | --- | | Fuel | | | 2018 | 2020 | 2025 | 2030 | | Information Source | | Energy Roadmap | Energy Roadmap | Energy Roadmap | Energy Roadmap | | Renewable | Biomass – Bagasse | 10.8% | 10.7% | 13.9% | 12.3% | | Biomass – Cane Trash | 0.3% | 0.6% | 1.3% | 1.8% | | Hydro | 4.4% | 3% | 2.8% | 2.5% | | Wind | 0.4% | 2.1% | 1.9% | 2.3%+2.4% (extra) | | Solar PV | 1.7% | 8% | 10.2% | 13.7% | | Waste-to-Energy | 0% | 0% | 4.2% | 3.7% | | Landfill Gas | 0.8% | 0.8% | 0.7% | 0.6% | |  |  |  |  |  | | Wave (extra) | 0% | 0% | 0% | 0.8% (extra) | | TOTAL RENEWABLE | 18.4% | 25.2% | 35% | 36.9% + 3.2% (extra)  40% | | Non-Renewable | Fuel Oil | - | - | - | - | | Coal | - | - | - | - |  Mitigation Action 2 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Wind Energy Penetration | Under implementation | Ministry of Energy and Public Utilities - Government of Mauritius | 2016-2030 | Energy industries - Electricity Generation | National | Reduction of 64 Gg CO2e by 2030 relative to BAU scenario  Reduction of 64 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The objective of the mitigation action consists on the increasing the energy generation through wind power, see table above. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | According to the Renewable Energy Roadmap 2030, in order to reach the 40% of the total energy generated from renewable energy technologies, the projection of energy generated from wind farms in 2030 is expected to contribute the 2.3%.  Some of the most relevant activities under this mitigation actions are listed below:   * Once Electricity Act 2005 is proclaimed, URA would oversee implementation of RE Roadmap and pricing mechanism for renewable energies, including wind energy * Invest in energy storage for renewable energies of intermittent sources * Generate geospatial information of wind potential to develop a zoning plan for the implementation of wind energy * Increase awareness of the pros and cons of wind energy in Mauritius, with focus on the ways to mitigate any of its negative impacts   Several projects developed under this mitigation policy:   * Wind Farm EOLE – Plaine des Roches (Ongoing). 9.35 MW wind farm. * Wind farm at Plaine Sophie – Suzlon Padco (Projected). 29.4 MW wind farm. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[7]](#footnote-8):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 64 | 64 | 64 | 64 | 64 | 64 | 64 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, information is collected in the Mitigation Action 1 above. | | | | | | |  Mitigation Action 3 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Solar Energy Penetration | Under implementation | Ministry of Energy and Public Utilities - Government of Mauritius | 2016-2030 | Energy industries - Electricity Generation | National | Reduction of 119 Gg CO2e by 2030 relative to BAU scenario  Reduction of 118 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The objective of the mitigation action consists on the increasing the energy generation through solar power, see table above. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | According to the Renewable Energy Roadmap 2030, to reach the 40% of the total energy generated from renewable energy technologies in 2030, the projection of energy generated from solar farms is expected to contribute the 13.7%.  Some of the most relevant activities under this mitigation actions are listed below:   * Once Electricity Act 2005 is proclaimed, URA would oversee implementation of RE Roadmap and pricing mechanism for renewable energies, including solar PV * Invest on energy storage for renewable energies of intermittent sources * Generate geospatial information of solar PV potential to develop a zoning plan for the implementation of utility-scale solar PV * CEB has currently launched new schemes for religious bodies and public buildings.   Several projects developed under this mitigation policy:   * La Feme – Bambous 15 MW solar power farm (Completed) * GCF Project – Accelerating the transformation shift to a low-carbon economy in the RoM;(Ongoing) * Mont Choisy (Completed) * L’Esperance (Completed) * Petite Retraite (Completed) * Queen Victoria (Completed) * Solitude (Completed) * Beau Champ (Completed) * Henrietta (Completed) * Petite Rivière (Ongoing) * Solar PV Scheme for residences – SSDG (Ongoing) * Solar PV schemes for cooperatives (Ongoing) * Home Solar Project targeting low income households (Ongoing) * Solar PV schemes for SMEs (Ongoing) * Solar PV schemes for commercial buildings – MSDG (Ongoing) | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[8]](#footnote-9):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 119 | 119 | 119 | 119 | 119 | 119 | 118 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, information is collected in the Mitigation Action 1 above. | | | | | | |  Mitigation Action 4 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Waste to Energy (WtE) Penetration | Under implementation | Ministry of Energy and Public Utilities - Government of Mauritius | 2017-2030 | Energy industries - Electricity Generation | National | Reduction of 207 Gg CO2e by 2030 relative to BAU scenario  Reduction of 208 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The objective of the mitigation action consists on the use of the landfill gas generated in the decomposition of the solid wastes as energy source, see table above. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | According to the Renewable Energy Roadmap 2030, to reach the 40% of the total energy generated from renewable energy technologies in 2030, the projection of energy generated from waste to energy plants in 2030 is expected to contribute 3.7%.  Some of the most relevant activities under this mitigation actions are listed below:   * Carry out a feasibility study concerting the appropriateness of alternative WtE options in Mauritius * Generate and communicate information to wider public regarding the pros and cons of alternative WtE technologies * Develop a zoning plan for locating WtE plant * Include impacts of air emissions on health in feasibility study on the appropriateness of alternative WtE options * Waste streams segregated according to calorific values eases choice of feedstock for energy generation * Invest in infrastructure for waste segregation at source establish incentives and disincentives to promote sorting of waste at source   Several projects developed under this mitigation policy:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Project name** | **Date** | **Status** | **Description** | **Savings / Mitigation** | | Landfill gas to energy | 2011 – ongoing | Ongoing | Construction of a landfill gas to energy facility to generate 22 GWh/year of electricity | Average of 70,000 tCO2/year emission reduction | | Mare Chicose Landfill | 2015 – ongoing | Ongoing | Construction of a landfill gas to energy facility in the Mare Chicose landfill | 183,370 tCO2eq/year emission reduction | | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[9]](#footnote-10):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 219 | 220 | 207 | 208 | 207 | 207 | 208 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, information is collected in the Mitigation Action 1 above. | | | | | | |  Mitigation Action 5 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Biomass Energy Penetration | Under implementation | Ministry of Energy and Public Utilities - Government of Mauritius | 2017-2030 | Energy industries - Electricity Generation | National | Reduction of 106 Gg CO2e by 2030 relative to BAU scenario  Reduction of 103 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The objective of the mitigation action consists on the increasing of the energy generated from biomass sources (bagasse, a by-product of sugarcane and cane trash), see table above. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | According to the Renewable Energy Roadmap 2030, in order to reach the 40% of the total energy generated from renewable energy technologies in 2030, the projection of energy generated from bagasse (biomass) energy plants is expected to contribute 12.3%, and the cane trash plants the 1.8%.  Some of the most relevant activities under this mitigation actions are listed below:   * Once Electricity Act 2005 is proclaimed, URA would oversee implementation of RE Roadmap and pricing mechanism for renewable energies, including renewable biomass * A Bioectricity Strategy in Mauritius is being developed by MEPU. This report will eventually be used by Ministry of Agro-Industry and Food Security for the development of a Biomass Framework. * Generate geospatial information of renewable biomass potential to develop a zoning plan for the implementation of renewable biomass for power generation (among other aims within the ambit of an integrated sustainable agro-industry strategy).   Several projects developed under this mitigation policy:   * Sweet Power: Using cane trash as a source of energy for power production (Ongoing) * Sweet Paper: Recyclable paper (shredded as source for power production (Ongoing) * Bioethanol Distillery (Completed) * Small Energy Plant (Completed) | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[10]](#footnote-11):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 0 | 103 | 104 | 103 | 104 | 104 | 103 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, information is collected in the Mitigation Action 1 above. | | | | | | |  Mitigation Action 6 – Energy sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Additional Renewable Energy (RE) Penetration | Planning phase | Ministry of Energy and Public Utilities - Government of Mauritius | 2030-2050 | Energy industries - Electricity Generation | National | Reduction of 77 Gg CO2e by 2030 relative to BAU scenario  Reduction of 261 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The objective of the mitigation action consists on the implementation of additional renewable energy sources beyond 2030. Additional renewable energies have been analysed at RoM to be implemented in the country, in order to reach the energy target. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | Other renewable energy sources have been identified in order to reach the energy target of 40% of renewable energy by 2030. The Renewable Energy Roadmap 2030 have stated that other renewable energies such as offshore wind and wave will be implemented too, in order to reach the target.  Offshore wind will contribute to the 2.4% of the renewable energy mix in 2030, and wave power to the 0.8% of the renewable energy mix in 2030.  In addition to these technologies, , SWAC systems and carbon burnout plants have been identified and/or implemented:   * From 2030 to 2035 it is proposed an extra 80 GWh of energy generated from renewable sources * From 2036 to 2040 an extra 90 GWh * An extra 120 GWh between 2041 and 2042 * 150 GWh between 2043 and 2044 * 160 GWh in 2045 and 2046 * An extra 180 GWh in 2047 * Extra 210 GWh in 2048 * Extra 230 GWh in 2049 * 270 GWh in 2050.   The above reported information in bullet point are not official targets to be held by the country, they are proposed projections for the additional renewable energy penetration mitigation action. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[11]](#footnote-12):   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 0 | 0 | 77 | 78 | 87 | 154 | 261 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the BaU scenario or the baseline emission scenario, information is collected in the Mitigation Action 1 above. | | | | | | |  Mitigation Action 7 – Transport sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Improved fuel intensity | Under implementation | Ministry of Land Transport and Light Rail- Government of Mauritius | 2016-2030 | Transport - Road transportation | National | Reduction of 19 Gg CO2e by 2030 relative to BAU scenario  Reduction of 25 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The main objective of this mitigation policy is the improvement of the fuel intensity. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | The mitigation action consists on the improvement in the fuel intensity of vehicles (applied to all vehicles) at the rate of 1% per year pre-2020 and increasing to 1.5% per year post-2020.  Some of the most relevant activities under this mitigation actions are listed below:   * System established to make spare parts available on local market * Display of fuel efficiency information is made mandatory through changes in legal/regulatory requirements * Create awareness programme on the benefits of new technology | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[12]](#footnote-13):   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 2020 | 2030 | 2040 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 11 | 19 | 22 | 25 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | For the calculation of the GHG emission related to the land transport, considering that these emissions are rather related to the distance that the vehicles travel, a parametric model has been developed (Baguant et al., 1996).  The model is composed of two components:   1. Passenger mobility measured in annual passenger-km travelled (PAX km/capita/year), which is parametrized as follows:      1. Freight mobility measured in tonne of freight/goods km per capita, which is parametrized as a linear relationship to economic growth as follows:     These equations were used to project annual passenger mobility and freight mobility to 2030 using a GDP growth rate of 3.8% per annum. The GDP growth rate for the period 2031 to 2050 is set at 3% based on expert guidance received from stakeholders. | | | | | | |  Mitigation Action 8 – Transport sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation policy** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Improved vehicle inspection | Under implementation | Ministry of Land Transport and Light Rail- Government of Mauritius | 2017-2030 | Transport - Road transportation | National | Reduction of 64 Gg CO2e by 2030 relative to BAU scenario  Reduction of 82 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation policy** | | | | | | | |  | The main objective of the mitigation action is the improvement of the vehicle inspection centres. | | | | | | | |  | **Brief description and activities planned under the mitigation policy** | | | | | | | |  | The mitigation action consists on the privatisation of the vehicle inspection centres starting in 2017 leads to an overall reduction in GHG emissions of 5% in 2019.  Some of the most relevant activities under this mitigation actions are listed below:   * Review vehicle examination fees in order to provide visibility on return on investments for private vehicle examination stations * Develop training programme to skill personnel manning the examination stations * Create awareness programme to dispel technology stigmatisation as being against the poor | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[13]](#footnote-14):   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 2020 | 2030 | 2040 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 54 | 64 | 73 | 82 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | Not specified | | | | | | |  Mitigation Action 9 – Transport sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Low-carbon options | Under implementation | Ministry of Land Transport and Light Rail- Government of Mauritius | 2016-2030 | Transport - Road transportation | National | Reduction of 42 Gg CO2e by 2030 relative to BAU scenario  Reduction of 180 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | The main objective of this mitigation action is to reduce the GHG emissions by combining different low-carbon technologies. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | The low-carbon options considered to be combined are:   * Blended bio-ethanol produced in Mauritius * Hybrid cars * Electric cars   In all three cases, it is assumed that the low-carbon option will impact gasoline-fuelled cars. Assuming there is a total available potential of 20 ml of bio-ethanol per year, the low-carbon scenario accounts for a 25% penetration in 2020 and increasing by increments of 5% in subsequent years until 100% penetration is reached in 2035 (50% in 2025 and 75% in 2030).  Some of the most relevant activities under this mitigation actions are listed below:   * Develop financial model for owning and operating a hybrid car using life cycle assessment in order to increase willingness to pay among consumers * Design and implement financial incentives for the uptake of blended fuel * Establish clear guidelines regarding the stock of gasoline-driven vehicles that may use blended fuel * Review financial/economic incentive scheme to make uptake of hybrid cars more attractive thereby also increasing scale of economies for parts and batteries * Create awareness by providing full information on the technology benefits * Design awareness campaign to make technical information on blended fuel available to end users   Regarding the roadmap developed by the country regarding the introduction of electric cars. It is assumed the introduction of electric cars in the country that will substitute fuelled cars (PHEV and BEV electric cars). In the following table it is collected the estimations considered regarding the implementation of the proposed measure.   |  |  |  |  | | --- | --- | --- | --- | |  | 2020 | 2025 | 2030 | | Number of PHEV cars | 850 | 5,500 | 15,000 | | Number of BEV cars | 390 | 2,900 | 11,000 | | Total number of electric cars | 1,200 | 8,400 | 26,000 | | Impact on emissions compared to BAU (Mt CO2eq)  (-) reductions and (+) increases | +0.4 | -1.0 | -25.7 |   Although the use of other transport modes such as electric cars, there will be still GHG emissions produced from these sources, due to the use of no renewable energy sources to produce energy that will be used by these electric cars. For that reason, the implementation of this measure should be done parallel and together with the energy industry measures (see Measures 1 to 6).  For more information, the Republic of Mauritius has developed the report “A 10 year Electric Vehicle Integration Roadmap for Mauritius”. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | The expected GHG emissions reductions relative to BaU scenario[[14]](#footnote-15):   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 2020 | 2030 | 2040 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 9 | 42 | 99 | 180 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | The assumptions taken for the low-carbon option actions are related to the share of passenger mobility (%) allocated to hybrid and electric car that would replace gasoline-fuelled cars.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Year** | **2020** | **2030** | **2040** | **2050** | | Hybrid car (%) | 2.06 | 8.31 | 20.81 | 43.31 | | Electric car (%) | 0.00 | 1.50 | 7.50 | 18.75 | | | | | | | |  Mitigation Action 10 – Transport sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Light rail system | Under implementation | Ministry of Land Transport and Light Rail- Government of Mauritius | 2019-2021 | Transport - Road transportation | National | Reduction of 26 Gg CO2e by 2030 relative to BAU scenario  Reduction of 27 Gg CO2e by 2050 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | Light Rail System (LRS) consists on a measure to generate modal shift away from private cars and buses along the Curepipe – Port Louis corridor. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | Mauritius Metro Express or LRS is a 26km light rail transit system being developed in Mauritius. The line will extend from Curepipe to Immigration Square in Port Louis and include 19 stations. Estimated to cost MUR18.8bn ($565m), the project was officially launched in March 2017 and is being undertaken by Metro Express Limited, a wholly-owned company of the Government of Mauritius.  Operations are due to begin on the Rose Hill to Port Louis section in September 2019, while train services from the Curepipe station are expected to start in early-2021. The metro project will cut the journey time from Curepipe to Port Louis to 41 minutes. It is expected to create approximately 7,000 full-time jobs during the construction phase.  The light rail project is being undertaken to decrease traffic congestion in Mauritius, which is costing the nation MUR4bn ($119.6m) a year. The project design includes the creation of a multimodal urban transit solution, connecting three major bus interchanges to give commuters to access bus services. A future north-south expansion of the metro express is in plan, which will create a direct connection to the airport.  The Metro Express project includes the construction of stations, viaducts and bridges in addition to the installation of electric traction systems, ticketing and passenger information systems, and other maintenance equipment. The stations will feature user-friendly ticket machines, and the tracks will be ballast-less.  Although the use of other transport modes such as public transport light rail system, there will be still GHG emissions produced from this source, due to the use of non-renewable energy sources to produce energy that will be used by this light rail system to operate. For that reason, the implementation of this measure should be done parallel and together with the energy industry measures (see Measures 1 to 6). | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | It is estimated to operates 32 trains on the rail track (15 trains per hour, each with 304 passenger capacity) carrying up to 80,000 passengers per day. Immediately after the introduction of the LRS Metro Express, 20% of bus commuters and 10% of personal vehicle users are expected to switch to using the LRT Metro Express system.  The expected GHG emissions reductions relative to BaU scenario[[15]](#footnote-16):   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 2020 | 2030 | 2040 | 2050 | | Reductions relative to BAU scenario (Gg CO2eq) | 25 | 26 | 27 | 27 | | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | The impact of the LRS on road transport GHG emissions has been modelled taking into account the reduction in car and bus annual distance travelled as follows:  2018: 109,540,000 km by car and 10,547,000 km by bus  2028: 107,204,000 km by car and 10,836,000 km by bus  2038: 115,300,000 km by car and 11,330,000 km by bus  The reductions have been kept constant at their 2038 levels for the period 2039 to 2050. Also, 90% of the reduction in car passenger mobility is attributed to gasoline-fuelled cars, and the remaining 10% to diesel-fuelled cars. | | | | | | |  Mitigation Action 11 – Transport sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Bus Modernisation Programme | Under implementation | Ministry of Land Transport and Light Rail- Government of Mauritius | 2020-2024 | Transport - Road transportation | National | Reduction of 10,950t CO2e by 2030 relative to BAU scenario | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | The objective of the mitigation action consists on the modernisation of the bus fleet of Mauritius by substituting the current operational buses for electric e-buses. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | As part as the Government’s transport sector’s goals, a mitigation action was planned as a low-carbon initiative. The bus fleet, consistent of 2034 buses as of 2018, is becoming increasingly antiquated.  The action is proposed to develop necessary policy/regulatory framework and deploy electric bus fleet for last mile/feeder connectivity to MetroExpress stations from nearby high population density urban and rural locations in Mauritius. A bus leasing model will be followed, with electric buses being leased from either domestic leasing companies. This model would still require government subsidies, which could be financed from Global Environment Facility (GEF) with support from UNDP. Solar energy based electric bus fast-charging infrastructure and their maintenance would be the responsibility of bus leasing companies, although bus operators could collaborate with leasing companies in this aspect.  The action would focus on the procurement of 30 electric buses and solar energy based electric bus fast-charging infrastructures.  Currently, 344 semi low floor buses and 2 electric buses have been purchased. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | Each e-bus is estimated to reduce at least 36.5 tons CO2e per annum, considering the substitution of 30 buses, the GHG emission reduction would achieve the amount of 10,950 tons CO2e by 2030. | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | An average diesel bus is estimated to emit about 1 km CO2e per km travelled. Assuming solar powered charging is used for charging the e-buses to be used in Mauritius, which, when deployed, are estimated to operate for about 100 km per day. | | | | | | | |

## Mitigation Actions for the IPPU sector

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| The Republic of Mauritius does not count on specific and detailed mitigation actions related to IPPU sector. Despite this, the MoESWMCC (Department of Environment), under the National Ozone Unit (NOU), has redacted several actions and laws to be in line with the restrictions adopted in the Montreal Protocol and the Kigali Amendment. This actions/activities/laws have not been widely developed to build a table as the ones above, but a brief description or mention about some of the most representative actions could be found in the following lines.  **Projects carried out to phase out Chlorofluorocarbons (CFCs):**   * Country Programme: The main achievement of the Country Programme has been the elimination of **32 ODP tons** in the Aerosol and the domestic refrigerator manufacturing sectors in late 1990s.   + countrywide survey on the supply-demand scenario of ODS use in Mauritius   + Analysis of future requirements and the limits imposed by the Protocol.   + Assessment of options available for changing over to alternative technologies and substances in each sector and sub-sector   + Assessment of the actions to be undertaken to implement phase-out of CFC   + The banning on imports of all CFC based appliances since 1999 and HCFCs based ones since 2013.   + The ban on import of aerosol containing CFC, excluding Medical aerosols.   + The institution of an import licensing system for controlling the import of CFCs.   + The Ban on imports of halons.   + Constitution of a steering committee with representation of all concerned ministries to guide the phase out process in Mauritius * Refrigeration Management Plan: Phase out the use of CFCs in the servicing and maintaining of refrigeration equipment   + Training in good practices (Trainers, Refrigeration technicians and Customs officials).   + Recovery and Recycling of CFC’s.   + Initiation of Legislative Measures.   + Initiation of Policy Measures including economic instruments.   + Conversion projects including Retrofitting * Terminal Phase out Management Plan: Achieve complete phase out of CFCs earlier than scheduled by the provisions of the Protocol, through a strict control, monitoring and gradual reduction of imports of the ODS as well as appliances containing substances. There was also training of customs officers, technicians and hydrocarbons Technology. * Several legislations measures have been put in place to control ozone depleting substances (ODS) and these are:   + The Consumer Protection Regulations 1999: Control of imports of all equipment/ appliances containing controlled refrigerants   + The Dangerous Chemicals Control Act 2004: provides in its different schedules for the control of ozone depleting substances as well as their substitutes   + The Environment Protection Act 2002: the issue of EIA licenses for scheduled undertakings   + Customs Tariff Regulations to provide tax rebate on alternatives to CFCs   **Projects carried out to phase out Hydrochlorofluorocarbons (HCFCs):**  Mauritius embarked on Hydrochlorofluorocarbon (HCFC) Phase Out Management Plan (HPMP) in 2011 with the objective of a complete phase out by 2025.The 4 pillars that have contributed to successfully phase out CFCs and will enable Mauritius to achieve the early phase-out of HCFCs (by 2025 instead of 2030) are:   * Government/ political will * Institutional set up – coordination by Ministry of Environment, Solid Waste Management and Climate Change (Focal point) * Legal framework * Public and private sector participation   Through the HPMP, some projects have been implemented/completed comprising of:   * the HCFC policy instrument which serves to control the import of HCFCs through a quota system and imposition of a ban on import of all HCFC appliances as from January 2013; * Intensive awareness raising by the NOU; * Training in the technical and enforcement fields (e.g.: training of trainers, provision of equipment to training institutions, training of technicians, training of customs, DDCB, environment officers)   Some other phase-out activities on HCFCs:   * Prior to importation and exportation of refrigerants, clearances are issued by the MoESWMCC (Environment and Sustainable Division) and the Dangerous Chemical Control Board * Training equipment such as leak detectors and related tools for the technicians have been provided to training centres * Facilitate training of technicians by trained trainers from the government and private sectors. Some training sessions have been conducted: training of technicians on hydrocarbon technology, training of customs officers and training of technicians on carbon dioxide   **Mauritius as party to both the Kyoto and Montreal Protocols is promoting both climate and ozone friendly refrigerants. In fact, the strategy is to leapfrog to natural refrigerants such as hydrocarbons, ammonia and carbon dioxide.**  Several **projects** are being **undertaken to mitigate from the impacts of ozone layer depletion** and climate change. These include   * Demonstration project on Ammonia carbon dioxide cascade system under the HPMP.. The equipment has been installed at Universite Des Mascareignes and is used for training purposes (refrigeration and air conditioning technicians) * Retrofitting (training of technicians – e.g.: Training on hydrocarbon technology) * Under Green Cooling Initiative for Africa (GCIA), a survey on alternatives to HFC appliances was done. The findings were presented in a workshop in June 2017 to eventually prepare an HFC phase out management plan in the future. * Installation of Refrigeration System Running on Carbon Dioxide Refrigerant Supermarkets (not yet implemented)   On the other hand, the Republic of Mauritius has ratified the Kigali Amendment in 2019, which means that the country is forced to meet some points:   * Adapting existing laws or introducing new ones to achieve the HFC phase-down * Extend the ODS import and export licensing system to cover HFCs * Put in place, where appropriate, any practical arrangements that may be required for customs officers to assume extra responsibilities concerning HFCs * Surveying existing HFC consumption and production * Develop the resources to report under the amendment * Develop a strategy for HFC phase-down, including monitoring and enforcement * Make reference to Annex F in the Montreal Protocol which includes a list of HFCs * Article 5 and non-Article 5 countries are required to phase-down the production and consumption of the HFCs listed in Annex F * Import and export licensing systems for HFCs must be in place by 1 January 2019, except that an Article 5 party that decides it is not in a position to meet that deadline may delay until 1 January 2021 * Trade with states that have not ratified the Amendment must be banned from 1 January 2033 * Monitoring and reporting of HFC production and consumption, and HFC-23 emissions where relevant |

## Mitigation Actions for the AFOLU sector

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| **Agriculture Sector**  Over the years, the agricultural sector has played a pivotal, economic role and served as a driver in the development of Mauritius. Since the early 1970s however, the contribution of agricultural production to Gross Domestic Product (GDP) has been declining steadily from around 30% to only 3.4% in 2013, largely as a result of the successful diversification of the economy into the manufacturing and services sectors. Out of these 3.4%, some 2.2% are generated by the sugar subsector. Nonetheless, the sector still plays a vital, multi-functional role within the economy. It contributes significantly to GDP in absolute terms, and has significant economic, social and environmental impacts. In addition, agriculture provides direct employment to some 44,200 persons[[16]](#footnote-17).  Building on the achievements of past strategic plans and based on lessons learned, the Ministry of Agro-Industry and Food Security has developed its new strategy for the period 2016-2020 using a participatory approach. The Plan is inspired broadly by the Government Programme 2015-2019 and has been formulated to take Mauritius to a higher level of food security whilst respecting the need for safe food and better nutrition of the population. It takes on board the need for sustainable agricultural development in a climate-friendly mode as well as safeguarding farmer’s livelihoods.  In line with Government’s vision for bio-food, bio-farming including permaculture and other variants will be promoted. This would require a drastic change in farmers’ mindset vis-à-vis agrochemicals.  The following measures are proposed:   * Sensitization of the public on the importance of consuming bio-food, and valuing the difference; * Development of bio-production protocols; * Establishment of dedicated bio-farming zones, and the relevant conditions to be imposed on land use and crop management; * Training of farmers in production of bio-food production; * Introduction of a bio-farming certificate /label to encourage bio-food production.   **Non-sugar crops**  The non-sugar crops sub-sector covers food crops, fruits and ornamentals and is driven mainly by 8,000 small growers and 375 hydroponic producers. Close to 100% self-sufficiency is achieved for fresh vegetables and tropical fruits, except for off-season imports of selected vegetables such as potato, onion and garlic. For food crop production, the shift towards bio-farming will ensure the production of safe and quality food, with standards and norms defined.  **Livestock**  The Livestock sub-sector has made little progress in recent years, mainly because of high costs of production, limited access to land and breeding animals, lack of an organized market structure, and difficulties to comply with environmental regulations. Emerging issues relate to competition from cheap imports, high cost of quality inputs and the increasing consumer concern over food safety and animal welfare.  **Mitigations actions being taken, and other climate projects being implemented for the reduction of greenhouse gas emissions;**   1. Development of Biofarming/ organic package and Agri-waste recycling and composting 2. Improving the Resilience of Small Farmers to Climate Change “Development of an integrated sheltered farming system comprising of roof-top rainwater harvesting structure, a solar water pump coupled with a pressurized drip fertigation system or a gravity-fed drip irrigation system for vegetable crops production” 3. Development of IPNS as an eco-friendly approach to optimize fertilizer use and management of soil fertility in crop production. 4. IAEA RAF/5/079 “Enhancing crop nutrition and soil and water management and technology transfer in irrigated systems for increased food production and income generation” 5. Optimising fertiliser use in tea cultivation “Review fertilizer recommendation of existing and new tea plantation” 6. Testing of new products “Testing of new products as substitutes to chemical fertilizer and for sustaining crop production” 7. Development and promotion of the Agro forestry sector to optimize forest land for agricultural purpose, under Organic and Natural techniques  Mitigation Action 12 – AFOLU sector  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Standards for treated manure from animal waste | Under implementation | FAREI and Mauritius Standard Bureau | 2019- | Agriculture- Livestock | National | Reduction of CH4 and N2O to be assessed during implementation | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | Developing treated manure standards using proven locally adapted technology | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | To develop the standard for treating the manure from animal waste for farming practices. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | * Implementation Committee set up under the chairmanship of MSB to develop technology to meet published standards * Voluntary standards MS 196: Specifications for treated farm animal manure published in November 2018 * Action plan and Protocol for sanitation of cattle and poultry manure under review. * Experimental trials to start by October 2019 by FAREI in collaboration of University of Mauritius and MSB | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | *To be answered by CCD-RoM upon discussion with the team and experts who are involved* | | | | | | |  Mitigation Action 13  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | **Promotion of small livestock projects at back yard level** | **Under implementation** | **FAREI** | **2018-** | **Agriculture-Livestock** | **National** | **Reduction GHGs gases by controlled rearing of livestock animals** | **CH4, N2O** | |  | **Objective of the mitigation action** | | | | | | | |  | to reduce GHG emission through small livestock rearing | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | FAREI is promoting to reduce the GHGs emission from livestock sector by controlled rearing at backyard level for domestic purpose. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | * encourage farmers to engage in backyard quail and duck production * promote the use of electric artificial incubators to improve hatchability of eggs at farm levels * publish a booklet on quail in 2018 * contribute in an MBC emission “mati ke mol” in 2018 to promote quail production * set up a nucleus rabbit unit at CLRS with the objective to produce breeding animals for farmers in 2018 | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | *Direct interaction with farmers and to disseminate the awareness on benefits of small livestock at backyard for domestic purpose.* | | | | | | |  Mitigation Action 14  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Training of farmers and officers on climate smart agriculture under GCCA+ | Planning Phase (funding disbursement awaited) | FAREI | 2019-2020 | Agriculture | National | To be assessed | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | Climate Smart Agriculture is an approach to developing the technical, policy and investment conditions so as to achieve sustainable agricultural development for food security under climate change. This calls for the comprehensive integration of the climate change effects into agricultural planning, investment and programmes. Small-scale composting has no doubt been promoted, but climate change is yet to be properly mainstreamed throughout the agriculture sector. Basically, there is not enough awareness, policy or financial strategy to promote climate smart agriculture; the human and infrastructural capacity for R&D is limited, and coordination amongst stakeholders and institutions is weak. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | To address climate smart agriculture (crop and livestock), it is proposed to:   * Disseminate information, improve climate change awareness and highlight the potential of agriculture to capture and sequester carbon and reduce GHG emissions to offset the effects of CC. * Develop sustainable and natural farming practices for crop and livestock production, such as composting at farm scale; shift from mineral fertilisers, pesticides and herbicides into biologically active plant protectors and control agents; use of minimum-tillage, crop rotation and cover crops. * Promote soil and water conservation techniques (rainwater harvesting, micro-irrigation, waste water recycling, crop and animal waste management)   In addition, options will be explored for promoting agro-forestry, reforestation and afforestation projects for carbon credit markets, especially the voluntary private markets, which are currently the most active, and develop appropriate methodologies for designing and marketing such projects. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | A Climate Change Working Group will be set at FAREI for concerted actions and to interface with other agencies responsible for Climate Change. Its first task will be to undertake a detailed survey of climate impacts, vulnerabilities and coping measures as well as ways to improve usage of climate information and forecasts. | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | UNFCCC- CDM, VCS methodologies have been proposed. | | | | | | |  Mitigation Action 15  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | **Assessing aerobic and anaerobic methods for treating livestock waste and waste recycling (mitigating measures)** | Under Implementation (Funding Approved) | FAREI &Ministry of Social Security, National Solidarity, and Environment and Sustainable Development | 2019- | Agriculture- Livestock | National | To be assessed during implementation phase | CO2, CH4, N2O | |  | **Objective of the mitigation action** | | | | | | | |  | Monitoring of biogas units Island wise to assess the GHG emission reduction in the livestock sector | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | * Setting up a pilot biogas project at Curepipe Livestock Research station to generate electricity * Develop GHG emissions models for livestock & setting up of Biogas at CLRS * To develop CDM/VCS/Gold Standard project under Agriculture and Livestock sector | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | Agriculture offers good potential for reducing emissions of greenhouse gas (GHG), namely through:   1. Recycling and composting crop residues and livestock wastes; 2. Carbon sequestration in biomass and soil organic matter; and 3. Adopting Good Agricultural Practices, including natural farming systems and agro-forestry; 4. Promoting the use of solar panels, wind turbines and production of biomass to generate renewable energy; 5. Minimal use of agrochemicals (fertilizers and pesticides) in crop production. | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  |  | | | | | | |  Mitigation Action 16  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Model Eco Village project  Implementing a biomass to electricity chain in Rodrigues Island (Mauritius) | Under Implementation | EU under the IOC ENERGIES Programme | 2019 | Energy, Agri Biomass | Rodrigues Regional Assemble | To be assessed during implementation phase | CO2, CH4, | |  | **Objective of the mitigation action** | | | | | | | |  | To  (i) facilitate the conditions of access to development, investment and sustainable management of renewable energies;  (ii) increase the energy efficiency of the various economic sectors. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | Power production from woody biomass may contribute to a better energy autonomy of the IOC  member states:  i) biomass resources, although unequally distributed over the territories, are globally  under-exploited;  ii) it may be a base or semi-base energy and thus be complementary to intermittent  renewable energies such as solar and wind energy;  (iii) it is potentially a source of additional income for agriculture and agro-industry / agribusiness sectors  The different activities under the project are:  (a) Procurement of an electric car and setting up of a solar charging station.  The objective is to demonstrate the use of renewable energy in the transport industry. The electric car, which is the first in Rodrigues, will be used to sensitise the population on the ecological importance and availability of this technology.  (b) Constructions of six bio digesters.  The use of biogas for cooking purposes is a very good ecological way of living. The use of bottled LPG gas is the most common source of energy for cooking purposes. Most of the Rodriguans are back yard breeders so that raw materials to feed the bio digesters are readily available. The bio digesters are constructed using local materials and with very little technological knowhow which can be easily replicated across the island.  (c) Procurement of Street Lightings.  Actually, most of the street lightings across the island are connected to the grid. They consume quite a considerable amount of electricity. The objective of the activity is to showcase the use of solar lightings to replace the grid connected ones that will help to reduce energy consumption from fossil fuels.  (d) Setting up of a community solar PV farm.  Actually the use of renewable energy across the island is around 10 % which is basically from the wind farm. A solar PV farm of capacity 60 kWp has been set up in the western part of the island to power a desalination plant. The use of solar energy is quite restricted to individual households.  A solar PV farm of capacity 100 kWp will be set up in the village of Riviere Coco. The farm will be grid connected and as per the SSDG Scheme developed by the Central Electricity Board, the village will benefit from revenue derived from the project. At the same time the PV farm will reduce the dependency on fossil fuels in supplying electricity. The objective of this activity is to replicate same across the other villages which will contribute towards the energy policy of the island. The vision of the Rodrigues Regional Assembly is to achieve the use of renewable energy at 100 % by the year 2025. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | * Inventory of available woody biomass, with particular attention to forest resources, invasive species, green wastes and agricultural residues; * Evaluation of possible routes for bioelectricity production through thermochemical conversion of woody species identified. * Preliminary scaling of a bioelectricity plant, taking into account the available biomass potential; * Technical and socio-économic analysis of constraints and opportunities related to the supply of the plant associated with plans for the eradication or management of invasive species. | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | The technological choices and the scaling of a bioelectricity production facility (and more generally of  a whole production chain) are based on several criteria   * electricity demand (grid connection or decentralized electrification, power ...) but also heat demand in the case of cogeneration systems; * performance and reliability of the production technology; * regular supply of biomass, with controlled quantity and quality; * regulatory framework regarding for biomass supply chain and electricity generation; * production costs along the whole chain. | | | | | | |   **Other Information on Mitigation Actions**  **Mitigations actions and climate projects implementation for GHG emissions in Rodrigues Regional Assembly**  **A). Forest Restoration**  Over the past decade, the Environment Commission of the Rodrigues Regional Assembly has established a programme of experimental control of invasive woody plants, combined with replanting of seedlings of selected endemic and other indigenous plants, including a number of threatened species. The principal aims of this programme, which is managed by the Rodrigues Forestry Services, are to:  1. Reduce the prevalence of selected highly invasive woody species, which are currently spreading rapidly in different zones of the island  2. Re-establish native forest across a variety of habitats, in state-managed protected areas  3. Increase the populations of threatened endemic plants and provide additional habitat for endemic animals.  **Recent restoration projects:**  Two projects co -financed by the European Union and the RRA are listed below:   1. Preparation and Testing of a comprehensive model for preventing and managing the spread of invasive species on island ecosystems   In this project 20 Hectares were restored at a cost of MUR 5 million   1. Setting up of a Nature Reserve at Cascade Pigeon, 20Hectares were tested and restored at a cost of MUR 7 million   **Community forest restoration projects**  Since 2013 the local Community has been involved in forest restoration projects and more than 300 000 native and endemic plants have been planted within forest areas by them.  **B. Agroforestry Project**  The Commission for environment has launched a scheme to promote the development of green businesses in the field of agro-forestry as a means to reforest bare land surfaces, address the problem of soil erosion and lagoon sedimentation.  In the first instance some 200 hectares of land is targeted in the region of the South east Marine parks Area (SEMPA) and some funding has been provided already by the UNDP ($150 000). Purchases of fencing materials have already started.  **C. Awareness Raising**  Sensitization campaign on plant biodiversity conservation is being done by the forest Services as follows:   * Radio talks * Talks at school with students * Marking important events such as World forest Day, World Biodiversity Day, through aggressive Biodiversity campaigns * Production of pamphlets on Biodiversity * Production of films |

## Mitigation Actions for the Waste sector

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| The Solid Waste Management Division is coordinating the design and implementation of the new Strategy and Action Plan for a new Solid Waste Management and Resource Recovery System for Mauritius (detailed described in table below).  Other relevant actions that RoM is trying to carry out are:   * the vertical expansion of the Mare Chicose landfill, which will increase the capacity for landfill gas abstraction and power generation. * It is under consideration the option of an anaerobic digestion process for treatment of the high organic fraction of MSW in Mauritius. This will contribute to increase the biogas production that can be combusted for electricity production. As a major constraint/gap, financial and technical assistance for an in-depth feasibility study on the technology are required.   These two projects are planned, that is, not under implementation now, so are not projects which contribute with emissions reductions in RoM now.  Regarding wastewater sector, the Wastewater Management Authority (WMA) is the entity responsible in RoM for:   * Protecting the Water and Marine Environment of Mauritius. * Providing an excellent quality of waste-water services for residential and business customers. * Achieving financial sustainability. * Forging a reliable partnership with all stakeholder’s sensitive to the cause of the environment.   Based on the Annual Report 2017-2018, the WMA Strategic Direction is based on:   * Implementation of projects in critical areas where the existing disposal system is creating inconvenience and represents health hazards to inhabitants * Ensure reliability of infrastructure * “Zero Overflow” policy through adequate operation and maintenance and preventive actions * Improved sanitation and limit health risks of the population   Based on the Annual Report 2017-2018, during the 2017-2018 period, four (4) wastewater capital projects were successfully completed as per hereunder:   * Plaines Wilhems Sewerage Project – Lot 1A, the completion of which marks the whole completion of the whole Plaines Wilhems Sewerage Project which was identified in the National Sewerage Programme * Design and Construction of Sewer Reticulation and House Connection at Cipaye Brulé, Vallée des Prêtres * Rehabilitation/Provision of Sewerage Infrastructure at Residence Palmerstone, Phoenix * Rehabilitation/Provision of Sewerage Infrastructure at Residence La Cure, Port Louis   And the defined key actions for 2019-2020, which would be related at some point with potential mitigation actions, were:   * Implementation of the Pailles Guibies Phase II Sewerage Project and the Grand Baie Phase IB Sewerage Project, thereby connecting around 7,000 new households * Implementation of the Framework Agreement (House Connections and Operations & Maintenance Works) * Procurement of Specialised Vehicles and Equipment for Operation and Maintenance of Public Sewers, Wastewater Treatment Plants and Pumping Stations   WMA has several ongoing projects which are under implementation, as well as future planned projects to be designed and implemented. In line with the stated mission of the Government to connect 50% of the population by 2030, the WMA is committed to meet the target set with the completion of the ongoing projects in the region of Plaines Wilhems, Parisot, Verger Bissambar and the forthcoming projects in the Pailles-Guibies region.  All this information allows to realize that RoM, through the WMA, is really working hard in continue improving the wastewater in the country, and many projects and initiatives have been implemented and some more are planned. However, although some of these projects/initiatives could imply a potential emissions reduction, the available information is not enough to quantify that emissions reductions. This happens because the projects were not devised from a mitigation point of view, and a data tracking system required to determine their mitigation potential is not available. RoM will work to be able to estimate and report mitigation projects regarding wastewater in future BURs.  It is also important to mention that not all projects developed regarding wastewater imply emissions reductions. It is important that all wastewaters are piped and treated from a health and general environmental point of view, however, based on MCF values provided by 2006 IPCC Guidelines, depending on the treatment applied and how well it is operated, the emissions can be higher when wastewaters are treated instead of been directly discharged into the sea or river. Mitigation measure 17  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Name of the mitigation action** | **Status** | **Implementing institution** | **Duration** | **Sector and subsector** | **Scope** | **Quantitative targets (both GHG-related and non-GHG impacts)** | **GHGs covered** | | Strategy and Action Plan for a new Solid Waste Management and Resource Recovery System for Mauritius | Under implementation | Solid Waste Management Division – Government of Mauritius | 5 years | MSW | National - Mauritius | Not estimated. To be assessed during design and/or implementation phase of specific projects | CO2  CH4  N2O | |  | **Objective of the mitigation action** | | | | | | | |  | Maximising resource recovery and recycling in the short to medium term, while also tapping the energy recovery potential from wastes in the long term. | | | | | | | |  | **Brief description and activities planned under the mitigation action** | | | | | | | |  | Proposed Strategy focuses on five key areas:  **Strategic Area I: “Prevention and Environmentally Responsible Consumption”**  Emphasis is laid on the minimization of the impacts of wastes by reducing the quantities of wastes generated. Concrete actions that can be implemented at low costs and in the short-term include home composting, deposit on post-consumer products, among others. The use of legal instruments and enforcement to discourage bad behavior and to prohibit non-environmental friendly products has also been recommended.  **Strategic Area II: “Increase in Resource Recovery”**  This Strategic Area proposes ways and means to efficiently recover such resources that are otherwise being wasted by throwing away of recyclables with intrinsic economic value, such as organic matter, wastepaper, plastic, glass and metal. Separation of waste at source is viewed to be of paramount importance for this initiative to succeed. The introduction of a systematic segregation and material recovery system for waste generated at, but not limited to, household level, such as wood waste, bulky waste, small hazardous waste, is being recommended, with accompanying legal and financial measures. This will ensure the continuous supply of non-contaminated resources to the recycling industry, reduce the quantity of wastes to be landfilled and stimulates the economy with the creation of new green jobs.  **Strategic Area III: “Adequate Technologies for Energy Recovery”**  The setting up of Waste-to-Energy infrastructure can only be envisaged for implementation in the long-term, that is, after successful implementation of resource recovery and recycling projects. Thus, it is proposed that an assessment of the potential of waste-to-energy technologies be carried out in the medium term, as this would not be relevant in the short term.  **Strategic Area IV: “Provision of Adequate Disposal Infrastructure”**  It is reckoned that despite all efforts to minimize wastes, to recycle resources and to recover energy, a landfill will still be needed to dispose of residual wastes. This area focuses at short- and medium-term on the extension or further optimization of the existing Mare Chicose landfill, while also considering the eventual option of a new landfill.  **Strategic Area V: “Information, Education and Communication”**  Commitment and engagement of all stakeholders are essential in the sustained implementation of the Strategy over the next five years. A lot of focus is thus laid on capacity building of important stakeholders and awareness-raising on new waste practices in general. | | | | | | | |  | **Estimated outcomes and estimated emission reductions** | | | | | | | |  | While all the Strategic Areas are fundamental to the successful implementation of this new solid waste management system, Strategic Area II on “Resource Recovery” is the cornerstone of this Strategy and Action Plan. An advanced resource recovery will be obtained only by introducing a systematic segregation and material recovery of domestic wastes into the habits of Mauritians. The development of two Pilot Projects in the South and West of Mauritius will serve as the catalyst to the new solid waste management system for Mauritius. These pilot projects, which will initially focus on 25% of each pilot region, will consist of a Material Recovery Facility (MRF) that may be composed of a compost plant, a Sorting Unit (SU) and a Civic Amenity Centre (CAC). The SU will act as a platform for the reception of recyclables while the compost plant will accept only organic and yard wastes. The CAC will accept household wastes such as waste oil, household hazardous wastes, bulky wastes and construction and demolition wastes.  There is no emissions reduction estimates due to this Strategy and Action Plan yet. It is a Strategy and Action Plan, which will be defined by the implementation of specific mitigation projects, which will have a specific scope, so mitigation potentials will be able to be estimated for each specific project. | | | | | | | |  | **Methodologies and assumptions** | | | | | | | |  | The Action Plan emanating from the Strategy covers the different waste streams generated at, but not limited to, household including organic and yard waste, paper and cardboard, plastics, glass, metal, bulky waste, wood waste, construction and demolition waste, waste oil and household hazardous wastes.  Implementation of this Strategy and Action Plan will ascertain that Mauritius is no more dependent on landfilling while also ensuring that one of the targets of Sustainable Development Goal 12 (Ensure sustainable consumption and production patterns) “By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse” is achieved. The approval of this Strategy and Action Plan will also assist in the implementation of good practices and the eventual shift towards a ‘Zero Waste’ society. | | | | | | | |

## Constraints and barriers to mitigation

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| There are some challenges and opportunities identified.   |  |  |  | | --- | --- | --- | | Sector | Challenge | Opportunity/Potential Improvement | | Energy | * The intermittency of RE electricity poses a challenge in terms of controlling and stabilising the frequency of the electricity grid, particularly to cater for any sudden fall in power output. This may impose a limit on the extent of intermittent RE absorption in the grid, even if batteries are being deployed to mitigate the problem * Mauritius has limited access to cleaner energy sources. Although Mauritius is endowed with sunshine and wind, there is a limitation in terms of availability of land for implementation of large-scale PV and wind farms. An offshore wind farm may be contemplated; however, the technology remains nonetheless very expensive. Financial resources are also a major constraint for the implementation and management of RE projects | * The cost of sustaining renewable energy technologies is high. CEB proposes to progressively increase the capacity of the Battery Energy Storage System (BESS) to 18 MW. The CEB will assess the situation and take remedial action so as to maintain a high quality of power supply in Mauritius. * The country is considering the development of a regional Hub for Liquefied Natural Gas (LNG). A new project of waste-to-energy will be operational in 2022. This project will both produce electricity and alleviate the problem posed by waste disposal. Investment opportunities for Deep Ocean Water Application (DOWA) are being explored | | Waste | * RoM, through its Solid Waste Management Division, is working in the design and implementation of an ambitious and well-defined Strategy and Action Plan for the solid waste management. However, from a climate mitigation point of view, this Strategy and Action Plan needs specific projects to be implemented, which will be the specific mitigation actions to be considered in future climate reporting. * RoM, through the WMA, is continue improving the wastewater in the country, and many projects and initiatives have been implemented and some more are planned. However, although some of these projects/initiatives could imply a potential emissions reduction, the available information is not enough to quantify that emissions reductions. This happens because the projects were not devised from a mitigation point of view, and a data tracking system required to determine their mitigation potential is not available. RoM will work to be able to estimate and report mitigation projects regarding wastewater in future BURs. | * Once this Strategy and Action Plan is fully design, its implementation through specific projects will be an opportunity to developed specific and well-defined mitigation projects. These projects should be designed and implemented with a detailed data tracking system which ensures the appropriate estimation of the mitigation potential that every project will offer to RoM through their implementation. * Same potential improvement for wastewater mitigation projects. These projects should be designed and implemented with a detailed data tracking system which ensures the appropriate estimation of the mitigation potential that every project will offer to RoM through their implementation | | AFOLU | * No proper LU maps, soil maps and climate maps available to support the GHG work | * To develop a time series of LU maps, classify soil maps in IPCC categories and climate maps in IPCC categories using GIS | |  | * No age distribution for natural forest including mountain reserves | * Small survey to develop these factors | |  | * No data for private forests, management data, harvest, etc after 2003 | * Survey of all private forests, and use RS tech coupled with ground referencing | |  | * Coverage only mainland MRU | * Extend to territory of Republic | |  | * Factors based on typical Africa forests | * Need to develop carbon stock factors specific to the country | |  | * Carbon stock in non-woody trees, namely ravenala | * Assess carbon stock of these non-woody species | |  | * No data on fruit trees not bearing fruits and non-fruit trees | * Plan work to estimate the number of trees | |  | * No data on age, species, etc | * Plan data collection on age and species of fruit trees | |  | * No data on fertilizers of golf courses | * Plan data collection on fertilizer for golf courses | |  | * No data on woody biomass of shrubland | * Plan data collection on woody biomass of shrubland | |

# Finance, Technology and Capacity Building Needs and Support Received

This chapter provides relevant information about the needs and support received in the field of climate change in the Republic of Mauritius regarding the finance, technology and capacity building aspects.

Financial resources represent the funds that need to be (needs) or have been mobilized (finance received) which can come from public, private or alternative financing sources. On the other hand, the capacity building, is understood as a process that seeks to increase the capacity of individuals, organizations and institutions in developing/economies in transition countries by identifying, planning and implementing ways to mitigate and adapt to climate change (UNFCCC, 2019). Technology transfer is defined as processes developed for knowledge, financing and goods exchange among the different parties involved leading to the technology dissemination for the adaptation or the mitigation of climate change. This includes the process that encompasses the technologies dissemination – hardware and software - and technological cooperation through and within countries.

## Support needed

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| During the process of preparation of the present First BUR, various constraints and gaps and the related financial, technical and capacity needs were identified. As indicated in the NDC of the country, “The RoM imperatively needs international technical and financial support to enable it to abate its GHG emissions by 30%, by the year 2030, relative to the BaU scenario of 7 M tCO2eq.”. To this end, it will require international support in its efforts to transition towards a low-carbon development path through greater utilisation of renewable sources of energy.  The most pressing ones related to climate change have been collected in the following table:  Table 27. List of support needs   |  |  |  |  | | --- | --- | --- | --- | | Need identified f | Support needed | Specific type of support requested  [technology transfer, capacity building, financial support] | Funding source and/or Cost estimates (USD) | | GHG inventory development | Calculation of GHG emissions as footprint assessment  GHG inventories using specialized tools and knowhow for assessing the carbon sink potential  Calculation of emission from waste | Capacity building | Not specified | | There is no statistical system for GHG emissions | Need of capacity building for the establishment of a statistical system for GHG emissions | Capacity building | Not specified | | Capacity building needs related to mitigation actions | Identification, assessment and promotion of mitigation technologies including endogenous ones to accelerate mitigation  Project design, preparation, implementation and MRV system  Conducting cost benefit analyses for mitigation measures  Multi-criteria process in mitigation | Capacity building | Not specified | | Capacity building needs related to energy | Training to personnel on the new equipment and Automatic Generation Control (AGC) software in Smart Grid System  Household energy efficiency-institutional capacity  Capacity building to energy auditors and development of skills of installers | Capacity building | Not specified | | There is no enough training for good decision making to fight climate change | Need of capacity building to improve decision making for coping with climate change at local level | Capacity building | Not specified | | Lack of disaggregated activity data and local and country specific emission and sink factors for more refined GHG calculation to higher tiers | Enhanced CB of scientists and better laboratory facilities to conduct studies on determination of local and country specific EF for emissions and sinks | Capacity building and Technology transfer | Local training  UNFCCC  Bilateral funding | | Enforcement of regulations under the Energy Efficiency Act | Training the energy market responsible, allow the increase in energy auditors operating. | Capacity building | Local training  UNFCCC  Bilateral funding | | Absence of energy efficiency mass transportation systems based on hybrid technologies and cleaner energies in the transport sector | Policy development, institutional capacity building and technology transfer | Capacity building and technology transfer | UNFCCC  Bilateral funding | | Supplement its own financing and investment in the form of grant/concessional financing | Expansion of solar, wind and biomass energy production and other renewable energy sources. | Financial support  Technology transfer  Capacity building | International support  600 M | | Gradual shift towards the use of cleaner energy technologies, such as LNG, among others | Financial support  Technology transfer  Capacity building | International support  600 M | | Modernisation of the national electricity grid through the use of smart technologies, which is a prerequisite to accelerate the uptake of renewable energy | Financial support  Technology transfer  Capacity building | International support  60 M | | Efficient use of energy through the deployment of appropriate technologies in all sectors of the economy, including an eco-friendly manufacturing sector, and awareness raising on energy conservation | Financial support  Technology transfer  Capacity building | International support  50 M | | Sustainable transportation, including promotion of energy efficient mass transportation systems based on hybrid technologies and cleaner energy sources | Financial support  Technology transfer  Capacity building | International support  50 M | | Leapfrog to low global warming potential refrigerants | Financial support  Technology transfer  Capacity building | International support  20 M | | REDD+ Activities in Mauritius | There is currently no standalone project funded under the REDD programme in Mauritius. However, there are several national measures/activities that help to curb emission form forest degradation. | Financial support  Technology transfer  Capacity building | Not Specified |   ***Source:*** *Adapted from the Third National Communication, 2016.* |

## Financial support received

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| The financial support received for climate change activities in the RoM is differenced into domestic public finance and private sector finance.  The domestic public finance for climate change activities, specifically mitigation activities, as reported in the Mauritius Public Environmental Expenditure Review 2011 – 2014, the percentage of climate change expenditures are 7.6% of the total government expenditures for 2014 which are accounted in 106,693 MUR m, where the 22% are related to mitigation activities. The major part of the mitigation-related expenditures is from solid waste sector, local authorities (most of the bulk related to waste management) and livestock production (TNC Report, 2016).  The private sector finances some projects that contribute to climate change mitigation. The most representative projects funded by private sector are collected in the following table:  Table 28. List of financial support received   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Name of project** | **Implementing organisation** | **Benefits** | **Funding** | **Start date – End date** | **Status of implementation** | | La Feme – Bambours 15 MW Solar Power Farm | SARAKO PVP Co. Ltd and as strategic partner, TAUBER-SOLAR | * 222 260 tCO2e abated over 10 years (fixed) * Improve energy self-sufficiency * Creation of 300 jobs * Transfer of technology. | M.€35.7 | 2014 – 2034 | Operational project and the process is on-going. | | EOLE Plaine des Roches | Joint Venture local companies: Sugar Investment Trust and Aerowatt Mauritius Ltd | * Imports substituted by local production * Renewable energy development, with CO2 avoided and improve towards energy self-sufficiency * Jobs creation * Forestry sustainability with a tree replant programme | Total Investment by Capital Expenditure USD 18.4 M (Equity USD 3.9 M, and Debt USD 14.5 M) BPCE/Banque des Mascareignes | Operation date 2016 | Completed | | Sweet Power: Using cane trash as a source of energy for power production | Terragen | * Decrease of coal consumption * Reduction of burning of sugarcane before harvesting * Social and economic benefits in the country * Sustainability of cane industry * Creation of jobs | MUR 100 M | 2015 – 2020 | On-going | | Sweet Paper: Recyclabe paper (shredded) as source for power production | Terragen | * Decrease of coal consumption * Enhance recycling of paper | MUR 10 M | 2016 – 2020 | On-going | | Bioethanol distillery | Omnicane Ethanol Production Limited | * Annual bioethanol production capacity of 24 million litres/year * Use of Concentrated Molassess Stillage to produce bio-fertilizers * Reduction in CO2 emissions by capturing and using it in beverage industry | USD 29 M | 2012 – 2014 | Completed | | Small Energy Plant | Omnicane Heat and Power Services Ltd/Omnicane Thermal Energy Operations (La Baraque) Limited | * Less reliance on grid for electricity * 3.8 MW power plant using both woodchips and coal to produce steam and electricity for the cluster only | USD 17 M | 2013 – 2014 | Completed | | Carbon Burn Out | Thermal Valorisation Co. Ltd./Omnicane Thermal Energy Operations (La Baraque ) Ltd. | * Reduced CO2 by 29,000 tonnes yearly from avoided production of cement * Eliminate need for landfilling of ash, hence no dependency on land availability * Recommendations for re-use of fly ash in cement by the Strategic Environmental Assessment of MAAS in 2007 * Technical Advisory Committee on Coal Ash Management in 2009 | USD 22 M | 2015 – 2016 | Completed | | Landfill Gas to energy | Sotravic Ltée | * Renewable energy generation with contribution to the electricity needs of the country at an average of 22 GWh per year which is equivalent to nearly 1% of the total consumption * CDM registration as an emission-reduction projects is developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO2. On average, it is estimated that an average of 70,000 tCO2eq has been reduced annually since operation | Disbursement of MUR 200 million since 2010 with additional investment of MUR 150 million foreseen in 2017 | 2011 – Not specified | On-going | | Applications (DOWA) | Urban Cooling, Ltd | * The project will aim at the reduction of about 25,000 tons of CO2 * There will be reduction of electricity consumption and consequently fossil fuel imports equivalent to 15MW which is the electricity consumption of the 22 targeted buildings. The proposed SWAC system can cool the building in Phase 1 using only 1.5MW of electricity | Amount spent on development cost as at 31st of Dec 2015 amount to approximately MUR 60 million for an anticipated project cost of MUR 2.1 billion excluding downstream opportunities. | 2015 - Not specified | On-going |   ***Source:*** *Adapted from the Third National Communication, 2016.*  On the other hand, international donors finance some other projects related to climate change in the country. This projects and information about the financing are collected in the following table:  Table 29. List of climate finance from international donors   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Name of project | Implementing organization | Amount of funds | Source of Funding | Type of funding | Type of cooperation | Start date – End date | | Nationally Appropriate Mitigation Actions | MoESWMCC | USD 1.462 M | GEF | Grant | Bilateral | 2017 – 2020 | | Land Degradation Neutrality Target Setting Programme | Forestry Service | USD 35,000 | Global Mechanism | Grant | Multilateral | 20116 – ongoing | | Support to forest code revision and institutional reform in Mauritius | Forestry Service | USD 298,000 | FAO | Grant | Bilateral | 2016 – 2018 | | Support to climate smart agriculture for small holders | Ministry of Agro Industry and Food Security | EUR 300,000 | GCCA | Grant | Bilateral | 2016 – 2018 | | Climate change adaptation in the coastal zone | MoESWMCC | USD 9.12 M | Adaptation Fund Board | Grant | Bilateral | 2012 – 2018 | | Biennial Update Report | MoESWMCC | USD 352,000 | GEF | Grant | Bilateral | 2016 – 2017 | | Enhancing the observation, forecasting and warning capabilities of Mauritius Meteorological Services | MMS | USD 0.98 M | JICA | Technical Cooperation | Bilateral | 2014 – 2016 | | Improvement of the Meteorological Radar System | MMS | USD 13.8 M | JICA | Grant | Bilateral | 2016 – 2018 | | Expanding coverage and strengthening management effectiveness of the protected area network on the island of Mauritius (PAN Project) | NPCS | USD 4 M | GEF / UNDP | Grant |  | 2010 – 2018 | | National Biodiversity Planning to support the implementation  of the CBD 2011-2020 Strategic Plan in Mauritius (NBSAP Project) | NPCS | USD 220,000 | GEF / UNDP | Grant | 2016 |  | | Africa Adaptation Programme | MoESWMCC | USD 3 M | Government of Japan under its Cool Earth Partnership for Africa | Grant | Multilateral | 2010 – 2012 | | Technology needs assessment | MoESWMCC | USD 120,000 | GEF | Grant | Bilateral | 2011 – 2013 | | Capacity development on coastal protection and rehabilitation | MoESWMCC | USD 5.15 M | JICA | Technical cooperation | Bilateral | 2012 – 2015 | | Mauritius 2050 Pathways calculator | MoESWMCC | £ 20,000 | UK Foreign and Commonwealth Office | Grant | Bilateral | 2014 – 2015 | | Landslide Management | MPI&LT | USD 3.38 M | JICA | Technical cooperation | Bilateral | 2012 – 2015 | | Training of Trainers Programme on “Gendered Impacts of Climate Change” and campaigns on the same issue | MGECDFW | USD 5,715 | MoESWMCCthrough the Government of Japan under the AAP on Adaptation to Climate Change | Grant | Bilateral | 2012 | | Production of an interactive DVD entitled “Women and Climate Change” (in Creole language) Capacity Building Programme of Officers on the DVD Awareness raising on the DVD at the level of Women Centres, Social Welfare Divisions, Community Centres, Women’s Associations and Secondary Schools | MGECDFW | USD 2,800 | Commonwealth of Learning | Grant | Bilateral | 2013 - 2015 | |  |  |  |  |  |  |  |   ***Source:*** *Adapted from the Third National Communication, 2016.* |

## Technology and capacity building support received

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| Mauritius has previously benefited from technical assistance financed by the GEF to implement the Technology Needs Assessment (TNA) project, that provides a robust methodology approach to developing mitigation action plans in the form of Technology Action Plans (TAPs) to support the transfer and diffusion of Environmentally Sound Technologies (ESTs).  Capacity-building for climate action is, at the core of Article 11 of the Paris Agreement, fundamental in preparing communities for climate change and protecting them against its possible impacts. Various capacity building initiatives have been undertaken by the RoM to move forward with sustainable development and climate change agendas. Increased emphasis is being placed on institutional strengthening and enhancement of human capital. Capacity building for the mitigation of climate change and adaptation is being promoted in most socio-economic and environmental sectors.  In the following table it can be found some of the most relevant capacity building and technology transfer supporting activities carried out by local and international consultants in Mauritius. This capacity building was delivered to concerned stakeholders, including public and private sectors, NGOs, research institutions and academia.  Table 30. List of capacity building and technology transfer activities developed in the country   |  |  |  | | --- | --- | --- | | **Project** | **Capacity building undertaken** | Start date – End date | | African adaptation programme for the Republic of Mauritius | * Research under AAP: MRC has funded 11 research projects, 8 of which deal with climate change adaptation | 2010 – 2013 | | Climate change adaptation programme in the coastal zone of Mauritius | * Development of Post Graduate course on coastal engineering * 13 short continuous professional development courses * >500 officers from the Governmental and parastatal sectors trained on coastal engineering, cost benefit analysis, climate change, ICZM, DRRM in coastal zone, ocean data collection and analysis | 2012 - 2018 | | Technology needs assessment | * Capacity building on Multi Criteria Analysis and Identification of feasible technologies * Reinforcement of capacity building of research and extension to identify and adapt green and environment friendly technologies | 2011 – 2013 | | Capacity Development on Climate Change Measures in Republic of Mauritius | * Technical exchange: 5 officers trained in Japan * 3 official training sessions for 30 educators and Headmasters, 25 youth caders and 65 women and 4 awareness raising sessions for 45 farmers, 40 senior citizens, 30 working adults and the general public (> 10,000) have been carried out * Training on the development of a climate-resilience and site-specific guideline for coastal setback | 2014 – 2016 | | Third National Communication | * Mitigation: training of 40 persons on mitigation assessment, Multi Criteria Analysis, Technology Needs Assessment and barrier analysis * Vulnerability assessment and adaptation: training of 50 persons and 4 local experts on biodiversity, health, fisheries and infrastructures * GHG Inventory: training of 55 persons on data collection, use of methodology for inventory, IPCC inventory software, training of 22 persons on geospatial technique for assessing LULUCF to support GHG inventory by RCMRD, key category analysis and Quality Assurance/Quality Control | 2014 – 2016 | | Mauritius 2050 pathways calculator | * 2 officers trained at the department of energy and climate change on the methodology of the 2050 pathway calculator | 2014 – 2015 | | Preparation of Intended Nationally Determined Contributions and INDC Action Plans | * Technical capacity provided to transition towards a low-carbon development path through greater utilisation of renewable sources of energy and to adapt to the negative impacts of climate change * Capacity building needs identified in various sectors such as water resources management, agriculture (IPM, irrigation, climate smart agriculture), climate smart fisheries, health sector, marine and terrestrial biodiversity (assessment, management and monitoring), critical coastal infrastructures and disaster risk reduction. | 2015 – 2016 | | Global fuel economy initiative | * Half-day seminar on eco-driving for 50 fleet managers of the private and public sector * Advance training course on eco-driving was conducted for 25 government officials and representatives of the Driving School Association | 2013 - 2014 | | Removal of barriers to energy efficiency and energy conservation in buildings and in industry | * In 2012-2013 under the Alliance of Small Island States (AOSIS/SIDSDOCK), the staff of some 30 manufacturing enterprises were trained industrial energy audits and energy management * Capacity building on energy saving in the building sector including development of an Energy Efficiency Building Code Compliance Scheme (EEBCCS), software development, training, examination and certification of energy compliance assessors for the EEBCCS and organisation of workshops for dissemination of information to the construction industry and the public in general | 2007 – 2014 | | Capacity Development on Coastal Protection and Rehabilitation in the Republic of Mauritius | * 3 officers of ICZM Division attended technical exchange training in Seychelles, 6 officers of RoM attended capacity building on coastal protection in JICA, Japan and 2 officers attended capacity building on coral reef monitoring in JICA, Japan * Capacity building on coastal protection and rehabilitation: preparation of coastal conservation plans for 14 coastal areas; technical guidelines on beach conservation measures; beach and coral reef monitoring and Environmental Impact Assessment for coastal development projects; and implementation of the ‘gravel beach nourishment’ demonstration project at Grand Sable Village | 212 – 2015 | | Capacity Development on Landslide Management in the Republic of Mauritius | * The Landslide Management Unit (LMU) has implemented the CB plan on landslide investigation/analysis, design and construction/supervision through on the job training, seminars and training in Japan * Organisational establishment-posting of six engineers was decided in March 2014 * Coordination with other stakeholders - As collaboration of all stakeholders is essential to deal with landslide issues, the tasks and responsibilities of LMU as well as the other stakeholders were defined and finalized through a wide consultative process | 2012 – 2015 | | Improvement of the Meteorological Radar System – Phase II | * The project comprises the installation of an S-Band Solid State Doppler Radar together with Data Display and Communication Systems and the construction of a new Radar Tower Building with an exhibition hall for the public at Trou-aux-Cerfs * The radar is expected to be operational by March 2018 and staff of the Meteorological Services will be provided CB on the use of the radar data for application in general weather forecasting | 2016 – 2018 | | Capacity building for Sustainable Land Management (SLM) | * Capacity building for SLM in appropriate Government and civil society institutions/ user groups in Mauritius and Rodrigues, and mainstreaming of SLM into Government planning and strategy development | 2009 – 2013 | | Toolkit for Climate Change Vulnerability Assessment and Identification of Adaptation Options for Local Authorities (**MoESWMCC**) | * Training of seven staff of local authorities (Municipality of Vacoas-Phoenix) on the use of GIS for vulnerability assessment due to climate change | Not specified | | Drill on DRR at the level of Local Authorities | * Training of 75 staff of local authorities (District Council of Flacq, Municipality of Quatre Bornes, District Council of Savanne) and 110 members of the public through drills on Disaster Risk Reduction and Management | Not specified | | Capacity building of staff of the **MoESWMCC** | * 67 officers of the **MoESWMCC**have attended various trainings and capacity building programmes on climate change issues outside Mauritius e.g. India, China, Japan, Singapore, Kenya, Thailand, Germany, Botswana, South Africa, etc | 2010 - 2016 |   ***Source:*** *Adapted from the Third National Communication, 2016.*  Table 31. List of capacity building and technology transfer activities developed in the country under cooperation   |  |  |  |  | | --- | --- | --- | --- | | **Project** | **Capacity building undertaken** | **Cost** | Start date – End date | | The ISLANDS programme for the Implementation of the Mauritius Strategy for SIDS of the ESA-IO region | This programme provides valuable opportunities to identify and develop mechanisms, national and regional frameworks, tools and partnerships to implementing measures for promoting SD and to address common challenges such as coral reef degradation, natural disasters, and climate change. Regional training on DESINVENTAR and CAPRA to allow countries to put in place their national databases and undertake national country risk profile are conducted. | EUR 10 M | Not specified | | The Smartfish programme for the Implementation of a Regional Fisheries Strategy in the ESA-IO region | The overall objective is to contribute to an increased level of social, economic and environmental development and deeper regional integration in the ESA-IO through the sustainable exploitation of marine and lake fisheries resources | EUR 21 M | 2011 – 2014 | | Project to reinforce the capacity of members of the IOC to adapt to climate change | The main objective of this project was to establish regional cooperation between Member States of the IOC to better facilitate adaptation to climate change. Participating countries include Comoros, Madagascar, La Réunion, Mauritius, and Maldives | EUR 3,645,000 | 2009 – 2012 | | programme to support the IMF Regional Technical Assistance Centres (AFRITACs) of the ESA-IO | The programme aims at improving the design, implementation, and monitoring of sound macroeconomic policies, and enhanced regional harmonisation and integration in ESA-IO Member States to assist them in the implementation of the regional integration agenda of their regional organisations | EUR 15 M | Not specified | | Coastal, Marine and Island Specific Biodiversity Management in the ESA-Ю | The programme aims at developing and strengthening over five years the national and regional capacities for sustainable participatory management of coastal, marine and island specific biodiversity in the islands states and coastal states of the ESA-IO region | EUR 15 M | Not specified | | Programme for the Renewable Energy development and Energy Efficiency improvements in IOC Member States | The programme aims at establishing the conditions for the development, investment and sustainable management of renewable energy and improvements in the efficiency of energy use in the IOC region | EUR 15 M |  | | Migration, Environment and Climate Change: Evidence for Policy project. Implemented by the IOM and **MoESWMCC**and supported by EU and IDF | The project aims to contribute to the global knowledge base on the relationship between migration and environmental change, including climate change. The innovative research will aim to formulate policy options on how migration can benefit adaptation strategies to environmental and climate change. Participating countries: Dominican Republic, Haiti, Kenya, Mauritius, Papua New Guinea and Viet Nam | EUR 2.4 M | 2014 – 2016 | | Setting up of the Commonwealth Climate Finance Access Hub in Mauritius | The programme aims to support capacity development for Small States, including SIDS, LDCs and other vulnerable countries. The purpose is to enable these countries to access and effectively utilise climate finance. This capacity development is intended to facilitate long-term unlocking of access to means of implementation covering the entire scope including technology transfer | USD 1 M  pledged by Australia | 2016 | | Switch Africa Green Project | The project aims at promoting a shift to SCP patterns with a view to achieve sustainable development. The objectives are to encourage green business development and eco-entrepreneurship through adoption of resource efficient production practices and create an enabling environment, with clear policies, regulatory frameworks and economic incentives which will encourage the green entrepreneurship. Participating countries: Burkina Faso, Ghana, Kenya, Mauritius, South Africa and Uganda | EUR 19 M  funded by EU and is being managed by UNEP, UNOPS and UNDP | 2014 - 2017 |   ***Source:*** *Adapted from the Third National Communication, 2016* |

## Data/information gaps

|  |
| --- |
| The most relevant data gap identified has been the absence of updated data related to finance, technology transfer, and capacity building related needs and supports received for the period 2015-2018. Data used in this BUR have been the ones available from the TNC, which contains information gathered in 2016. |

## Suggestions and needs for improvement of reporting

|  |
| --- |
| In line with the data gap identified and exposed in the 5.4 section, with the purpose of improving the information submitted through future BURs, it may be necessary to focus efforts on updating de information available related to the finance, technology transfer and capacity building needs and supports received. |

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# Technical Annex to the BUR: GHG Inventory

## Annex 1: Methodology Applied in 2000 – 2016 series

Table 32. Methodology applied for the GHG emission inventory 2000-2016

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 | ESDD, Commerce Division and Manufacturing Statistics Mauritius |
| **1.A.3 – Transport Sector** | | | | |
| 1.A.3.a.i – Internatioanl Aviation | T1 | D/T1 | D | International Energy Agency |
| 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 |
| 1.A.3.d.i – International Water-borne Navigation | T1 | D/T1 | D | International Energy Agency |
| 1.A.3.d.ii – Water-borne Navigation | T1 | D/T1 | CS | Tourism Authority, Water-borne navigation |
| **1.A.4 – Other Sector** | | | | |
| 1.A.4.a – Commercial / Institutional | T1 | D/T1 | CS | Ministry of Environment. Data for Energy Other Sectors |
| 1.A.4.b – Residential | T1 | D/T1 | CS | Ministry of Environment, Data for Energy Other Sectors |
| 1.A.4.c – Agriculture | T1 | D/T1 | CS | Ministry of Environment, Data for Energy Other Sectors |
| 1.A.4.d – Other | T1 | D/T1 | CS | Ministry of Environment, Data for Energy Other Sectors |
| **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 | - |
| **2.A – Mineral Industry** | | | | |
| 2.A.2 – Lime production | T2 | D (CO2) | - | Statistics Unit of the ESDD[[17]](#footnote-18) facilitated by the institutional authority via mail |
| **2.B – Chemical Industry** | | | | |
| 2.B – Chemical Industry | NO | NO | - | - |
| **2.C – Metal Industry** | | | | |
| 2.C.1 – Iron and Steel production | T1 | D (CO2) | - | Statistics Unit of the ESDD facilitated by the institutional authority via mail |
| **2.D – Non-Energy Products from Fuels and Solvent Use** | | | | |
| 2.D – Non-Energy Products from Fuels and Solvent Use | T1 | D (CO2) | - | International Energy Agency |
| **2.E – Electronics Industry** | | | | |
| 2.E – Electronics Industry | NO | NO | - |  |
| **2.F – Product Uses as Substitutes for Ozone Depleting Substances (ODS)** | | | | |
| 2.F.1 – Refrigeration and Air Conditioning | | | | |
| 2.F.1.a – Refrigeration and Stationary Air Conditioning | T1 | D (HFCs) | - | Statistics Unit of the ESDD facilitated by the institutional authority via mail |
| 2.F.1.b – Mobile Air Conditioning | T1 | D (HFCs) | - | Statistics Unit of the ESDD facilitated by the institutional authority via mail |
| **2.G – Other Product Manufacture and Use** | | | | |
| 2.G – Other Product Manufacture and Use | NO | NO | - | - |
| **2.H – Other** | | | | |
| 2.H – Other | NO | NO | - | - |
| **4 - Waste** | | | | |
| 4.A – Solid Waste Disposal | T2 | D, CS | - | Solid Waste Management Division, Statistics Mauritius |
| 4.B – Biological Treatment of Solid Waste | T2 | D | - | Solid Waste Management Division, Statistics Mauritius |
| 4.C – Incineration and Open Burning of Waste | T2 | D | - | Solid Waste Management Division, Statistics Mauritius |
| 4.D – Wastewater Treatment and Discharge | T2 | D, CS | - | Wastewater Management Authority, Statistics Mauritius |
| 4.E – Other | NO | NO | - | - |

## Annex 2: Summary Report for GHG Emissions Inventory

Table 33. Summary Report for GHG Emissions Inventory, Year 2000

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 2,281.43 | 26.38 | 0.15 | 47.99 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 2,282.52 | 0.60 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 2,282.52 | 0.60 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 1,159.26 | 0.25 | 0.04 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 363.71 | 0.13 | 0.02 |  |  |  |  |
| 1.A.3 - Transport | 563.74 | 0.13 | 0.03 |  |  |  |  |
| 1.A.4 - Other Sectors | 195.81 | 0.10 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 22.33 | 0.00 | 0.00 | 47.99 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 2.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 2.75 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 19.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 19.57 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 0.00 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 47.99 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 47.99 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | -23.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.00 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 0.00 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | -23.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | -23.98 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.56 | 25.78 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 16.79 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 8.99 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,296.58 | 0.07 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 605.40 | 0.00 | 0.02 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 691.17 | 0.06 | 0.02 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 34. Summary Report for GHG Emissions Inventory, Year 2005

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 2,820.66 | 29.17 | 0.17 | 88.26 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 2,829.35 | 0.64 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 2,829.35 | 0.64 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 1,567.12 | 0.26 | 0.05 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 336.09 | 0.12 | 0.02 |  |  |  |  |
| 1.A.3 - Transport | 701.73 | 0.16 | 0.03 |  |  |  |  |
| 1.A.4 - Other Sectors | 224.40 | 0.10 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 24.89 | 0.00 | 0.00 | 88.26 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 1.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 1.97 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 22.92 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 22.92 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 0.00 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 88.26 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 88.26 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | -34.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.00 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 0.00 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | -34.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | -34.11 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.52 | 28.52 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 19.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 8.84 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,324.20 | 0.06 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 722.07 | 0.01 | 0.02 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 602.13 | 0.06 | 0.02 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 35. Summary Report for GHG Emissions Inventory, Year 2010

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 3,686.70 | 29.66 | 0.19 | 114.58 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 3,665.29 | 0.67 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 3,665.29 | 0.67 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 2,194.94 | 0.29 | 0.06 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 357.67 | 0.08 | 0.01 |  |  |  |  |
| 1.A.3 - Transport | 879.36 | 0.20 | 0.04 |  |  |  |  |
| 1.A.4 - Other Sectors | 233.32 | 0.10 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 37.14 | 0.00 | 0.00 | 114.58 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 2.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 2.16 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 34.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 34.98 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 0.00 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 114.58 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 114.58 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | -16.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.00 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 0.00 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | -16.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | -16.26 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.53 | 28.99 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 20.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 8.10 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,466.74 | 0.07 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 722.07 | 0.01 | 0.02 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 744.67 | 0.07 | 0.02 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 36. Summary Report for GHG Emissions Inventory, Year 2014

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 3,980.40 | 29.07 | 0.33 | 264.64 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 3,940.63 | 0.63 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 3,940.63 | 0.63 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 2,393.79 | 0.27 | 0.06 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 333.60 | 0.06 | 0.01 |  |  |  |  |
| 1.A.3 - Transport | 978.15 | 0.21 | 0.05 |  |  |  |  |
| 1.A.4 - Other Sectors | 234.28 | 0.09 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.81 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 36.15 | 0.00 | 0.00 | 264.64 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 0.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 0.80 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 26.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 26.50 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 8.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 8.84 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 264.64 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 264.64 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | 2.96 | 0.56 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.56 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 5.54 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 5.54 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.12 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.01 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | -2.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | -2.58 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.66 | 27.88 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 19.83 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.16 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 7.88 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,670.57 | 0.09 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 763.06 | 0.01 | 0.02 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 907.51 | 0.08 | 0.02 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 37. Summary Report for GHG Emissions Inventory, Year 2015

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 4,026.25 | 28.16 | 0.22 | 269.03 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 3,990.42 | 0.69 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 3,990.42 | 0.69 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 2,339.08 | 0.29 | 0.06 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 339.89 | 0.06 | 0.01 |  |  |  |  |
| 1.A.3 - Transport | 1,066.11 | 0.25 | 0.05 |  |  |  |  |
| 1.A.4 - Other Sectors | 244.49 | 0.09 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.85 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 31.93 | 0.00 | 0.00 | 269.03 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 0.00 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 25.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 25.44 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 6.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 6.49 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 269.03 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 269.03 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | 3.17 | 0.52 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.52 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 5.68 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 5.68 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.00 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.01 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | -2.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | -2.51 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.74 | 26.94 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 19.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.15 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 7.64 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,708.48 | 0.09 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 816.67 | 0.01 | 0.02 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 891.81 | 0.08 | 0.02 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 38. Summary Report for GHG Emissions Inventory, Year 2016

| **Categories** | **Emissions (Gg)** | | | **Emissions CO2 Equivalents (Gg)** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Net CO2** | **CH4** | **N2O** | **HFCs** | **PFCs** | **SF6** | **Other halogenated gases with CO2 equivalent conversion factors** |
| **Total National Emissions and Removals** | 4,164.29 | 28.03 | 0.34 | 282.10 | 0.00 | 0.00 | 0.00 |
| **1 - Energy** | 4,128.90 | 0.69 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1.A - Fuel Combustion Activities** | 4,128.90 | 0.69 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.1 - Energy Industries | 2,397.16 | 0.27 | 0.06 |  |  |  |  |
| 1.A.2 - Manufacturing Industries and Construction | 338.80 | 0.05 | 0.01 |  |  |  |  |
| 1.A.3 - Transport | 1,146.34 | 0.28 | 0.06 |  |  |  |  |
| 1.A.4 - Other Sectors | 245.73 | 0.09 | 0.00 |  |  |  |  |
| 1.A.5 - Non-Specified | 0.87 | 0.00 | 0.00 |  |  |  |  |
| **1.B - Fugitive emissions from fuels** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.B.1 - Solid Fuels | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.2 - Oil and Natural Gas | 0.00 | 0.00 | 0.00 |  |  |  |  |
| 1.B.3 - Other emissions from Energy Production | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **1.C - Carbon dioxide Transport and Storage** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.C.1 - Transport of CO2 | 0.00 |  |  |  |  |  |  |
| 1.C.2 - Injection and Storage | 0.00 |  |  |  |  |  |  |
| 1.C.3 - Other | 0.00 |  |  |  |  |  |  |
| **2 - Industrial Processes and Product Use** | 29.08 | 0.00 | 0.00 | 282.10 | 0.00 | 0.00 | 0.00 |
| **2.A - Mineral Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.A.1 - Cement production | 0.00 |  |  |  |  |  |  |
| 2.A.2 - Lime production | 0.00 |  |  |  |  |  |  |
| 2.A.3 - Glass Production | 0.00 |  |  |  |  |  |  |
| 2.A.4 - Other Process Uses of Carbonates | 0.00 |  |  |  |  |  |  |
| 2.A.5 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.B - Chemical Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.1 - Ammonia Production | 0.00 |  |  |  |  |  |  |
| 2.B.2 - Nitric Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.3 - Adipic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |  |  | 0.00 |  |  |  |  |
| 2.B.5 - Carbide Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.6 - Titanium Dioxide Production | 0.00 |  |  |  |  |  |  |
| 2.B.7 - Soda Ash Production | 0.00 |  |  |  |  |  |  |
| 2.B.8 - Petrochemical and Carbon Black Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.B.9 - Fluorochemical Production |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.B.10 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.C - Metal Industry** | 21.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.C.1 - Iron and Steel Production | 21.41 | 0.00 |  |  |  |  |  |
| 2.C.2 - Ferroalloys Production | 0.00 | 0.00 |  |  |  |  |  |
| 2.C.3 - Aluminium production | 0.00 |  |  |  | 0.00 |  |  |
| 2.C.4 - Magnesium production | 0.00 |  |  |  |  | 0.00 |  |
| 2.C.5 - Lead Production | 0.00 |  |  |  |  |  |  |
| 2.C.6 - Zinc Production | 0.00 |  |  |  |  |  |  |
| 2.C.7 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.D - Non-Energy Products from Fuels and Solvent Use** | 7.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.D.1 - Lubricant Use | 7.66 |  |  |  |  |  |  |
| 2.D.2 - Paraffin Wax Use | 0.00 |  |  |  |  |  |  |
| 2.D.3 - Solvent Use |  |  |  |  |  |  |  |
| 2.D.4 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **2.E - Electronics Industry** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.1 - Integrated Circuit or Semiconductor |  |  |  | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.E.2 - TFT Flat Panel Display |  |  |  |  | 0.00 | 0.00 | 0.00 |
| 2.E.3 - Photovoltaics |  |  |  |  | 0.00 |  |  |
| 2.E.4 - Heat Transfer Fluid |  |  |  |  | 0.00 |  |  |
| 2.E.5 - Other (please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.F - Product Uses as Substitutes for Ozone Depleting Substances** | 0.00 | 0.00 | 0.00 | 282.10 | 0.00 | 0.00 | 0.00 |
| 2.F.1 - Refrigeration and Air Conditioning |  |  |  | 282.10 |  |  |  |
| 2.F.2 - Foam Blowing Agents |  |  |  | 0.00 |  |  |  |
| 2.F.3 - Fire Protection |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.4 - Aerosols |  |  |  | 0.00 |  |  |  |
| 2.F.5 - Solvents |  |  |  | 0.00 | 0.00 |  |  |
| 2.F.6 - Other Applications (please specify) |  |  |  | 0.00 | 0.00 |  |  |
| **2.G - Other Product Manufacture and Use** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.G.1 - Electrical Equipment |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.2 - SF6 and PFCs from Other Product Uses |  |  |  |  | 0.00 | 0.00 |  |
| 2.G.3 - N2O from Product Uses |  |  | 0.00 |  |  |  |  |
| 2.G.4 - Other (Please specify) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2.H - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.H.1 - Pulp and Paper Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.2 - Food and Beverages Industry | 0.00 | 0.00 |  |  |  |  |  |
| 2.H.3 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **3 - Agriculture, Forestry, and Other Land Use** | 5.58 | 0.31 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| **3.A - Livestock** | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.A.1 - Enteric Fermentation |  | 0.31 |  |  |  |  |  |
| 3.A.2 - Manure Management |  | 0.00 | 0.00 |  |  |  |  |
| **3.B - Land** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.B.1 - Forest land | 0.00 |  |  |  |  |  |  |
| 3.B.2 - Cropland | 0.00 |  |  |  |  |  |  |
| 3.B.3 - Grassland | 0.00 |  |  |  |  |  |  |
| 3.B.4 - Wetlands | 0.00 |  | 0.00 |  |  |  |  |
| 3.B.5 - Settlements | 0.00 |  |  |  |  |  |  |
| 3.B.6 - Other Land | 0.00 |  |  |  |  |  |  |
| **3.C - Aggregate sources and non-CO2 emissions sources on land** | 5.58 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.C.1 - Emissions from biomass burning |  | 0.00 | 0.00 |  |  |  |  |
| 3.C.2 - Liming | 0.00 |  |  |  |  |  |  |
| 3.C.3 - Urea application | 5.58 |  |  |  |  |  |  |
| 3.C.4 - Direct N2O Emissions from managed soils |  |  | 0.12 |  |  |  |  |
| 3.C.5 - Indirect N2O Emissions from managed soils |  |  | 0.01 |  |  |  |  |
| 3.C.6 - Indirect N2O Emissions from manure management |  |  | 0.00 |  |  |  |  |
| 3.C.7 - Rice cultivations |  | 0.00 |  |  |  |  |  |
| 3.C.8 - Other (please specify) |  | 0.00 | 0.00 |  |  |  |  |
| **3.D - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3.D.1 - Harvested Wood Products | 0.00 |  |  |  |  |  |  |
| 3.D.2 - Other (please specify) | 0.00 | 0.00 | 0.00 |  |  |  |  |
| **4 - Waste** | 0.74 | 27.03 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.A - Solid Waste Disposal** | 0.00 | 19.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.B - Biological Treatment of Solid Waste** | 0.00 | 0.15 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.C - Incineration and Open Burning of Waste** | 0.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.D - Wastewater Treatment and Discharge** | 0.00 | 7.67 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| **4.E - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5 - Other** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **5.B - Other (please specify)** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|  |  |  |  |  |  |  |  |
| **Memo Items (5)** |  |  |  |  |  |  |  |
| **International Bunkers** | 1,978.47 | 0.10 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1.A.3.a.i - International Aviation (International Bunkers) | 917.57 | 0.01 | 0.03 |  |  |  |  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) | 1,060.91 | 0.10 | 0.03 |  |  |  |  |
| **1.A.5.c - Multilateral Operations** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

## Annex 3: Key Category Analysis

Table 39. Key Category Analysis, Approach 1 – Level Assessment

| **IPCC Category code** | **IPCC Category** | **GHG** | **2016 Ex,t (Gg CO2 Eq)** | **|Ex,t| (Gg CO2 Eq)** | **Lx,t** | **Cumulative Total of Column F** |
| --- | --- | --- | --- | --- | --- | --- |
| **1.A.1** | **Energy Industries - Solid Fuels** | **CO2** | **1694,13** | **1694,13** | **0,33** | **0,33** |
| **1.A.3.b** | **Road Transportation** | **CO2** | **1071,80** | **1071,80** | **0,21** | **0,54** |
| **1.A.1** | **Energy Industries - Liquid Fuels** | **CO2** | **703,03** | **703,03** | **0,14** | **0,67** |
| **4.A** | **Solid Waste Disposal** | **CH4** | **403,30** | **403,30** | **0,08** | **0,75** |
| **2.F.1** | **Refrigeration and Air Conditioning** | **HFCs, PFCs** | **282,10** | **282,10** | **0,05** | **0,81** |
| **1.A.2** | **Manufacturing Industries and Construction - Liquid Fuels** | **CO2** | **261,45** | **261,45** | **0,05** | **0,86** |
| **1.A.4** | **Other Sectors - Liquid Fuels** | **CO2** | **245,73** | **245,73** | **0,05** | **0,91** |
| **4.D** | **Wastewater Treatment and Discharge** | **CH4** | **161,14** | **161,14** | **0,03** | **0,94** |
| **1.A.2** | **Manufacturing Industries and Construction - Solid Fuels** | **CO2** | **77,35** | **77,35** | **0,02** | **0,95** |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | CO2 | 64,83 | 64,83 | 0,01 | 0,97 |
| 3.C.4 | Direct N2O Emissions from managed soils | N2O | 37,04 | 37,04 | 0,01 | 0,97 |
| 4.D | Wastewater Treatment and Discharge | N2O | 21,56 | 21,56 | 0,00 | 0,98 |
| 2.C.1 | Iron and Steel Production | CO2 | 21,41 | 21,41 | 0,00 | 0,98 |
| 1.A.3.b | Road Transportation | N2O | 16,47 | 16,47 | 0,00 | 0,98 |
| 1.A.3.a | Civil Aviation | CO2 | 9,71 | 9,71 | 0,00 | 0,99 |
| 1.A.1 | Energy Industries - Biomass | N2O | 9,40 | 9,40 | 0,00 | 0,99 |
| 1.A.1 | Energy Industries - Solid Fuels | N2O | 8,20 | 8,20 | 0,00 | 0,99 |
| 2.D | Non-Energy Products from Fuels and Solvent Use | CO2 | 7,66 | 7,66 | 0,00 | 0,99 |
| 3.A.1 | Enteric Fermentation | CH4 | 6,50 | 6,50 | 0,00 | 0,99 |
| 1.A.3.b | Road Transportation | CH4 | 5,69 | 5,69 | 0,00 | 0,99 |
| 3.C.3 | Urea application | CO2 | 5,58 | 5,58 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Biomass | CH4 | 4,77 | 4,77 | 0,00 | 1,00 |
| 3.C.5 | Indirect N2O Emissions from managed soils | N2O | 3,70 | 3,70 | 0,00 | 1,00 |
| 4.B | Biological Treatment of Solid Waste | CH4 | 3,22 | 3,22 | 0,00 | 1,00 |
| 4.B | Biological Treatment of Solid Waste | N2O | 2,85 | 2,85 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Liquid Fuels | N2O | 1,69 | 1,69 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | CH4 | 1,40 | 1,40 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | N2O | 1,34 | 1,34 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | CO2 | 0,87 | 0,87 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | CO2 | 0,74 | 0,74 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | CH4 | 0,68 | 0,68 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | N2O | 0,61 | 0,61 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | N2O | 0,58 | 0,58 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Liquid Fuels | CH4 | 0,57 | 0,57 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Liquid Fuels | CH4 | 0,47 | 0,47 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | N2O | 0,37 | 0,37 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Solid Fuels | CH4 | 0,37 | 0,37 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | N2O | 0,27 | 0,27 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Liquid Fuels | N2O | 0,23 | 0,23 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | CH4 | 0,21 | 0,21 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | CH4 | 0,17 | 0,17 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | CH4 | 0,14 | 0,14 | 0,00 | 1,00 |
| 1.A.3.a | Civil Aviation | N2O | 0,08 | 0,08 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.a | Civil Aviation | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.C | Carbon dioxide Transport and Storage | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.1 | Cement production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.2 | Lime production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.3 | Glass Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.4 | Other Process Uses of Carbonates | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.1 | Ammonia Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.2 | Nitric Acid Production | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.3 | Adipic Acid Production | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.4 | Caprolactam, Glyoxal and Glyoxylic Acid Production | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.5 | Carbide Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.5 | Carbide Production | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.6 | Titanium Dioxide Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.7 | Soda Ash Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.8 | Petrochemical and Carbon Black Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.8 | Petrochemical and Carbon Black Production | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.9 | Fluorochemical Production | SF6, PFCs, HFCs and other | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.1 | Iron and Steel Production | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.2 | Ferroalloys Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.2 | Ferroalloys Production | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.3 | Aluminium production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.3 | Aluminium production | PFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.4 | Magnesium production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.4 | Magnesium production | SF6 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.5 | Lead Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.6 | Zinc Production | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.E | Electronics Industry | SF6, PFCs, HFCs and other | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.2 | Foam Blowing Agents | HFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.3 | Fire Protection | HFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.4 | Aerosols | HFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.5 | Solvents | HFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.6 | Other Applications (please specify) | HFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.G | Other Product Manufacture and Use | SF6, PFCs | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.G | Other Product Manufacture and Use | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.A.2 | Manure Management | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.A.2 | Manure Management | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.1.a | Forest land Remaining Forest land | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.1.b | Land Converted to Forest land | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.2.a | Cropland Remaining Cropland | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.2.b | Land Converted to Cropland | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.3.a | Grassland Remaining Grassland | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.3.b | Land Converted to Grassland | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.a.i | Peatlands remaining peatlands | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.a.i | Peatlands remaining peatlands | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.b | Land Converted to Wetlands | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.b | Land Converted to Wetlands | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.5.a | Settlements Remaining Settlements | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.5.b | Land Converted to Settlements | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.6.b | Land Converted to Other land | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.1 | Emissions from biomass burning | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.1 | Emissions from biomass burning | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.2 | Liming | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.6 | Indirect N2O Emissions from manure management | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.7 | Rice cultivation | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.D.1 | Harvested Wood Products | CO2 | 0,00 | 0,00 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | CH4 | 0,00 | 0,00 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | N2O | 0,00 | 0,00 | 0,00 | 1,00 |
| **Total** | | | | | | |
|  |  |  | **5,139.42** | **5,139.42** | **1** |  |

Table 40. Key Category Analysis, Approach 1 – Trend Assessment

| **IPCC Category code** | **IPCC Category** | **GHG** | **2000 Year Estimate Ex0 (Gg CO2 Eq)** | **2016 Year Estimate Ext (Gg CO2 Eq)** | **Trend Assessment (Txt)** | **% Contribution to Trend** | **Cumulative Total of Column G** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1.A.1** | **Energy Industries - Solid Fuels** | **CO2** | **561,54** | **1694,13** | **0,24** | **0,30** | **0,30** |
| **1.A.1** | **Energy Industries - Liquid Fuels** | **CO2** | **597,72** | **703,03** | **0,12** | **0,15** | **0,45** |
| **1.A.2** | **Manufacturing Industries and Construction - Liquid Fuels** | **CO2** | **303,60** | **261,45** | **0,09** | **0,12** | **0,57** |
| **4.A** | **Solid Waste Disposal** | **CH4** | **352,65** | **403,30** | **0,07** | **0,09** | **0,66** |
| **2.F.1** | **Refrigeration and Air Conditioning** | **HFCs, PFCs** | **47,99** | **282,10** | **0,07** | **0,09** | **0,75** |
| **4.D** | **Wastewater Treatment and Discharge** | **CH4** | **188,70** | **161,14** | **0,06** | **0,07** | **0,82** |
| **1.A.3.b** | **Road Transportation** | **CO2** | **528,48** | **1071,80** | **0,05** | **0,06** | **0,88** |
| **1.A.4** | **Other Sectors - Liquid Fuels** | **CO2** | **195,81** | **245,73** | **0,03** | **0,04** | **0,93** |
| **3.C.4** | **Direct N2O Emissions from managed soils** | **N2O** | **0,00** | **37,04** | **0,01** | **0,02** | **0,94** |
| **1.A.2** | **Manufacturing Industries and Construction - Solid Fuels** | **CO2** | **60,11** | **77,35** | **0,01** | **0,01** | **0,95** |
| 2.C.1 | Iron and Steel Production | CO2 | 19,57 | 21,41 | 0,00 | 0,01 | 0,96 |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | CO2 | 30,49 | 64,83 | 0,00 | 0,00 | 0,96 |
| 4.D | Wastewater Treatment and Discharge | N2O | 18,34 | 21,56 | 0,00 | 0,00 | 0,97 |
| 2.D | Non-Energy Products from Fuels and Solvent Use | CO2 | 0,00 | 7,66 | 0,00 | 0,00 | 0,97 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | N2O | 4,72 | 1,34 | 0,00 | 0,00 | 0,97 |
| 3.A.1 | Enteric Fermentation | CH4 | 0,00 | 6,50 | 0,00 | 0,00 | 0,98 |
| 1.A.1 | Energy Industries - Biomass | N2O | 9,01 | 9,40 | 0,00 | 0,00 | 0,98 |
| 3.D.1 | Harvested Wood Products | CO2 | -23,98 | 0,00 | 0,00 | 0,00 | 0,98 |
| 3.C.3 | Urea application | CO2 | 0,00 | 5,58 | 0,00 | 0,00 | 0,98 |
| 2.A.2 | Lime production | CO2 | 2,75 | 0,00 | 0,00 | 0,00 | 0,99 |
| 3.C.5 | Indirect N2O Emissions from managed soils | N2O | 0,00 | 3,70 | 0,00 | 0,00 | 0,99 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | CH4 | 2,40 | 0,68 | 0,00 | 0,00 | 0,99 |
| 1.A.1 | Energy Industries - Solid Fuels | N2O | 2,72 | 8,20 | 0,00 | 0,00 | 0,99 |
| 1.A.1 | Energy Industries - Biomass | CH4 | 4,58 | 4,77 | 0,00 | 0,00 | 0,99 |
| 4.B | Biological Treatment of Solid Waste | CH4 | 0,00 | 3,22 | 0,00 | 0,00 | 0,99 |
| 4.B | Biological Treatment of Solid Waste | N2O | 0,00 | 2,85 | 0,00 | 0,00 | 1,00 |
| 1.A.3.b | Road Transportation | N2O | 8,16 | 16,47 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | CH4 | 1,63 | 1,40 | 0,00 | 0,00 | 1,00 |
| 1.A.3.a | Civil Aviation | CO2 | 4,77 | 9,71 | 0,00 | 0,00 | 1,00 |
| 1.A.3.b | Road Transportation | CH4 | 2,62 | 5,69 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | CO2 | 0,00 | 0,87 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Liquid Fuels | N2O | 1,45 | 1,69 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | N2O | 0,72 | 0,61 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Liquid Fuels | CH4 | 0,49 | 0,57 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | N2O | 0,31 | 0,27 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Liquid Fuels | CH4 | 0,42 | 0,47 | 0,00 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | CO2 | 0,56 | 0,74 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Liquid Fuels | CH4 | 0,25 | 0,21 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Liquid Fuels | N2O | 0,25 | 0,23 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Solid Fuels | CH4 | 0,12 | 0,37 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | N2O | 0,29 | 0,37 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | N2O | 0,27 | 0,58 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Solid Fuels | CH4 | 0,13 | 0,17 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Liquid Fuels | CH4 | 0,06 | 0,14 | 0,00 | 0,00 | 1,00 |
| 1.A.3.a | Civil Aviation | N2O | 0,04 | 0,08 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Liquid Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.a | Civil Aviation | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Peat | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.1 | Energy Industries - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Peat | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.2 | Manufacturing Industries and Construction - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.c | Railways | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Peat | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.d | Water-borne Navigation - Biomass | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.3.e | Other Transportation | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Peat | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.4 | Other Sectors - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Gaseous Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Other Fossil Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Peat | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.A.5 | Non-Specified - Biomass | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.1 | Solid Fuels | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.a | Oil | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.B.2.b | Natural Gas | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 1.C | Carbon dioxide Transport and Storage | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.1 | Cement production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.3 | Glass Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.A.4 | Other Process Uses of Carbonates | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.1 | Ammonia Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.2 | Nitric Acid Production | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.3 | Adipic Acid Production | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.4 | Caprolactam, Glyoxal and Glyoxylic Acid Production | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.5 | Carbide Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.5 | Carbide Production | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.6 | Titanium Dioxide Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.7 | Soda Ash Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.8 | Petrochemical and Carbon Black Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.8 | Petrochemical and Carbon Black Production | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.B.9 | Fluorochemical Production | SF6, PFCs, HFCs and other | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.1 | Iron and Steel Production | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.2 | Ferroalloys Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.2 | Ferroalloys Production | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.3 | Aluminium production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.3 | Aluminium production | PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.4 | Magnesium production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.4 | Magnesium production | SF6 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.5 | Lead Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.C.6 | Zinc Production | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.E | Electronics Industry | SF6, PFCs, HFCs and other | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.2 | Foam Blowing Agents | HFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.3 | Fire Protection | HFCs, PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.4 | Aerosols | HFCs, PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.5 | Solvents | HFCs, PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.F.6 | Other Applications (please specify) | HFCs, PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.G | Other Product Manufacture and Use | SF6, PFCs | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 2.G | Other Product Manufacture and Use | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.A.2 | Manure Management | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.A.2 | Manure Management | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.1.a | Forest land Remaining Forest land | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.1.b | Land Converted to Forest land | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.2.a | Cropland Remaining Cropland | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.2.b | Land Converted to Cropland | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.3.a | Grassland Remaining Grassland | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.3.b | Land Converted to Grassland | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.a.i | Peatlands remaining peatlands | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.a.i | Peatlands remaining peatlands | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.b | Land Converted to Wetlands | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.4.b | Land Converted to Wetlands | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.5.a | Settlements Remaining Settlements | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.5.b | Land Converted to Settlements | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.B.6.b | Land Converted to Other land | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.1 | Emissions from biomass burning | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.1 | Emissions from biomass burning | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.2 | Liming | CO2 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.6 | Indirect N2O Emissions from manure management | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 3.C.7 | Rice cultivation | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | CH4 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| 4.C | Incineration and Open Burning of Waste | N2O | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| **Total** | | | | | | | |
|  |  |  | 2,929.73 | 5,139.42 | 0.78 | 1 |  |

1. Ellis, J., Briner, G., Moarif, S., Buchner, B., 2011, *Frequent and flexible: options for reporting guidelines for biennial reports*, OECD and IEA, COM/ENV/EPOC/IEA/SLT(2011)2, <http://www.oecd.org/env/cc/48073760.pdf>. [↑](#footnote-ref-2)
2. GHG Inventories (2010 and 2017) and National Communications (NC1, NC2 and NC3) are available in the following link <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-update-reports-non-annex-i-parties/national-communication-submissions-from-non-annex-i-parties> [↑](#footnote-ref-3)
3. Emissions are reported in Gg CO2eq for HFCs. [↑](#footnote-ref-4)
4. Environmental and Sustainable Development Division [↑](#footnote-ref-5)
5. Annual Report 2016-17, Ministry of Agro Industry and Food Security [↑](#footnote-ref-6)
6. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-7)
7. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-8)
8. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-9)
9. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-10)
10. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-11)
11. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-12)
12. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-13)
13. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-14)
14. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-15)
15. See explanation at the beginning of the section about the emission reduction estimates. [↑](#footnote-ref-16)
16. *Strategic Plan 2016 – 2020 for the Non-Sugar Sector* [↑](#footnote-ref-17)
17. Environmental and Sustainable Development Division [↑](#footnote-ref-18)