Mauritius National Climate Change Mitigation Strategy and Action Plan 2022-2030

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List of Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
ATCS	Adaptive Traffic Control System
BAU	Business-as-usual
BM	Business Mauritius
BUR1	Biennial Update Report (First)
CCA	Climate Change Act
CCC	Climate Change Committee
CCM	Climate Change Mitigation
CEB	Central Electricity Board
CO_{2e}	Carbon dioxide equivalent
DCC	Department of Climate Change
DLL	Dry Low Land
DOC	Degradable Organic Content
EE	Energy Efficiency
EEMO	Energy Efficiency Management Office
ETF	Enhanced Transparency Framework
EV	Electric Vehicle
FAREI	Food Agricultural Research and Extension Institute
FS	Forestry Service
GACMO	Greenhouse Gas Abatement Cost Model
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWh	Gigawatt hour
HEC	Higher Education Commission
HEI	Higher Education Institution
HFC	Hydrofluorocarbon
HOV	High Occupancy Vehicle
IMCCC	Inter-Ministerial Council on Climate Change
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPPU	Industrial Processes and Product Use
KIP	Kigali Implementation Plan
$ktCO_{2e}$	Kilo tonne of carbon dioxide equivalent
ktoe	Kilo tonne of oil equivalent
LPG	Liquefied Petroleum Gas
LRS	Light Rail System
MAIFS	Ministry of Agro Industry and Food Security
MARC	Marginal Abatement Revenue Curve
MARENA	Mauritius Renewable Energy Agency
M&E	Monitoring and Evaluation
MEL	Metro Express Limited
MEPU	Ministry of Energy and Public Utilities
MESWMCC	Ministry of Environment, Solid Waste Management and Climate Change
METEST	Ministry of Education, Tertiary Education, Science and Technology
MFARIIT	Ministry of Foreign Affairs, Regional Integration and International Trade
MFEPD	Ministry of Finance, Economic Planning and Development
MFSGG	Ministry of Financial Services and Good Governance
MGEFW	Ministry of Gender Equality and Family Welfare
MIE	Mauritius Institute of Education
MITCI	Ministry of Information Technology, Communication and Innovation
MITD	Mauritius Institute of Training and Development

MLIRE	Ministry of Labour, Industrial Relations and Employment
MLTLR	Ministry of Land Transport and Light Rail
MMS	Mauritius Meteorological Services
MNICD	Ministry of National Infrastructure and Community Development
MRIC	Mauritius Research and Innovation Council
MRA	Mauritius Revenue Authority
MSB	Mauritius Standards Bureau
MSW	Municipal Solid Waste
MtCO2e	Million tonne of carbon dioxide equivalent
MW	Megawatt
MYESR	Ministry of Youth Empowerment, Sports and Recreation
NAMA	Nationally Appropriate Mitigation Action
NCCMSAP	National Climate Change Mitigation Strategy and Action Plan
NECCF	National Environment and Climate Change Fund
NLTA	National Land Transport Authority
NDC	Nationally Determined Contribution
NIR	National Inventory Report
NOU	National Ozone Unit
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	OECD Development Assistance Committee
OIDC	Outer Islands Development Corporation
ODS	Ozone Depleting Substances
PA	Paris Agreement
PAX-km	Passenger kilometre
PS	Private Sector
RAC	Refrigeration and Air Conditioning
RCCC	Rodrigues Climate Change Committee
RE	Renewable Energy
REHF	Renewable Energy Hybrid Facility
RMCF	Resource Mobilization Committee for Climate Finance
SEDEC	Service Diocésain de L'Éducation Catholique
SEP	Stakeholder Engagement Plan
SIDS	Small Island Developing States
SWM	Solid Waste Management
SWMD	Solid Waste Management Division
TMRSU	Traffic Management and Road Safety Unit
TNC	Third National Communication
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WMA	Wastewater Management Authority
WTE	Waste-to-Energy

Executive Summary

In 2021, the Climate Change Act (CCA) 2020 was proclaimed with the overarching objective to enhance the national climate governance '*with a view to making Mauritius a climate change-resilient and low emission country*'. The CCA 2020 will also support Mauritius to implement the provisions of the Paris Agreement (PA) up to 2030. In 2021, Mauritius also submitted its updated Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) according to the requirements of the PA. The updated NDC expresses an increase in the level of ambition to reduce atmospheric emissions of greenhouse gases (GHGs), while taking into account the country context and the common-but-differentiated responsibilities and respective capabilities to address climate change.

The National Climate Change Mitigation Strategy and Action Plan (NCCMSAP) has been developed for the period 2022-2030 to support implementation of the NDC. The NCCMSAP supports the long-term objective 'to contribute towards achieving a net-zero carbon society by 2070 while achieving the Sustainable Development Goals. The focus is on delivering sustainable development co-benefits while at the same time reducing GHG emissions across all sectors. The NCCMSAP is also a contribution towards the formulation of long-term strategies as provisioned under the CCA 2020 (Section 14) and the PA (Article 4(19)). In addition to identifying the Strategies, Actions, Measures and Investments to support implementation of the NDC, a number of Enabling Factors (Legal & Institutional; Technology Transfer & Financing; Education and Research, Awareness Raising, and Role of Media; Gender and Children and Youth Mainstreaming) have been identified to support the formulation of a long-term National Climate Change Mitigation Strategy and Action Plan (NCCMSAP).

<u>The NCCMSAP at a glance</u>

The NCCMSAP is ordered using the sector classification used by the Intergovernmental Panel on Climate Change (IPCC). Some sectors are disaggregated for ease of readership. The NCCCMSAP comprises a total of 18 mitigation strategies and 32 mitigation actions. The total capital investment has been estimated to at least **USD 3.082 billion** for a total emission reduction of **2,175 $ktCO_{2e}$** by 2030, including the enhancement of sinks. The emission reductions are measured relative to the business as usual (BAU) scenario, which in 2030 amounts to 5,349 $ktCO_{2e}$ for all sectors. Hence, the total emission reduction represents 40.7% of the BAU emissions in 2030. It has been estimated that 7.6% and 92.4% of investments will be from public and private sources, respectively. The below table summarises the number of mitigation strategies and actions for each sector, including the estimated investment costs and the percentage allocation between public and private sources.

Sector	Number of Strategies & Actions	Emission Reductions 2030 ($ktCO_{2e}$)	Estimated Cost (USD million)	Public / Private Allocation (%)
Energy Industries	Strategies = 2 Actions = 11	1,942.0	1,745.03	Public – 10.2% Private – 89.8%
Land Transport	Strategies = 4 Actions = 8	74.0	>1,306.3	Public – 3.9% Private – 96.1%
Solid Waste Management	Strategies = 3 Actions = 3	42.3	>16.3	Private – 100%
Waste Water Management	Strategies = 1 Actions = 2	6.0	To be determined through feasibility studies	-
Industrial Processes and Product Use	Strategies = 3 Actions = 3	103.0	>0.15	Public – 100%

Agriculture (crops and livestock)	Strategies = 3 Actions = 3	(1.7)	>7.06	Public – 100%
Forestry	Strategies = 2 Actions = 2	9.5	7.3	Public – 100%
All Sectors	**Strategies = 18 Action = 32**	**2,175.1**	**3,082.14**	**Public – 7.6% Private – 92.4%**

Sectoral mitigation strategies and actions

Energy Industries

OUTCOME: Decarbonisation of the electricity system using renewable energies and demand side energy efficiency TARGET: Reduce emissions relative to BAU by 1,942 ktCO2e in 2030 INVESTMENT: USD 1,745.03 million		
EI1	Promote end-use energy efficiency	EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030 with 2019 as base year
EI2	Enhancing renewable energy sources in the electricity mix with completed phase out of coal before 2030 [60% RE in 2030]	EI2.1. Installation of additional 29 MW utility scale PV EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions) EI2.3. Installation of additional 32 MW floating solar PV EI2.4. Increase biomass generation capacity by 100 MW (hybrid facility) EI2.5. Renewable Energy (RE) from waste project for 10 MW EI2.6. Installation of 50 MW off-shore wind energy EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal) EI2.8. Installation of 100 MW new RE hybrid facility (solar + battery) EI2.9. Installation of 40 MW new RE hybrid facility (small scale solar + battery) EI2.10. Installation of 100 MW new RE hybrid facility (solar + wind + battery storage)

Land Transport

OUTCOME: Towards a sustainable low-carbon land transport system in Mauritius TARGET: Reduce emissions relative to BAU by 74 ktCO2e in 2030 INVESTMENT: USD 1,306.3 million		
LT1	Improved fuel economy of vehicles	LT1.1. Increased fuel economy at a rate of 0.5% per year
LT2	Decreasing peak time congestion to improve traffic fluidity	LT2.1. High Occupation Vehicles lane for uninterrupted flow along M2 LT2.2. Substituting ATCS for single timing traffic signaling to enhance real-time decision making LT2.3. Promoting active transportation LT2.4. Promoting car pooling
LT3	Reducing consumption of fossil fuels through increased adoption of lower-carbon vehicles	LT3.1. Increasing the share of hybrid cars to 8.31% of total passenger travel demand in 2030 LT3.2. Increasing the share of electric cars to 4.5% of total passenger travel demand in 2030
LT4	Electrification of mass transit mode of passenger transport	LT4.1. Operationalisation of the Light Rail System between Curepipe and Port Louis

Solid Waste Management

OUTCOME: Avoided emissions at landfill from a circular waste economy TARGET: Reduce emissions relative to BAU by 42.3 ktCO2e in 2030 INVESTMENT: USD 16.3 million		
SWM1	Composting of the putrescible fraction of solid waste	SWM1.1. Composting of 31% of municipal solid waste in 2030

SWM2	Recycling of municipal solid waste	SWM2.1. Recycling of 22% of municipal solid waste by 2030
SWM3	Energy recovery from municipal solid waste	SWM3.1. Twenty percent (20%) of municipal solid waste recovered for waste-to-energy

Waste Water Management

OUTCOME: Avoided emissions in wastewater management from adoption of low-carbon technologies TARGET: Reduce emissions relative to BAU by 6 ktCO2e in 2030 INVESTMENT: To be determined following feasibility study		
WWM1	Reduced methane emissions from adoption of low-carbon water treatment technologies	WWM1.1. Increasing utilisation level of aerobic treatment from 0.01 (BAU) to 0.03 in 2030 WWM1.2. Increasing utilisation level of anaerobic treatment from 0.01 (BAU) to 0.035 in 2030

Industrial Processes and Product Use

OUTCOME: Reducing the use HFCs according to Kigali Amendment to the Montreal Protocol TARGET: Reduce emissions relative to BAU by 103 ktCO2e in 2030 INVESTMENT: USD 0.15 million		
IP1	Phase Down of hydrofluorocarbons (HFCs) refrigerants in Mauritius	IP1.1. Reducing HFCs by 10% of the baseline value (2024) by 2029
IP2	Phase out of equipment using HFCs	IP2.1. Import ban on non-inverter type air conditioner with capacity above 36,000 BTU as from 2022 in a phased manner for the total ban in 2024
IP3	Environmentally-sound disposal of HFC refrigerants	IP3.1. Recovery and safe disposal of HFCs in retired stock of RAC equipment based on the Kigali Implementation Plan (KIP)

Agriculture (crops and livestock)

AGRICULTURE (crops) OUTCOME: Reducing emissions from good agricultural practices TARGET: Reduce emissions relative to BAU by 2.7 ktCO2e in 2030 INVESTMENT: USD 5.66 million		
A1	Reducing chemical inputs in crop production	A1.1. Reducing chemical inputs by 1% absolute per year until 2030 (bio-farming practices)
A2	Implementation of bio-farming and other sustainable agricultural practices	A1.2. Application of compost produced from MSW in crop cultivation
LIVESTOCK (L) OUTCOME: Improved food security with application of mitigation technologies for livestock waste management TARGET: Limiting increased emissions relative to BAU to 4.4 ktCO2e in 2030 INVESTMENT: USD 1.4 million		
L1	Improved food security with adoption of environmentally-sound animal excrement management technologies	L1.1. Increase in livestock heads for increased food security with low-carbon excrement management technologies

Forestry

OUTCOME: Increasing the sink capacity of Mauritius TARGET: Enhancing sink capacity relative to BAU by 9.5 ktCO2e in 2030 INVESTMENT: USD 7.3 million		
F1	Planting trees in urban areas	F1.1. Planting of 600,000 trees over a period of 7 years along the M1/M2 motorways

F2	Afforestation of abandoned agricultural land	F2.1. Afforesting 1,750 ha of abandoned sugar cane land with a combination of endemic by 2030

M&E Framework

The CCMSAP is accompanied by a Monitoring & Evaluation (M&E) Framework that seeks to address the transparency requirements of the PA and to measure the sustainable development benefits of the mitigation actions of the NDC. For the transparency requirements, an online Mauritius NDC Registry has been designed under the NAMA project to provide a user friendly and accessible platform that will facilitate data submission on outcomes, interventions, indicators and support needed and received from relevant stakeholders for tracking implementation progress of the NDC. This will allow for a visualization of progress on climate action (mitigation and adaptation) and support needed and received, and facilitate the generation of reports and decision making at the national level. To measure the sustainable development benefits of mitigation, three types of indicators (agenda setting indicators; policy/strategy formulation indicators; policy/strategy evaluation indicators) underpinning an integrated policy cycle have been proposed for all emission sectors. A selected set of indicators for the Energy Industries is illustrated below as example.

Issue	Agenda setting	Formulation	Evaluation
Rising energy costs due to heavy reliance on imported fossil fuels (supply side)	1. Per capita energy bill (US$/person/year) 2. Fossil fuel use (% of total final energy and electricity consumption) 3. Fossil fuel subsidies (US$/year) 4. Share of floor area of green buildings in total park of buildings (%)	1. Share of renewables in electricity production (%) 2. Economic and financial incentives (US$/year) to invest in renewable energy sources and energy storage technologies 3. Investments in grid strengthening (US$/year) 4. Installed capacity of different types of renewables (MW) 5. Number of persons trained in renewables value chains (sex disaggregated)	1. Reduced costs of energy imports (US$/year) 2. National and household energy savings (US$/year) 3. Emissions from electricity generation and consumption (tCO_2/year) 4. Grid emission factor (tCO_2/MWh) 5. Number of green jobs created in the electricity supply and demand value chains
Low adoption of end-use energy efficiency (demand side management)		1. Amount of incentives to energy efficient appliances (US$/year) 2. Number of energy efficiency performance standards and labels, including building energy codes, that are enforced 3. Number of persons trained in demand side management value chains (sex disaggregated) 4. Number of annual energy audits and energy value (GJ / GWh) carried out in manufacturing, and commercial and distributive trades 5. Number of registered energy auditors 6. Investments in urban green infrastructure (US$/year)	

Financing mitigation measures

A marginal abatement revenue curve analysis of the mitigation measures finds that most mitigation measures for the energy industries are expected to yield positive return on investment compared to the BAU scenario, while contributing to the achievement of emission reductions. Only four of the thirty-two mitigation measures presented in this NCCMSAP, EI2.1, EI2.2, LT4.1 and F1.1 are found to be investment ready. Three actions have a high level of maturity, EI2.4, LT3.2 and L1.1, but still with unclarity regarding the financial mechanism or implementation arrangements. The remaining actions are found to be in need

of support for preparation and/or development, or are expected to be implemented in the longer term. This highlights the need for increased strategic resource allocation for the implementation of mitigation measures, and enhanced financial, technology development and transfer, and capacity building from the international community.

Part of the USD 2.686 billion needed for the implementation of the NCCMSAP are expected to be covered by government resources (7,6%), while the majority of the needed investments are expected to be covered by the private sector, donors and other external sources. Mauritius should continue to secure finance for the implementation of the NCCMSAP through its existing long-standing strategic relationship with international partners, while exploring new funding opportunities, diversifying both the funding sources and applied financial instruments.

1 Introduction

The scientific consensus is clear that unabated emissions of greenhouse gases (GHGs) in the atmosphere will have irreversible detrimental effects on the global climate system.[1] The ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC)[2] is to achieve stabilisation of atmospheric greenhouse gases (GHGs) at a level that would prevent dangerous anthropogenic interference with the climate system. The post-2020 legal instrument for achieving the objective of the UNFCCC is the Paris Agreement. Its objective is to constrain the temperature increase to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.[3] Each Party to the Paris Agreement is expected to communicate ambitious efforts in Nationally Determined Contributions (NDCs) reflecting the common but differentiated responsibilities and respective capabilities, in the light of its national circumstances. Mauritius submitted its initial NDC in 2015[4] and an updated and enhanced NDC in 2021.[5] The increased mitigation ambition is reflected by an increase in economy-wide emissions reductions from 30% to 40% in 2030 relative to the business-as-usual (BAU). According to the updated NDC, the business-as-usual (BAU) emissions would reach 6.9 MtCO2e in 2030.

Connected to the NDCs is the preparation and communication of mid-century strategies, plans and actions[6] for low GHG emissions development that is the object of the National Climate Change Mitigation Strategy and Action Plan (NCCMSAP). Another requirement of the Paris Agreement is the need for a Party to provide information necessary for clarity and transparency related to progress made in the implementation of contributions. In this respect, and while noting some flexibility for developing countries on the information to be reported, and providing Small Island Developing States (SIDS) the option to submit the information at their discretion, Parties are expected to submit Biennial Transparency Reports (BTRs) by 31 December 2024. In order to be able to carry out reporting on implementation progress, as well as on support needed and received, an Enhanced Transparency Framework (ETF) needs to be established at the national level.

The long-term objective of the NCCMSAP is "*to contribute towards achieving a net-zero carbon society by 2070 while achieving the Sustainable Development Goals*". It is underpinned by several Rio Principles, including: sovereignty (Principle 2), common-but-differentiated responsibilities and respective capabilities (Principle 7), inclusiveness and subsidiarity (Principle 10), women and youth participation (Principle 20 and Principle 21), intergenerational equity (Principle 3), poverty elimination (Principle 5), precautionary approach (Principle 15), and partnerships (Principle 27).

Scope of the National Climate Change Mitigation Strategy and Action Plan

[1] IPCC (2021) Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., et al. (eds.)]. Cambridge University Press.
[2] UNFCCC (1992) United Nations Framework Convention on Climate Change. https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf. Accessed 15 Apr 2022.
[3] UNFCCC (2015) Decision 1/CP.21: Adoption of the Paris Agreement. Paris Climate Change Conference, Paris, France.
[4] Republic of Mauritius (2015) Intended Nationally Determined Contribution for the Republic of Mauritius, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.
[5] Republic of Mauritius (2021) Update of the Nationally Determined Contribution of the Republic of Mauritius, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.
[6] The long-term, low-carbon strategies that have been communicated to the UNFCCC are found at: https://unfccc.int/process/the-paris-agreement/long-term-strategies - accessed 19 October 2021.

Article 4 of the Paris Agreement states that Parties[7] should aim to reach global peaking of GHGs as soon as possible, and to undertake rapid reductions thereafter based on the best available science in order to achieve balance between anthropogenic emissions and removals by sinks of GHGs – i.e. net zero carbon emissions – in the second half of this century. Reductions in GHGs are to be carried out on the basis of equity and based on national circumstances[8] so as to support sustainable development and eradication of poverty. Article 4 of the Paris Agreement is reflected in Section 14 of the Climate Change Act (CCA) 2020[9], which provides the legal framework towards making Mauritius a climate change resilient and low-emission country. The NCCMSAP responds to Article 4 of the Paris Agreement and Section 14 of the CCA 2020, and, in particular, to the provisions of its Section 14(3):

"14(3) The National Climate Change Mitigation Strategy and Action Plan shall include –
(a) national development priorities;
(b) policy formulation, including national policies and measures for mitigation and the enhancement of sinks;
(c) an action plan and investment programme;
(d) information on compliance with international commitments;
(e) research and development;
(f) climate data and information;
(g) recommendations on education, training and public awareness; and
(h) approaches for monitoring, evaluation and reporting."

Approach used for mitigation assessments

Mitigation assessments can be made based on a combination of three alternatives namely (i) a project- or activity-based approach, (ii) an outcome-based approach, or (iii) a combination of the two. These types of mitigation actions known as 'contribution type' are depicted in **Figure 1**.

[7] Article 4(6) states that '*The least developed countries and small island developing States may prepare and communicate strategies, plans and actions for low greenhouse gas emissions development reflecting their special circumstances*'.
[8] Parties should strive to formulate and communicate their long-term low GHG emission development strategies, mindful of Article 2 – i.e. pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels – using the principle of common but differentiated responsibilities and respective capabilities; PNK Deenapanray (2021) Increasing the ambition of mitigation action in small emitters: the case of Mauritius, Climate Policy 21(4):514-528.
[9] Republic of Mauritius (2020) The Climate Change Act 2020, Government Gazette of Mauritius No. 145 of 28 November 2020.

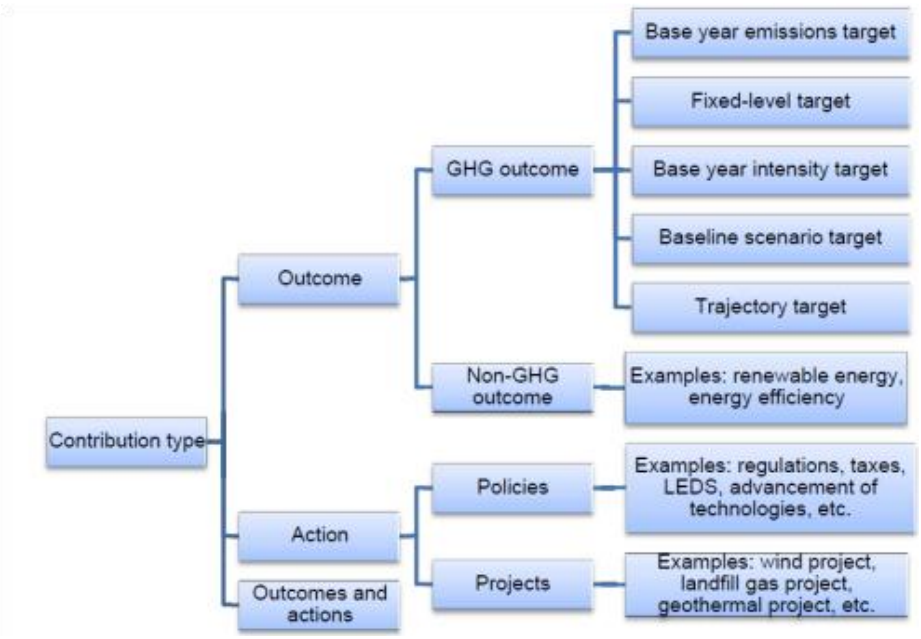


Figure 1. Definition of different types of mitigation contributions.
(Source: WRI & UDP 2015)

In developing the NCCMSAP, both activity-based (bottom-up) and outcome-based (top-down) approaches have been adopted. The overall level of GHG emission reductions or sequestration has been calculated by developing BAU sectoral baseline scenarios and mitigation scenarios comprised of mitigation actions.

The NCCMSAP has been formulated based on the objectives and goals emanating from the Inter-Ministerial Council on Climate Change as captured in the updated NDC. The strategy and action planning has hinged on three interrelated activities, namely: (i) stakeholder engagement; (ii) identification and prioritisation of mitigation actions; and (iii) policy and mitigation scenario analyses, including costing.

Stakeholder engagement is a cornerstone of the CCA 2020 both through Section 8(2)(l) and Section 19 on public consultation where public institutions should carry out public consultations for the purpose of developing strategies and policies. As per Section 19 of the CCA 2020, the process of formulating the Mitigation Strategy and Action Plan requires broad stakeholder consultations, including cross-sectoral coordination between public institutions. A Stakeholder Engagement Plan (SEP)[10] has been developed to guide facilitation of multi-stakeholder processes in order to achieve inclusiveness in participation.

Mitigation actions were identified using policy documents and expert knowledge on mitigation technologies and deployment pathways that are detailed for each sector below. For the purpose of the NCCMSAP, the definition of sectors has been aligned with the nomenclature of the Intergovernmental Panel on Climate Change (IPCC). A BAU GHG emission scenario was modelled for each sector (or sub-sector) reflecting the absence of mitigation strategy and action plan. Similarly, alternative lower-emission scenarios were modelled for the identified mitigation policies and actions. The modelling approaches and customised tools for carrying out mitigation scenario analyses[11] are listed in **Table 1**.

Table 1. Approaches and tools used to carry out mitigation scenario analyses in NAMA project.

[10] Ministry of Environment, Solid Waste Management and Climate Change (2022) Stakeholder Engagement Plan, MESWMCC, Mauritius.
[11] PNK Deenapanray and AM Bassi (2022) Mitigation Scenarios Modelling for Strategic Planning in Mauritius; The tools have been developed as open source products, and have been shared with institutional stakeholders.

Sector / sub-sector	Approaches and tools
Energy industries (electricity generation and use)	System dynamics model customized for Mauritius.[12] Customization was carried out in collaboration with the Central Electricity Board (CEB). The model has been transferred to CEB, and the purchase of necessary software to run (and update) the model and mitigation scenarios was funded by this GEF-financed NAMA project.
Transport (land)	Econometric modelling of travel demand for passengers and freight,[13] and allocation of total travel demand to different modes of land transportation. Disaggregation of travel demand by vehicle type is then converted to energy use and greenhouse gas emissions.
Solid waste management	Excel-based tool customized for Mauritius using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[14]
Waste water management	Excel-based tool customized for Mauritius using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[15]
Agriculture (food crops and livestock waste management)	Excel-based tool customized for Mauritius using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[16]
Forestry	Excel-based tool customized for Mauritius using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[17]
Refrigeration and air conditioning	Excel-based tool customized for Mauritius using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[18]
All sectors	The development of Marginal Abatement Revenue Curve (MARC) has been carried out using the Greenhouse Gas Abatement Cost Model (GACMO) developed by the United Nations Environment Programme (UNEP) Copenhagen Climate Centre.

Source: Author's elaboration

[12] More details of the structure of the model can be found in: Bassi A.M., and Deenapanray, P.N.K. (2012). A green investment analysis using system dynamics modeling – The case study of Mauritius. *Small States: Economic Review and Basic Statistics*, 16(12):256-265; Deenapanray, P.N K., and Bassi, A.M. (2015). System dynamics modelling of the power sector in Mauritius. *Environmental and Climate Technologies*, 16(1):20-35.

[13] PNK Deenapanray, N Khadun (2021) Land transport greenhouse gas emission scenarios for Mauritius based on modelling transport demand, *Interdisciplinary Perspectives in Transportation Research* **9**, 100299.

[14] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf - accessed 18 January 2022.

[15] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_6_Ch6_Wastewater.pdf - accessed 20 November 2021.

[16] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_05_Ch5_Cropland.pdf; https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf - accessed 18 February 2022;

[17] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf - accessed 18 February 2022.

[18] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_7_Ch7_ODS_Substitutes.pdf - accessed 15 February 2022.

2 Climate governance in Mauritius and enabling actions for the formulation and achievement of NDC commitments

2.1 National climate governance

The CCA 2020 sketches the institutional arrangements for climate governance in the Republic of Mauritius. A schematic representation of the institutional mechanism proposed in the CCA 2020 is shown in **Figure 2**. The mains organs of this institutional structure are:

- The apex body an **Inter-Ministerial Council on Climate Change** (IMCCC), is established as per Section 4 of the CCA 2020. Section 5 of the Act mandates the IMCCC to set national objectives, goals and targets, determine policies and priorities for climate change adaptation and mitigation, and to monitor and review progress made by public departments on any aspect of climate change projects and programmes. Although not mentioned explicitly, it is understood that the objectives, goals and targets set by the IMCCC will be used to formulate the National Climate Change Mitigation Strategy and Action Plan (NCCMSAP)[19] and the corresponding NDCs. The IMCCC is composed of Ministers and it is chaired by the Prime Minister. The Chief Commissioner of Rodrigues can be invited to attend IMCCC meetings on a needs basis. The Director of the Department of Climate Change will act as Secretary to the IMCCC;
- Based on the national objectives, goals and targets set by the IMCCC, the **Minister** (MESWMCC) is to propose and develop policies on climate change (adaptation and mitigation) as per Section 7(1) of the Act. The Minister may set up Technical Advisory Committees on a needs basis;
- A **Department of Climate Change** (DCC) is established under Section 8(1), and it will be headed by a Director (Section 9). The responsibilities of the Director are stipulated in Section 9(3). The Director is responsible to execute the climate change policy of the Ministry. In turn, the DCC shall be responsible to develop policies, formulate and implement measures, coordinate, monitor and evaluate programmes and action plans relating to climate change, as well as conduct and coordinate research on climate change.

Reporting on progress made on the formulation and implementation of climate change strategies and action plans in order to achieve the goals and objectives set by the Council flows from the DCC to the Minister to the Council. Section 9(3) is explicit that the Director of the DCC shall report to the Minister: (i) on an annual basis regarding the compliance with Section 16 of the CCA 2020 relating to the duties of public and private institutions (discussed in the next section), and (ii) on any such matters as may be required under the CCA 2020.

[19] The institutional arrangements for developing the NMSAP as per Section 15 of the Act are discussed in section 4 of this report.

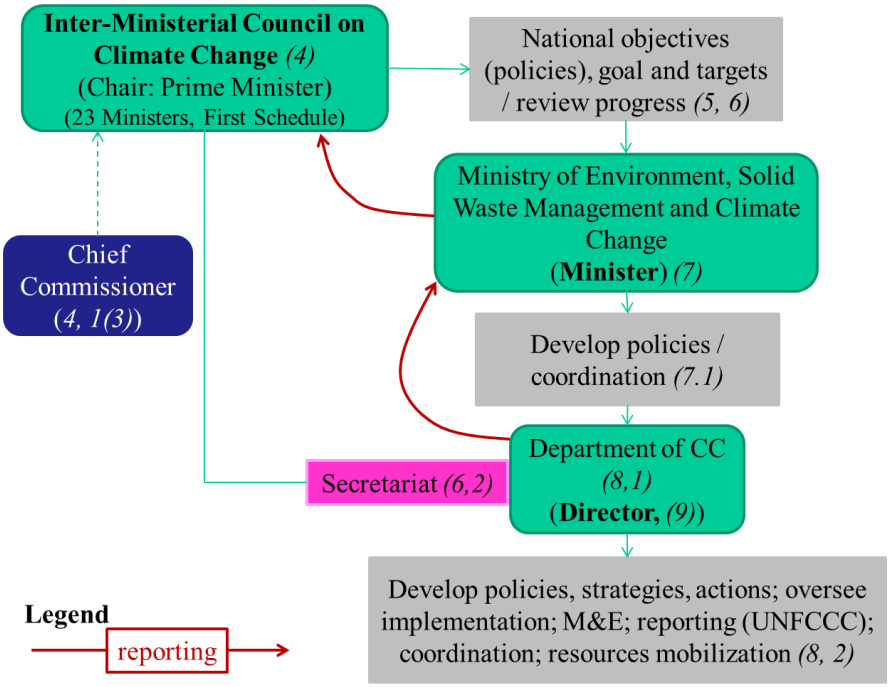


Figure 2. Schematic of institutional arrangements proposed in the Climate Change Act. (*Source: Author's elaboration*)

Since climate change is a developmental issue that cuts across all socioeconomic systems, the CCA 2020 also makes provision for carrying out multi-stakeholder coordination. For this, a **Climate Change Committee** (CCC) is established under Section 11(1), which shall coordinate the implementation of activities related to greenhouse gas inventories, greenhouse gas emission reductions, climate change vulnerability assessments and adaptation and ensure compliance with the provisions of the CCA 2020, as well as monitoring climate change relevant targets of Sustainable Development Goals (Section 11(3)). The CCC is chaired by the Supervising Officer (Permanent Secretary, MESWMCC), and is constituted by representatives from 29 public institutions; 1 professional body; 1 civil society; 1 private sector as per Section 11(1). This Committee is expected to report to the Minister on progress made in discharging its functions every 2 years (Section 11(4)). It adjourns on a monthly basis, and has the mandate to establish subcommittees as may be necessary. The Secretariat of the CCC is a public officer of MESWMCC chosen by the Supervising Officer (presently an Assistant Permanent Secretary).[20] The institutional arrangement including the CCC and subsidiary bodies that may be established are shown in **Figure 3**.

[20] The CCA 2020 does not explicitly state that the said Public Officer should be from the Department of Climate Change.

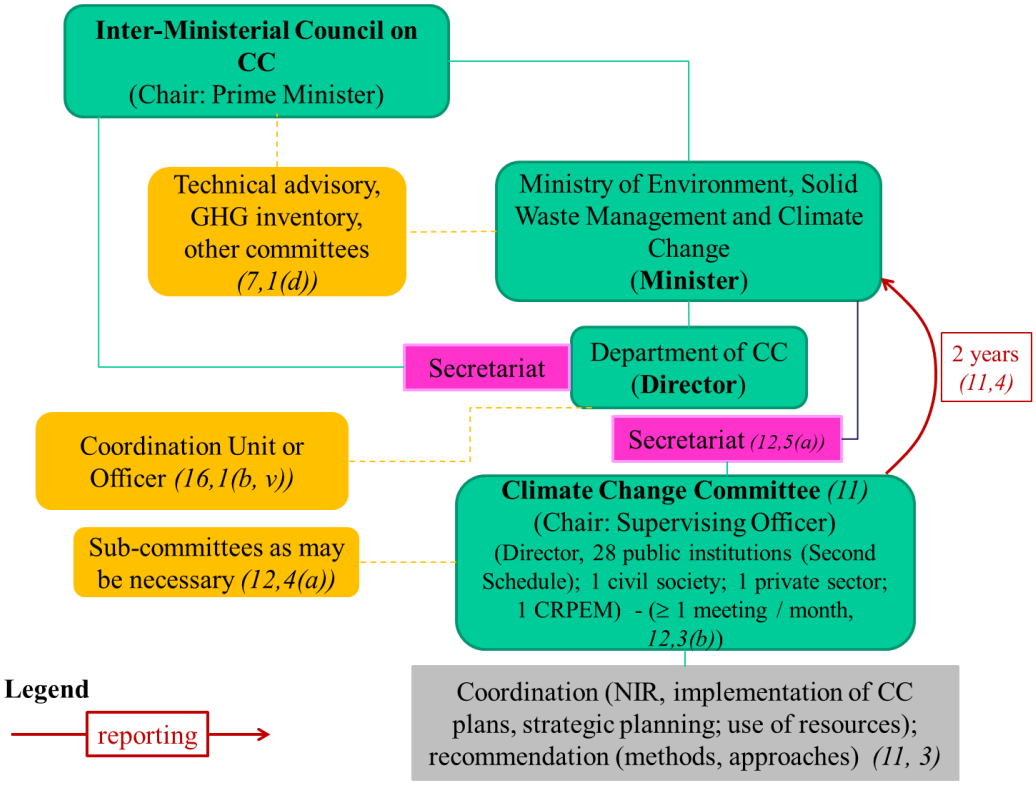


Figure 3. Additional structures proposed in the CCA 2020.
(*Source: Author's elaboration*)

Similarly, the CCA 2020 proposes the setting up of a **Rodrigues Climate Change Committee** (RCCC), which shall coordinate strategic planning and policies in the field of climate change in Rodrigues, coordinate the implementation of climate change measures, and collaborate and coordinate with the DCC for reporting purposes to the UNFCCC. The Departmental Head of the Commission (Environment) has the mandate to appoint any officers to support the RCCC in discharging its functions.

According to Section 15(4)(b) of the CCA 2020, the General Manager of the Outer Islands Development Corporation (OIDC) shall, at the request of the Department provide data on GHG emissions and sinks for the preparation of the annual GHG inventory report.

2.2 Enabling factors for mitigation strategic planning

Several enabling factors or drivers of change will be required to implement all sectoral mitigation strategies and actions that are detailed in the NCCMSAP. The mitigation landscape is dynamic and actions to 2030 must be extended to reach the long-term objective of net-zero carbon society. Hence, the following enabling factors underpin a forward looking approach to decarbonisation in the Republic of Mauritius, as well as supporting the country to respond to the requirements of the Paris Agreement.

2.2.1 Legal and Institutional Arrangements

The Climate Change Act 2020 makes provisions for institutional arrangements, mainly at the national level, for carrying out stakeholder coordination related to climate change. It also broadly lists the roles and responsibilities of stakeholders. In order to foster the Principles of subsidiarity and inclusiveness (Rio

Principle 10[21]) and partnerships (Rio Principle 27[22]), and to operationalise the roles and responsibilities of stakeholders as per the requirements of the Paris Agreement, **Table 2** proposes Strategies and Actions to improve the national climate governance discussed above. Institutional arrangements should allow for stakeholders to be coordinated in two distinct processes, namely: (i) processes related to UNFCCC initiatives (e.g. national communications, biennial transparency reports and nationally determined contributions) that are under the oversight of the CCC; and (ii) processes related to the formulation of sectoral mitigation strategies and action plans. Plans to engage stakeholders in the two processes are likely to be distinct as well.

Table 2. Strategies and Actions for strengthening national climate governance.

LEGAL AND INSTITUTIONAL (LI) ARRANGEMENTS				
	Strategy	**Action**	**Time Frame**	**Owner**
LI1	Improved legal framework for enhanced climate governance	**LI1.1.** Update the Climate Change Act 2020 and associated legislations using an adaptive management approach based on lessons learned on its application	Ongoing	MESWMCC, DCC
		LI1.2. Strengthen laws & regulations such as creating legal code for defining the responsibilities of main emitters, introduction of extended producer responsibility, and adoption of novel market-based tools to support mitigation actions	Ongoing	MESWMCC, DCC
		LI1.3. Update the National Code of Corporate Governance 2016 for public interest entities to explicitly integrate climate risks analysis	2023-2024	Ministry of Financial Services and Good Governance (MFSGG)
LI2	Improving stakeholder coordination for climate inclusiveness	**LI2.1.** Operationalise Sectoral Guidelines for supporting institutions to carry out their obligations, and roles and responsibilities	2022 - 2025	DCC & institutional stakeholders
		LI2.2. Establish a work programme under the aegis of the CCC that will culminate in the setting up of a formal institutional mechanism for taking the views of children and youth in public decision-making related to climate change	2022 - 2023	CCC
		LI2.3. Provide technical support to stakeholders to fulfill their respective roles and responsibilities in relation to Operational Guidelines (LI2.1)	2022 - 2024	DCC & institutional stakeholders
		LI2.4. Support provided to institutional stakeholders to implement the Stakeholder Engagement Plan (SEP) for engaging all key stakeholders for the formulation of sectoral mitigation strategies, action plans and projects/programmes	2022 - 2024	DCC & institutional stakeholders

[21] Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided

[22] States and people shall co-operate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

LI3	Institutional strengthening of public institutions to integrate the function of climate change	**LI3.1.** Identify human resources needs and technical capacity needs of institutional stakeholders to implement provisions of the CCA 2020	2022	DCC & institutional stakeholders
		LI3.2. Scale up efforts to establish and operationalise Climate Change Units / Focal Points in public and private institutions	2022 - 2024	DCC & institutional stakeholders
		LI3.3. Training provided to policy makers on Integrated Policy Planning for mainstreaming climate change mitigation in sectoral policies, strategies and action plans.	2022 - 2024	DCC & institutional stakeholders
		LI3.4. Establish a formal Scientific Advisory Body to the Inter-Ministerial Council to enhance the science-policy interface	2022	MESWMCC; DCC
LI4	Institutional strengthening for enhanced regional and international climate dialogues	**LI4.1.** Establish a work programme under the aegis of the CCC that will enhance the capacity of Mauritius to contribute to regional and international climate dialogues for enhanced climate governance	2025	CCC

Source: Author's elaboration

2.2.2 Technology Transfer and Financing

The process to achieving the long-term objective is dynamic, implying that there will be a constant need to review, revise and update the NCCMSAP. Two important aspects of this process are: (i) to scan for technological change; and (ii) to mobilise sufficient financial resources for implementation. Please note that the investment plan for the NCCMSAP is detailed in section 10. The Strategies and Actions addressing the provisions made under Article 10 (technology development and transfer) and Article 9 (financing) of the Paris Agreement are given in **Table 3** and **Table 4**, respectively.

Table 3. Strategies and Actions for Technology Transfer.

TECHNOLOGY DEVELOPMENT AND TRANSFER (TT)				
	Strategy	**Action**	**Time Frame**	**Owner**
TT1	Developing and updating Technology Action Plans (TAPs)	**TT1.1.** Apply the Guidelines for identifying and prioritising mitigation technologies in all emitting sectors using a participatory, inclusive multi-stakeholder process	2022-2030	DCC; institutional stakeholders
		TT1.2. Carry out barriers analysis and detail the enabling environment for prioritized technologies	2022-2030	DCC; institutional stakeholders
		TT1.3. Develop Technology Action Plans (TAPs) and use them to formulate bankable proposals to attract international climate finance and funding from development partners, and to update sectoral strategies and action plans	2022-2030	DCC; institutional stakeholders
		TT1.4. Update TAPs on a regular basis to inform the formulation of higher level ambition NDCs and the continuing effort to attract climate finance	2022-2030	DCC; institutional stakeholders
TT2	Institutional and human capacity strengthening	**TT2.1.** Capacity building on the Technology Needs Assessment (TNA) methodology and tools	2022 - 2024	DCC
		TT2.2. Institutionalisation of TNA methodology and tools to develop TAPs through application of the Sector Guidelines (LI3.1)	2022 - 2024	DCC; institutional stakeholders

	for TT action planning			

Source: Author's elaboration

Table 4. Strategies and Actions for Climate Financing.

FINANCING (F)				
	Strategy	**Action**	**Time Frame**	**Owner**
F1	Institutionalising direct access and tracking flows of climate finance	**F1.1.** Implement budget tags and codes for tracking the allocation of climate finance in national budgetary process (including Funds related to CC such as the National Environment and Climate Change Fund, disaster funds)	2022-2024	MFEPD
		F1.2. Establish and operationalise National Implementing Entity (NIE) for direct access to multilateral climate funds as per Section 24 of CCA 2020	2022 - 2024	MFEPD; MESWMCC; Mauritius Renewable Energy Agency (MARENA)
F2	Institutional and human capacity strengthening for accessing international climate finance	**F2.1.** Develop a Climate Finance Policy and Strategy Framework (including a national Work Programme that identifies and prioritises projects/programmes for financial resources mobilisation)	2022 - 2023	MFEPD; DCC
		F2.2. Enhance human capacity (public, private, civil society and non-profit organisations, academia) to develop bankable proposals to attract international climate finance from multilateral (e.g. Green Climate Fund) and bilateral sources (a learning-by-doing approach is preferred)	ongoing	MFEPD; DCC; institutional stakeholders
		F2.3. Develop a pipeline of concept notes and proposals to increase preparedness to attract climate finance based on country priorities (sections 2 to 8 and TT1.3)	ongoing	MFEPD; DCC; institutional stakeholders
		F2.4. Strengthen donor / development partner coordination to match concept notes and proposals with potential sources of climate finance	ongoing	MFEPD; Ministry of Foreign Affairs, Regional Integration and International Trade (MFARIIT)
		F2.5. Leverage private sector participation and investments through public-private engagements	ongoing	MFEPD; DCC; BM

Source: Author's elaboration

2.2.3 Education and Research, Awareness Raising, and Role of Media

Climate change is a fast evolving area that requires adaptive education at all levels. Research on all aspects of climate change can provide a scientific basis for informed decision-making. As per the Mauritius Meteorological Services (MMS) Act 2019, the MMS has the mandate to promote education,

sensitization and awareness on weather and climate. Also, all stakeholders in the country have an influence on emissions of greenhouse gases, and they are, in turn, impacted by decisions that are taken to reduce emissions. Consequently, outreach activities on climate mitigation are necessary and reflective of an inclusive approach to achieving the long-term objective of net-zero carbon society. In this process, media outlets constitute a key group of stakeholders. **Table 5** gives the Strategies and Actions related to these elements of climate change mitigation.

Table 5. Strategies and Actions for Education and Research, Awareness Raising, and Role of Media.

EDUCATION AND RESEARCH (ER)				
	Strategy	**Action**	**Time Frame**	**Owner**
ER1	Integrating climate change in educational curricula at all levels	**ER1.1.** Strengthen the integration of the science of climate change, climate change mitigation in primary and secondary school curricula, including adequate pedagogical tools for learning-by-doing and interactive approaches	Ongoing	Ministry of Education, Tertiary Education, Science and Technology (METEST); Mauritius Institute of Education (MIE); MMS; DCC
		ER1.2. Support the development of undergraduate and postgraduate courses in areas of climate change mitigation where gaps exist	Ongoing	METEST; Higher Education Commission (HEC); Higher Education Institutions (HEIs); MMS; DCC
		ER1.3. Review and update / develop vocational training courses for supporting climate change mitigation based on needs gaps analyses, in conjunction with the private sector	Ongoing	METEST; Mauritius Institute of Training and Development (MITD); DCC
		ER1.4. Support the establishment of environmental clubs within schools at all levels to incentivise students to participate in climate mitigation actions	Ongoing	METEST; MESWMCC; Service Diocésain de L'Éducation Catholique (SEDEC)
ER2	Enhance the science-policy interface for evidence-based public policy	**ER2.1.** Support provided to tertiary institutions for the development of transdisciplinary approaches to climate science, mitigation scenarios analyses and technology development and transfer to support the science-policy interface through the Scientific Advisory Body (see LI3.4).	Ongoing	DCC; HEIs; METEST

	decision-making	Data sharing for the purpose of research to support the science-policy interface will also be facilitated.		
		ER2.2. Support to establish collaborations between local research institutions and regional and international counterparts to strengthen local institutional capabilities in all aspects of climate research, including mobilisation of regional and international research funding	Ongoing	DCC; HEIs; METEST; MARENA
		ER2.3. Establish dedicated priority funding for research on climate change in support of the science-policy interface	2023 onwards	HEC; Mauritius Research and Innovation Council (MRIC); DCC
AWARENESS RAISING (AR)				
AR1	Communication strategy on stakeholder outreach	**AR1.1.** Develop a communication strategy based on the Stakeholder Engagement Plan (SEP) and Gender and Youth Action Plan developed at LI3.2 and GY1.2, respectively.	2023-2024	DCC; Ministry of Gender Equality and Family Welfare (MGEFW); Ministry of Youth Empowerment, Sports and Recreation (MYESR)
		AR1.2. Carry out outreach activities to cover communication and awareness raising on all climate-related issues with stakeholders at all levels	Ongoing	DCC
AR2	Building partnerships for enhancing awareness on climate issues	**AR2.1.** Build partnerships between public, private, NGOs and CSOs to deliver the most effective and efficiency sensitisation campaigns at all levels	Ongoing	DCC
		AR2.2. Awareness raising among policy makers, parliamentarians and legislators to enhance cross-sectoral integration of climate mitigation in public policies.	Ongoing	DCC
CONTRIBUTION OF MEDIA (ME)				
ME1	Enhancing the role of the media as a conduit between decision makers and all stakeholders	**ME1.1.** Capacity building of journalists and influencers on the science of climate change, mitigation scenarios, and the sustainable development benefits of mitigation	Ongoing	DCC
		ME1.2. Establish focal points in traditional media outlets and engage them on a regular basis to communicate on all climate-related initiatives	2022	DCC
		ME1.3. Enhance capacity of government to utilise emerging digital media platforms to carry out large-scale outreach activities related to climate change to reach all stakeholders	2022 - 2023	Ministry of Information Technology, Communication and Innovation (MITCI)
		ME1.4. Government to ensure that appropriate media and outreach approaches are used to target children, young people and other vulnerable groups that do not have access to traditional media or digital media	Ongoing	DCC

Source: Author's elaboration

2.2.4 Gender, Children and Youth Mainstreaming

Women, children and youth form a significant segment of the population. A gendered approach to climate change is envisaged from a Human Rights approach. Also, children and youth are key stakeholders that are often neglected in climate change policy making despite the fact that it is known that future climate changes will become more severe. By virtue that long-term mitigation strategies are forward looking and spanning at least one generation (25-30 years), children and youth will be called upon to implement those strategies. Hence, it is equally important to include their interests and concerns in the strategic decision-making process. **Table 6** lists the Strategies and Actions for mainstreaming gender and youth in climate governance, which are additional to the strengthening of stakeholder inclusiveness (**Table 2**).

Table 6. Strategies and Actions for Gender, Children and Youth Mainstreaming.

GENDER, CHILDREN AND YOUTH (GY)				
	Policy	**Action**	**Time Frame**	**Owner**
GY1	Gender and youth mainstreaming in climate change	**GY1.1.** Carry out Gender, Children and Youth Analysis as part of baseline assessments when formulating sectoral climate mitigation strategies and projects/programmes in collaboration with relevant organisations	2023	MGEFW; MYESR; DCC
		GY1.2. Formulate Gender, Children and Youth Action Plan for all sectoral climate strategies and projects/programmes in collaboration with relevant organisations	2024	MGEFW; MYESR; DCC
GY2	Institutional and human capacity strengthening for gender and youth mainstreaming in climate change	**GY2.1.** Enhance the human capacity of with specialised focal person(s) dealing with gender, children and youth. Also, to propose best practices for institutional coordination in other institutions such as academia and private sector.	2022 onwards	MGEFW; MYESR; DCC; institutional stakeholders
		GY2.2. Capacity building of public and private institutions to carry out Gender and Youth Analysis, and to develop Gender, Children and Youth Action Plan for climate-related initiatives.	2023 onwards	MGEFW; MYESR; DCC; institutional stakeholders

Source: Author's elaboration

3 Energy Industries

3.1 Sectoral emission profile

The Energy Industries (EI) is related to the production of electricity from a combination of renewable and non-renewable energy sources. Since production is carried out to match consumption, electricity end-use efficiency (demand side management) is also included. The island of Mauritius has one electricity network comprised of a number of power plants and power units with a total of 849.1 MW installed capacity in 2021.[23] The distribution of installed generation capacities is listed in **Table 7** in terms of renewable and non-renewable production, and public (Central Electricity Board, CEB) and private (Independent Power Producer, IPP) generation. The largest share (668.4 MW) of electricity generation capacity is for thermal generation using fossil fuels (Heavy Fuel Oil, HFO and coal) and renewable biomass in the form of bagasse. Thermal generation using Landfill Gas is relatively small at 3.45 MW. The combined installed capacity of photovoltaic (PV), wind and hydroelectric generation was 177.195 MW.

Table 7. Installed power generation capacity in Mauritius, 2021 (MW).

Producer	Thermal (HFO)	Thermal (Coal and bagasse)	Thermal (LFG)	PV	Wind	Hydro
CEB	438.0	-	-	5.165	-	60.5
IPP	-	230.40	3.45	102.18	9.35	-

Source: Author's elaboration using data from Energy and Water Statistics - 2021

The effective plant capacity was 760.9 MW in 2021 when peak demand reached 470.8 MW. It is observed that the peak demand was 507.2 MW in 2019. The baseline year of 2019 has been used for mitigation scenario analysis as it provides a more realistic baseline for electricity production compared to 2020 and 2021 when the generation and consumption of electricity were affected by Covid-19.

The Energy Industries is the single largest source of GHG emissions in Mauritius. In 2019, it contributed ~2,450 $ktCO_{2e}$ - i.e. just over 57% of national emissions.[24] In Mauritius, there is a relatively high share of renewable electricity generation. Of the 3,192.5 GWh generated in 2019, 259.3 GWh was generated using non-biomass renewable energy technologies, hydro (98.6 GWh), wind (12.9 GWh), photovoltaic (128.0 GWh) and landfill gas (19.8 GWh). A further 439.6 GWh of electricity was generated from the combustion of bagasse that is a renewable biomass. Hence, around 21.9% of total electricity generated in Mauritius was from renewable energy sources. Except for hydropower and some PV that is generated by the Central Electricity Board (CEB), the remaining renewable electricity was generated by Independent Power Producers (IPPs). In 2019, the CEB and the IPPs generated 44.4% and 55.6% of total electricity in Mauritius.[25]

The non-renewable electricity was produced from thermal energy sources, including heavy fuel and diesel oil (1,349 GWh or 41.7% of electricity), and coal (1,174 GWh or 36.3% of electricity), which constitute the sources of GHG emissions.[26] The fuel input for thermal generation of electricity was 1,904.12 kilotonne in 2019, with the largest share (47.9%) and the smallest share (0.1%) going to coal and diesel oil, respectively (**Figure 4**).

[23] Statistics Mauritius. 2022. Energy and Water Statistics – 2021, Ministry of Finance, Economic Planning and Development, Mauritius.
[24] Statistics Mauritius, 2020. Environment Statistics – 2019, Ministry of Finance, Economic Planning and Development, Mauritius.
[25] Statistics Mauritius. 2022. Energy and Water Statistics – 2021, Ministry of Finance, Economic Planning and Development, Mauritius.
[26] Statistics Mauritius, 2020. Energy and Water Statistics – 2019, Ministry of Finance, Economic Planning and Development, Mauritius; Statistics Mauritius, 2022. Digest of Statistics Rodrigues – 2021, Ministry of Finance, Economic Planning and Development, Mauritius.

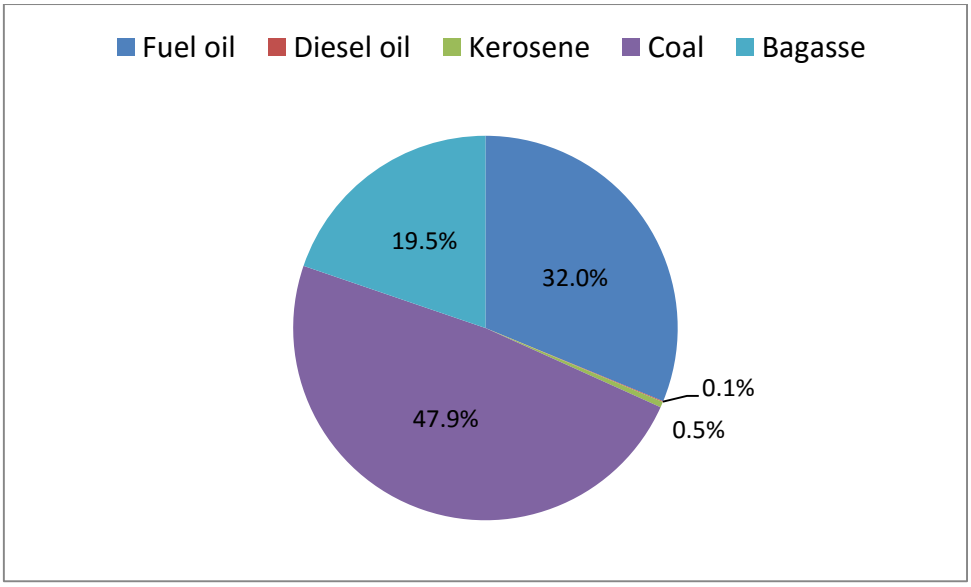


Figure 4. Fuel input for thermal generation, 2019 (%).
(*Source: Author's elaboration using data from Energy and Water Statistics – 2021*)

3.2 Sectoral strategies and targets

The sectoral strategies and targets underpinning low-carbon development in the EI are aligned with those reported in the updated NDC. The key mitigation objective by 2030 is to reduce the overall greenhouse gas (GHG) emissions by 40% predominantly by increasing the share of energy generation from green sources to 60% (**Table 8**), including phasing-out the use of coal, and increasing economy-wide efficiency in electricity end-use by 10% relative to 2019.

Electricity production is planned according to the Renewable Energy Roadmap 2030 for the Electricity Sector – Review 2022[27] which has as main objectives:

- The establishment of the Green Energy Industry as an economic pillar of activity;
- An accelerated increase in the share of Renewable Energy in the electricity mix to 60% by 2030, including the phasing out of the use of coal in electricity generation before 2030.

The above objectives also take into account the electrification of the land transport sector, especially through the implementation of the 10 year Electric Vehicle Integration Roadmap for Mauritius.[28]

Table 8. New renewable energy capacity additions for electricity generation: 2021-2030.

Renewable energy technology	Incremental capacity (MW)
Solar PV (Utility)	29
Solar PV (Rooftop)	214
Solar PV (Floating PV)	32
Offshore wind	50
Marine renewables	20
Renewable energy from waste	10
Renewable Energy Hybrid Facility, REHF (solar PV + battery)	100

[27] MEPU, MARENA, CEB and EEMO (2022) Renewable Energy Roadmap 2030 for the Electricity Sector – Review 2022, Ministry of Energy and Public Utilities, Port Louis. The capacity additions and timeline for investments are already prioritised.
[28] EVConsult and Ecosis Ltd (2020) A 10 year Electric Vehicle Integration Roadmap for Mauritius.

REHF biomass	100
REHF small-scale	40
REHF (solar + wind + battery)	100
TOTAL	**695**

Source: Renewable Energy Roadmap 2030 for the Electricity Sector – Review 2022

3.3 Mitigation actions, enabling measures and finance needs

The mitigation actions are detailed in **Table 9** following the deployment of renewable energy sources contained in the Renewable Energy Roadmap 2030 for the Electricity Sector – Review 2022. It also includes an economy-wide target of 10% electricity end use efficiency as captured in the updated Nationally Determined Contribution (NDC).[29] The enabling measures and capital investment needs are given in **Table 10**. The capital investments required for the additional 695 MW of renewable energy installations to reach the objective of 60% renewables in the electricity mix by 2030 are taken from the Renewable Energy Roadmap 2030 for the Electricity Sector – Review 2022. The modelled total GHG emission reductions expected by 2030 are 1,942 $ktCO_{2e}$ relative to the BAU. The total investment cost for mitigation actions for the Energy Industries is estimated at USD 1,745.03 million.

[29] Republic of Mauritius (2021) Update of the Nationally Determined Contribution of the Republic of Mauritius, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.

Table 9. Mitigation Strategies and Actions for Energy Industries.

Energy Industries, EI OUTCOME: Decarbonisation of the electricity system using renewable energies and demand side energy efficiency TARGET: Reduce emissions relative to BAU by 1,942 ktCO2e in 2030				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
EI1	Promote end-use energy efficiency [234 ktCO2e ER]	EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030 (baseline 2019)	2022 - 2030	Energy Efficiency Management Office (EEMO)
EI2	Enhancing renewable energy sources in the electricity mix with completed phase out of coal before 2030 [60% RE in 2030] [1,708 ktCO2e ER]	EI2.1. Installation of additional 29 MW utility scale PV	2022 - 2026	Ministry of Energy and Public Utilities (MEPU); CEB; MARENA; Private Sector (PS)
		EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions)	2022 - 2026	MEPU; CEB; MARENA; PS
		EI2.3. Installation of additional 32 MW floating solar PV	2023 - 2026	MEPU; CEB; MARENA; PS
		EI2.4. Increase biomass generation capacity by 100 MW (hybrid facility)	2021 - 2025	MEPU; CEB; MARENA; PS
		EI2.5. RE from waste project for 10 MW	2030	MEPU; CEB; SWMD, PS
		EI2.6. Installation of 50 MW off-shore wind energy	2026 - 2030	MEPU; CEB; Ministry of Blue Economy, Marine Resources, Fisheries and Shipping;

		EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal)	2026 - 2030	MEPU; Ministry of Blue Economy, Marine Resources, Fisheries and Shipping; CEB; MARENA; PS
		EI2.8. Installation of 100 MW new RE hybrid facility (solar + battery)	2026 - 2030	MEPU; CEB; MARENA; PS
		EI2.9. Installation of 40 MW new RE hybrid facility (small scale solar + battery)	2026 - 2030	MEPU; CEB; MARENA; PS
		EI2.10. Installation of 100 MW new RE hybrid facility (solar + wind + battery storage)	2026 - 2030	MEPU; CEB; MARENA; PS

Source : Author's elaboration

Table 10. Enabling measures and financing needs, Energy Industries.

Energy Industries, EI	
EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030	**USD 400 million**
• Measure 1.1.1. Establish energy efficiency (EE) Financing Scheme to promote commercial financing for EE projects in Small and Medium Enterprises (SMEs) and other companies • Measure 1.1.2. Establish EE Information Centre for awareness raising and provision of tailored technical information on EE technologies, opportunities, costs, suppliers and energy audits by an EE Information Centre • Measure 1.1.3. Development of an Energy Information System • Measure 1.1.4. Implementation of energy efficiency measures in building envelope • Measure 1.1.5. Financial incentives for retrofits (appliance and building envelope) for targeted groups • Measure 1.1.6. Building capacity of local installers (building envelope and systems) in the use of appropriate technologies for efficient use of energy in buildings • Measure 1.1.7. Implementation of Minimum Energy Performance Standards • Measure 1.1.8. The use of Building Energy Management Systems in hotels and service sector buildings • Measure 1.1.9. Introduce energy managers in all public buildings (with appropriate training) • Measure 1.1.10. Implementation of a programme to eliminate energy-inefficient lamps in outdoor lighting • Measure 1.1.11. Efficient energy use for water pumping at the Central Water Authority, Wastewater Management Authority and Irrigation Authority • Measure 1.1.12. Improving the Energy Use Intensity of primary, secondary and tertiary educational institutions • Measure 1.1.13. Use of mobile applications and artificial intelligence to promote EE	

EI2.1. Installation of additional 29 MW utility scale PV	**USD 11.75 million**
• Measure 2.1.1. Implementation of CEB's Green Field RE Scheme	
EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions)	**USD 120.70 million**
• Measure 2.2.1. Implementation of the Solar Home Project • Measure 2.2.2. Implementation of Small-Scale Distributed Generation (SSDG) Net-billing Scheme • Measure 2.2.3. Implementation of Solar PV Scheme of charging EVs • Measure 2.2.4. Implementation of Solar PV Scheme for Educational Institutions • Measure 2.2.5. Introduce second phase of Medium-Scale Distributed Generation (MSDG) Scheme • Measure 2.2.6. Implementation of SSDG Schemes for Cooperatives and SMEs	
EI2.3. Installation of additional 32 MW floating solar PV	**USD 19.78 million**
• Measure 2.3.1. Implementation of 2 MW pilot at Tamarind Falls Reservoir (2023) that will then be scaled up thereafter	
EI2.4. Increase hybrid biomass generation capacity by 100 MW	**USD 325 million**
• Measure 2.4.1. Implementation of Biomass Framework	
EI2.5. RE from waste project for 10 MW	**USD 48.1 million**
• Undertake feasibility study for the implementation of waste to energy	
EI2.6. Installation of 50 MW off-shore wind energy	**USD 99.3 million**
• Undertake feasibility study for the implementation of off-shore wind energy	
EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal)	**USD 114.4 million**
• Undertake feasibility study for the implementation of marine renewables (wave and/or tidal)	
EI2.8. Installation of 100 MW new RE Hybrid Facility (solar + battery)	**USD 145 million**
• Measure 2.8.1. Launching of Request for Proposal for RE Hybrid Facility • Measure 2.8.2. Signing of Power Purchase Agreement	
EI2.9. Installation of 40 MW new RE Hybrid Facility (small scale solar + battery)	**USD 200 million**
• Measure 2.9.1. Launching of Request for Proposal for RE Hybrid Facility • Measure 2.9.2. Signing of Power Purchase Agreement	
EI2.10. Installation of 100 MW new RE Hybrid Facility (solar + wind + battery storage)	**USD 261 million**
• Measure 2.10.1. Launching of Request for Proposal for RE Hybrid Facility • Measure 2.10.2. Signing of Power Purchase Agreement	
<u>Cross-cutting measures supporting EI2 (CcME)</u> • CcME 1: Grid reinforcement using Battery Energy Storage System, Automatic Generation Control, Advanced Distribution Management System, and Advanced Metering Infrastructure and installation of Gas Insulated Switchgear Substations • CcME 2: Full operationalisation of the Utility Regulatory Authority • CcME 3: Continued application of existing fiscal incentives to promote renewables • CcME 4: Operationalisation of new Renewable Energy Generation Schemes to promote solar PV (e.g. smart cities) • CcME 5: Measure 3.2.3. Implementation of the Biomass Framework	

- CcME 6: Carry out feasibility study of substituting coal with locally-grown renewable woody biomass
- CcME 7: Cost benefit analysis of increased penetration of variable REs with alternative storage technologies

Source: Author's elaboration

3.4 Mitigation scenarios

The impact of the mitigation strategies and actions (**Table 9**) on emissions reductions in the Energy Industries is shown in **Figure 5**. The scenarios take into account the effect of COVID-19 on electricity consumption in 2020 and 2021.[30] The mitigation strategies are implemented sequentially relative to a business-as-usual (BAU) scenario that includes the adoption of electric vehicles.[31] The share of renewables in the electricity mix increases from 18% (BAU) to ~20% (10% energy efficiency) to ~63% with complete coal phase-out by 2030, on a base case scenario. Whereas electrification of land transport results in an increase in electricity use, it does not influence GHG emissions. In 2030, the BAU emissions are 3.04 $MtCO_2$. As expected, the progressive implementation of energy efficiency and renewable energies (RE) with coal phase out reduces the emissions of GHGs as shown in **Figure** 5. In 2030, Energy efficiency (EE) gains in the electricity sector yield 0.23 $MtCO_{2e}$ emission reductions, and the combination of EE and RE, including coal phase out, yields a total reduction of 1.9 $MtCO_{2e}$ (**Table 11**).

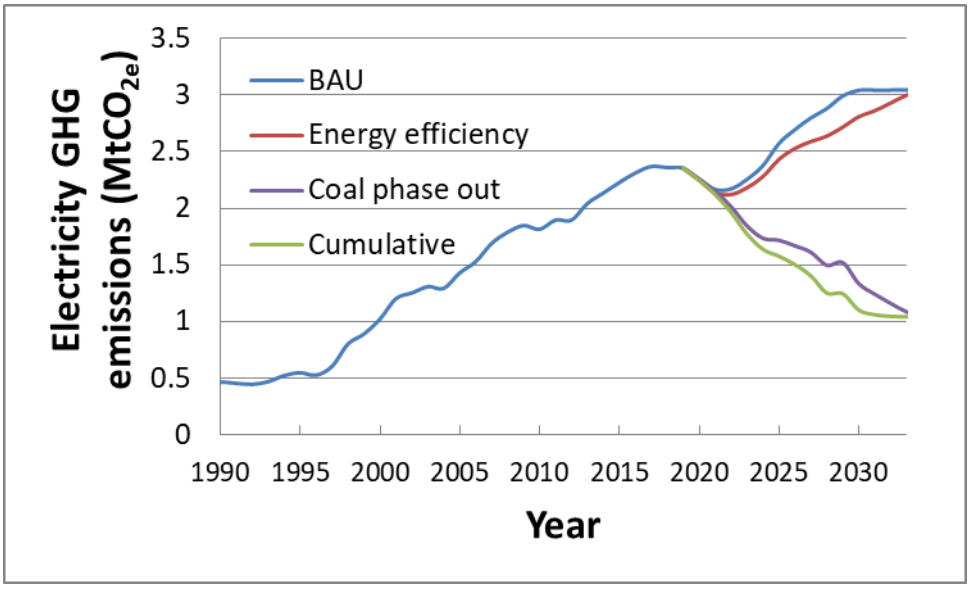


Figure 5. GHG emissions scenarios for energy industries.
(*Source: Author's elaboration*)

Table 11. Emission reductions in the energy industries relative to the BAU case, GgCO2e or ktCO2e.

Relative to BAU	2022	2030
Energy efficiency	0	234
Renewable energies (including coal phase out)	0	1,708
Cumulative effect	0	1,942

Source: Author's elaboration

[30] An intermediate pace of the recovery, with GDP growth reaching pre-crisis levels in 2022 and staying slightly higher thereafter as a result of the push created by economic stimulus measures, with GDP aligning with pre-crisis expectations by 2030.

[31] As per guidance received from the Ministry of Energy and Public Utilities, the medium market growth trajectory for electric vehicles (EVs) has been adopted with EVs comprising 26,000 units in 2030.

4 Land Transport

4.1 Sectoral emission profile

The land transport sector is the second largest contributor of GHGs in Mauritius, accounting for 1,132 $ktCO_{2e}$ in 2019.[32] A significant aspect of emissions from the land transport sector is that they are increasing at a Compound Average Growth Rate (CAGR) of 2.4% between 2010 and 2019 compared to 1.9% between 2005 and 2010. The increase in land transport emissions is directly related to the utilization of motorized modes of transport. The historical increase in the number of registered vehicles is shown in **Figure 6** for Mauritius. The park of registered vehicles has increased at a compound annual growth rate (CAGR) of 6.16% between 1987[33] and 2019 (pre-Covid19 baseline year). The growth rates between 2000 and 2009 and between 2010 and 2019 were 3.64% and 4.70%, respectively, indicating a relative increase in new vehicle additions over the most recent pre-Covid19 years.

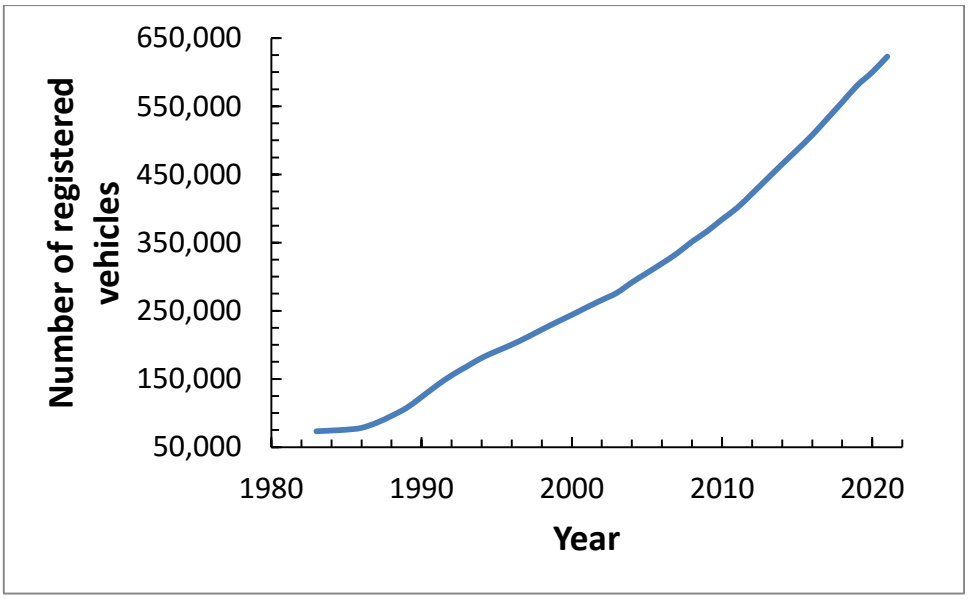


Figure 6. Number of registered cars in Mauritius: 1981-2021.
(*Source: Author's elaboration using statistical data from Road Transport and Road Accident Statistics Historical Series 1980-2020 and Road Transport and Road Accident Statistics – 2021*)

In 2021, ownership of motorised vehicles for private passenger transport (car, auto cycle and motor cycle) constituted 81.3% (i.e. 506,629 vehicles out of a total of 622,988 registered vehicles) of the total park of vehicles, while 16.9% of vehicles (1.e. 105,781 vehicles) included dual purpose vehicle, lorry and truck, double cab pickup and van. The public transport system was serviced by 3,151 buses, representing around 0.5% of the total number of registered vehicles. The remaining 1.3% was comprised of heavy vehicles such as tractors, prime movers and road rollers. There is an almost linear relationship between the number of registered vehicles and economic performance.[34] All else being

[32] Statistics Mauritius, 2020. Environment Statistics –2019, Ministry of Finance and Economic Development, Mauritius.

[33] The year used to mark the onset of an increase in number of registered vehicles.

[34] A linear regression to data points corresponding to the years 2001 and 2019 has $r^2 = 0.99$ (95% confidence interval) as shown in PNK Deenapanray, N Khadun (2021) Land transport greenhouse gas emission scenarios for Mauritius based on modelling transport demand, Interdisciplinary Perspectives in Transportation Research **9**, 100299. A similar trend has been found in both developed and developing countries, including small island developing states.

equal, the increasing trend in **Figure 6** can be expected to continue on its linear growth as economic output grows in the future.

The land transport sector is heavily dependent on imported fossil fuels, namely gasoline and diesel oil. The land transport energy consumption and its share in the total energy consumption of Mauritius are shown in **Figure 7**. In 2019 (the pre-Covid19 base year), energy consumption reached its historical maximum of 552 ktoe corresponding to 54.3% of all final energy consumption. Consequently, land transport contributes proportionally to the country's energy bill (Rs 35,848 million) that stood at 18% of the total imports bill of Mauritius.[35] This economic burden will only increase with fossil fuel price inflation arising from supply chain disruptions and global geopolitical concerns.

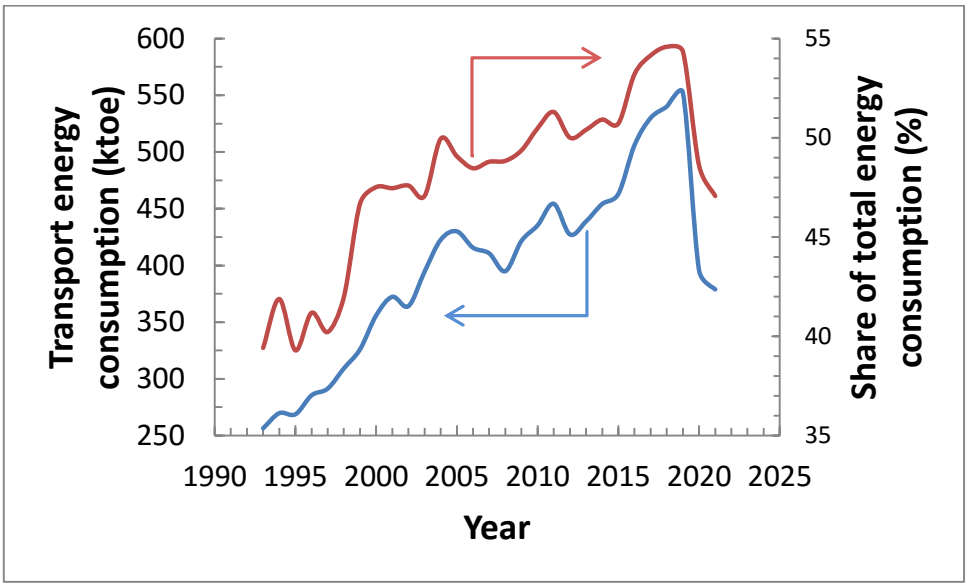


Figure 7. Transport energy consumption, ktoe (left); share of total energy consumption, % (right). (*Source: Author's elaboration using statistical data from Road Transport and Road Accident Statistics Historical Series 1980-2020 and Road Transport and Road Accident Statistics – 2021*)

4.2 Sectoral strategies and targets

With an increase in travel demand, rising incomes and availability of cheaper vehicles, the level of GHGs from land transport will continue to increase in the coming decades unless strict measures are put in place to contain the transport demand.[36] Except for electric vehicles (private cars and light rail), there is currently no policy, strategy and action plan for land transport that can be used to develop low-carbon scenarios.[37] Hence, mitigation strategies and targets were identified using multi-stakeholder engagements as listed in **Table 12**. They are based on a combination of ongoing government objectives and projects that seemed promising and practicable based on the expert judgement of the technical bodies operating under the aegis of the Ministry of Land Transport and Light Rail (MLTLR).

[35] Statistics Mauritius, 2020b. Energy and Water Statistics – 2019, Ministry of Finance and Economic Development, Mauritius.
[36] PNK Deenapanray, N Khadun (2021) Land transport greenhouse gas emission scenarios for Mauritius based on modelling transport demand, Interdisciplinary Perspectives in Transportation Research **9**, 100299.
[37] PNK Deenapanray and FA Canu. 2021. *MRV Baseline Analysis*. Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.

Table 12. Mitigation strategies for land transport.

<table>
<tr><th>Strategies</th><th>Description of mitigation actions and targets</th></tr>
<tr><td>Strategy 1: Vehicle fuel intensity improvements</td><td>Improvements in the fuel intensity of vehicles (applied to all vehicles) at the rate of 0.5% per year between 2022 and 2030, decreasing to 0.25% per year after 2030. This scenario was identified for two reasons, namely: (1) technological improvements would result in new vehicles having better fuel economies; and (2) investments in increasing the carrying capacity of road network. The decrease in efficiency gains is related to the rebound effect of a stimulation in passenger transport demand, result in traffic decongestion in the medium-to-long term.[38]</td></tr>
<tr><td>Strategy 2: Efficiency gains at peak travel time</td><td>The Traffic Management and Road Safety Unit (TMRSU) has identified a number of measures that will help decongestion at peak hours in selected geographic areas. All the measures were modelled except the one related to ‘Telecommuting’.[39]</td></tr>
<tr><td>Strategy 3: A bundle of low-carbon technological options</td><td>A combination of two low-carbon transport technologies has been modelled:
i) hybrid cars;
ii) electric cars.[40]
Hybrid and electric cars are expected to replace conventional gasoline-powered cars. The percentage annual increases of the share of hybrid and electric cars in the total passenger travel demand are listed below. Hybrid and electric cars accounted for 1.43% and 0.00%, respectively, of total passenger travel demand in 2019. The travel demand[41] used for the two technologies are listed in the table below.
<table>
<tr><th>Time period</th><th>Travel demand Hybrid (%)</th><th>Travel demand Electric (%)</th></tr>
<tr><td>2020</td><td>2.06</td><td>0</td></tr>
<tr><td>2025</td><td>4.46</td><td>1.5</td></tr>
<tr><td>2030</td><td>8.31</td><td>4.5</td></tr>
<tr><td>2035</td><td>13.31</td><td>8.25</td></tr>
<tr><td>2040</td><td>20.81</td><td>13.25</td></tr>
<tr><td>2045</td><td>30.81</td><td>19.5</td></tr>
<tr><td>2050</td><td>43.31</td><td>27.0</td></tr>
</table></td></tr>
<tr><td>Strategy 4: Light Rail System (LRS)</td><td>The LRS is expected to generate modal shift away from private cars and buses along the Curepipe – Port Louis corridor. Implementation of the LRS started in 2018 with a first tranche operational between Port Louis and Rose Hill at the end of December 2019. It is assumed that the Curepipe – Port Louis line will be fully operational by the end of 2022. 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:</td></tr>
</table>

[38] The results in Deenapanray and Khadun (2021) have revealed the influence of the rebound effect. The parameters used are assumptions that are lower than were previously used in order not to overestimate GHG emission reductions. More research is required to quantity the rebound effect arising from efficiency gains in land transport.

[39] Travel demand management through telecommuting is expected to generate relatively high reductions in travel demand, and therefore in fossil fuel combustion. If not implemented, its inclusion in the mitigation analysis for Scenario 3 would give an overestimation of GHG emission reductions that would violate the Conservativeness Principle of carbon accounting.

[40] Aligned with the medium trajectory in ‘EVConsult and Ecosis Ltd (2020) A 10 year electric vehicle integration roadmap for Mauritius’, which is the same as used for mitigation scenario modelling in the Energy Industries.

[41] Fuel use and emissions reductions in land transport are done by modeling passenger and freight travel demand. For passenger travel this is done in units of passenger kilometer per year (PAX.km/year); for freight it is done in units of tonne kilometer per year (tonne.km/year).

	2020: Cars - 109,540,000 km; Buses – 10,547,000 km; 2028: Cars - 107,204,000 km; Buses – 10,836,000 km; 2038: Cars - 115,300,000 km; Buses – 11,330,000 km; The above data is not publicly available and was obtained by the NTA from the then Ministry of Public of Infrastructure and Land Transport. The above data were first converted into annual car and bus passenger travel demand using the passenger occupancy data. These car and bus passenger travel demands were then subtracted from the baseline scenario representing a modal shift towards the LRS. The reductions have been kept constant at their 2038 levels for the period 2039 to 2050 because of the unavailability of data. Also, 90% of the reduction in car passenger transport is attributed to gasoline-fueled cars, and the remaining 10% to diesel-fueled cars.

Source: Author's elaboration

4.3 Mitigation actions, enabling measures and finance needs

The mitigation actions are given in **Table 13** for the mitigation strategies that are identified in **Table 12**. The enabling measures and capital investment needs are given in **Table 14**. The investments required for implementing the mitigation actions for the Land Transport sector are estimated to be above USD 1,306.27 million. The expected total GHG emission reductions expected by 2030 are 74 $ktCO_{2e}$ relative to the BAU, which is related to the displacement of liquid fossil fuels used in land transport.

Table 13. Mitigation Strategies and Actions for Land Transport.

Land Transport, LT **OUTCOME: Towards a sustainable low-carbon land transport system in Mauritius** **TARGET: Reduce emissions relative to BAU by 74 ktCO2e in 2030**				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
LT 1	Improved fuel economy of vehicles [6.7 ktCO2e ER]	LT1.1. Increased fuel economy at a rate of 0.5% per year	2021 - 2030	MLTLR; TMRSU; Mauritius Standards Bureau (MSB); National Land Transport Authority (NLTA); EEMO; Mauritius Revenue Authority (MRA); Ministry of National Infrastructure & Community Development (MNICD) [Mechanical

				Engineering Section]
LT 2	Decreasing peak time congestion to improve traffic fluidity [5.3 ktCO2e ER]	LT2.1. High Occupancy Vehicles (HOV) lane for uninterrupted flow along M2	2025 - 2027	MLTLR; TMRSU
		LT2.2. Substituting single timing traffic signaling for ATCS to enhance real-time decision making	2022 - 2027	MLTLR; TMRSU
		LT2.3. Promoting active transportation	2021 – 2025	MLTLR; TMRSU
		LT2.4. Promoting car pooling	2022 - 2030	MLTLR; TMRSU
LT 3	Reducing consumption of fossil fuels through increased adoption of lower-carbon vehicles [34.5 ktCO2e ER]	LT3.1. Increasing the share of hybrid cars to 8.31% of total passenger travel demand in 2030	2021 - 2030	MLTLR; MFEPD; NLTA; MEPU; MNICD (Mechanical Engineering Section)
		LT3.2. Increasing the share of electric cars to 4.5% of total passenger travel demand in 2030	2021 - 2030	MLTLR; MFEPD; NLTA; MEPU; MNICD (Mechanical Engineering Section)
LT 4	Electrification of mass transit mode of passenger transport [27.5 ktCO2e ER]	LT4.1. Operationalisation of the Light Rail System between Curepipe and Port Louis[42]	2022	MLTLR; Metro Express Limited (MEL)

Source: Author's elaboration

Table 14. Enabling measures and financing needs, Land Transport.

Land Transport, LT	
LT1.1. Increased fuel economy at a rate of 0.5% per year	**USD 0.10 million**
• Measure 1.1.1. Natural decrease in engine fuel intensity due to technology evolution • Measure 1.1.2. Develop and implement a fiscal instrument for placing a higher import tax on high fuel intensity vehicles (applied in conjunction with Measure 1.1.3) • Measure 1.1.3. Implement Energy Efficiency Labelling of vehicles • Measure 1.1.4. Implement Energy Efficiency Labelling of tyres	
LT2.1. High Occupancy Vehicles (HOV) lane for uninterrupted flow along M2	**USD 20 million**

[42] It is pointed out that the aim of Government is to extend the light rail network in the years to come. For instance, the light rail would operate from Rose Hill to Réduit by the end of 2022 while the corridor would also be extended to St Pierre and Cote D'Or afterwards.

• Measure 2.1.1. Vissim traffic micro-simulation to build a micro-simulation network model • Measure 2.1.2. Provision of overpass, grade-separated junctions, adaptive traffic control systems (ATCS) and coordinated ATCS in identified congested áreas	
LT2.2. Substituting single timing traffic signaling for ATCS to enhance real-time decision making	**>USD 0.23 million**
• Measure 2.2.1. Use high speed broadband technology to support the implementation of an island-wide Intelligent Transport System	
LT2.3. Promoting active transportation	**>USD 4.56 million**
• Measure 2.3.1. Developing cycle networks in four towns (Rose Hill, Vacoas, Grand Baie, Flacq)	
LT2.4. Promoting car pooling	**No cost**
• Measure 2.4.1. Adoption of carpooling from Plaine Magnien to Port Louis on Motorway M1	
LT3.1. Increasing the share of hybrid cars to 8.31% of total passenger travel demand in 2030	**(USD 497.68 million)**
• Measure 3.1.1. Promote the socio-economic and financial benefits of hybrid cars • Measure 3.1.2. Implementation of the GEF-financed project on e-mobility	
LT3.2. Increasing the share of electric cars to 4.5% of total passenger travel demand in 2030	**USD 1,281.38 million**
• Measure 3.2.1. Promote the socio-economic and financial benefits of electric cars • Measure 3.2.2. Investments in battery charging infrastructure • Measure 3.2.3. Adopt financial and economic incentives to promote electric vehicles	
LT4.1. Operationalisation of the Light Rail System (Metro Express) between Curepipe and Port Louis	**USD 405 million (sunk cost)**

Source: Author's elaboration

4.4 Mitigation scenarios

The scenario modelling results are shown in **Figure 8**. In all scenarios recovery of land transport demand is 90% of its expected value without COVID-19 in 2021. All the scenarios are measured against the BAU simulation that shows a monotonic increase. Fuel efficiency gains from Strategies 1 and 2 are negligible, and, for practical purposes, they overlap with the BAU scenario. The penetration of hybrid and electric cars would generate the most GHG emission reductions, but the impacts are more pronounced in the medium-to-long term – i.e. post-2030. The amount of emission reductions produced by the mitigation scenarios, as well as the cumulative effect are summarised in **Table 15**. The reductions are not given for 2020 because of the masking effect of depressed travel demand and hence lower GHG emission due to the COVID-19 situation.

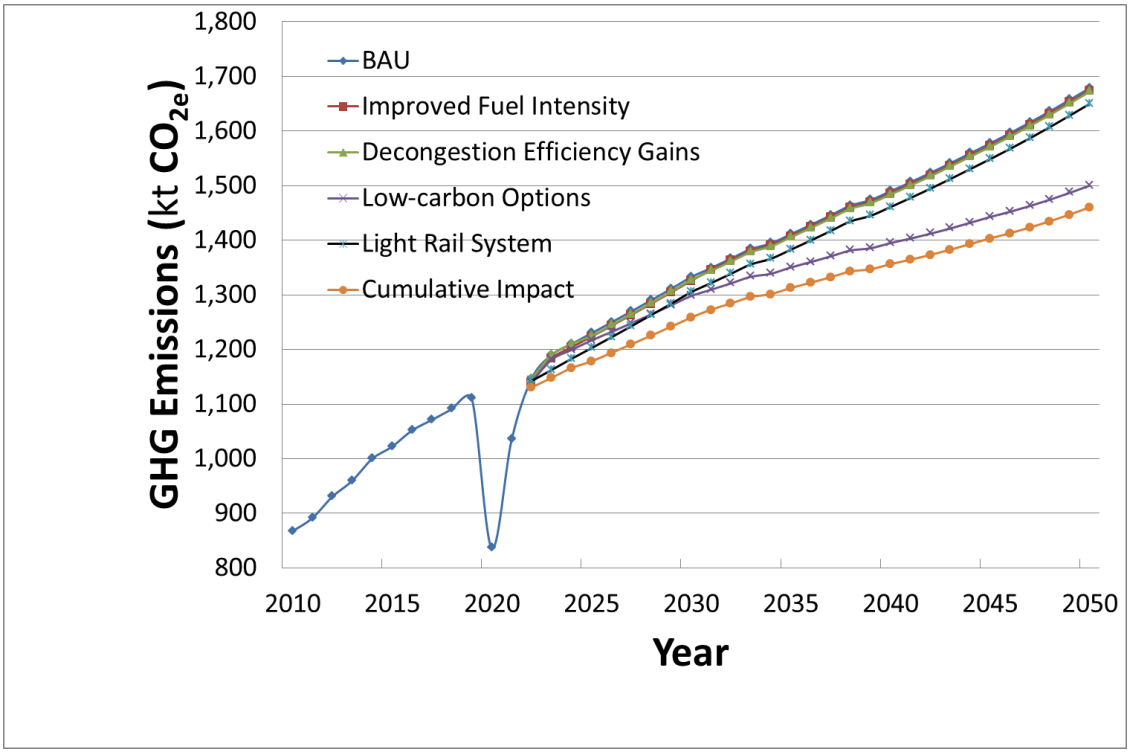


Figure 8. Mitigation scenarios for land transport.
(Source: Author's elaboration)

Table 15. Emission reductions in land transport relative to the BAU case, $GgCO_{2e}$ or $ktCO_{2e}$.

Relative to BAU	2022	2030	2040	2050
Improved fuel intensity	5.7	6.7	3.7	4.2
Efficiency gains	0.0	5.3	6.0	6.7
Low-carbon vehicles	6.0	34.5	94.7	178.5
Light Rail System	3.8	27.5	28.9	28.9
Cumulative effect	15.5	74.0	133.3	218.3

Source: Author's elaboration

5 Solid Waste Management

5.1 Sectoral emission profile

Solid Waste Management (SWM) is the largest emitter of methane arising from the engineered landfill at Mare Chicose. Compared to the National Inventory Report (NIR) produced under the Third National Communication (TNC), the inventory for GHG emissions from solid waste in the First Biennial Update Report (BUR1) has seen a decrease by around a factor 3.[43] Since the latest BUR1 inventory data is for 2016, analytical modelling (see 'Mitigation scenarios' below) has been used to estimate GHG emissions of around 392 $ktCO_{2e}$ in 2019. All else being equal, GHG emissions arising from SWM would

[43] Republic of Mauritius (2021) National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.

increase to 606 $ktCO_{2e}$ in 2030, representing an increase by 35.3% relative to 2019, and to 921 $ktCO_{2e}$ by 2050.

5.2 Sectoral strategies and targets

The Solid Waste Management Division (SWMD) of the MESWMCC is in the process of finalising a Strategic Plan for developing a circular waste economy in Mauritius. Under the business-as-usual scenario (**Figure 9**), the quantity of solid waste is expected to reach 647,930 tonnes per year in 2030. The bulk of this waste – i.e. 95% - would be destined for landfilling, and with the rest being recycled.

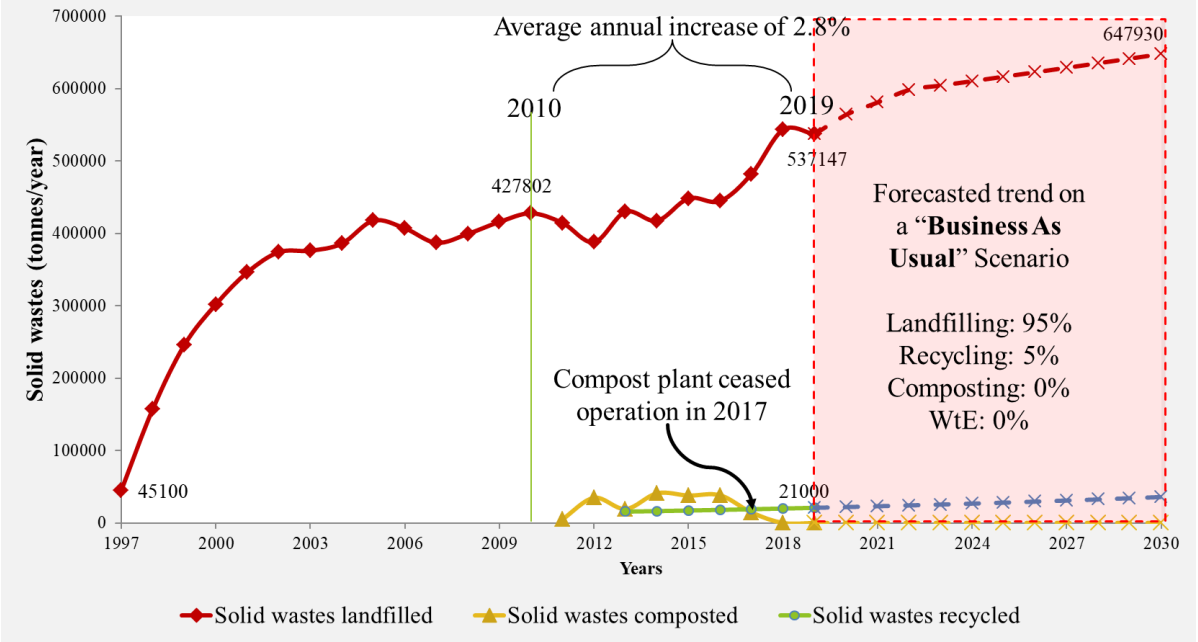


Figure 9. Evolution of solid waste generation and management under the BAU scenario. *(Source: Mr A. Beerachee. 2020. Solid Waste Management. Solid Waste Management Division, MESWMCC)*

For a more sustainable management of solid waste, including addressing the pressing issue of scarcity of land for landfilling of solid waste,[44] the SWMD has proposed four technological options for solid waste management between 2020 and 2030 (**Figure 10**).[45] These technological options can be used to develop mitigation scenarios to 2030, and consist of a combination of composting and anaerobic digestion of putrescible waste and waste recovery for recycling. Thermal waste-to-energy (WtE) will only be envisaged in the long-term if the need arises and subject to the outcome of a proper feasibility study and the setting-up of all legal and institutional frameworks.

[44] Neehaul, N., Jeetah, P. and Deenapanray, P.N.K., 2020. Energy recovery from municipal solid waste in Mauritius: Opportunities and challenges, *Environmental Development*, 33, 100489.
[45] Presentation made by Mr B. Beerachee, Ag. Director, SWMD on 17 December 2020 as part of the national dialogue on the formulation of the National Environment Policy.

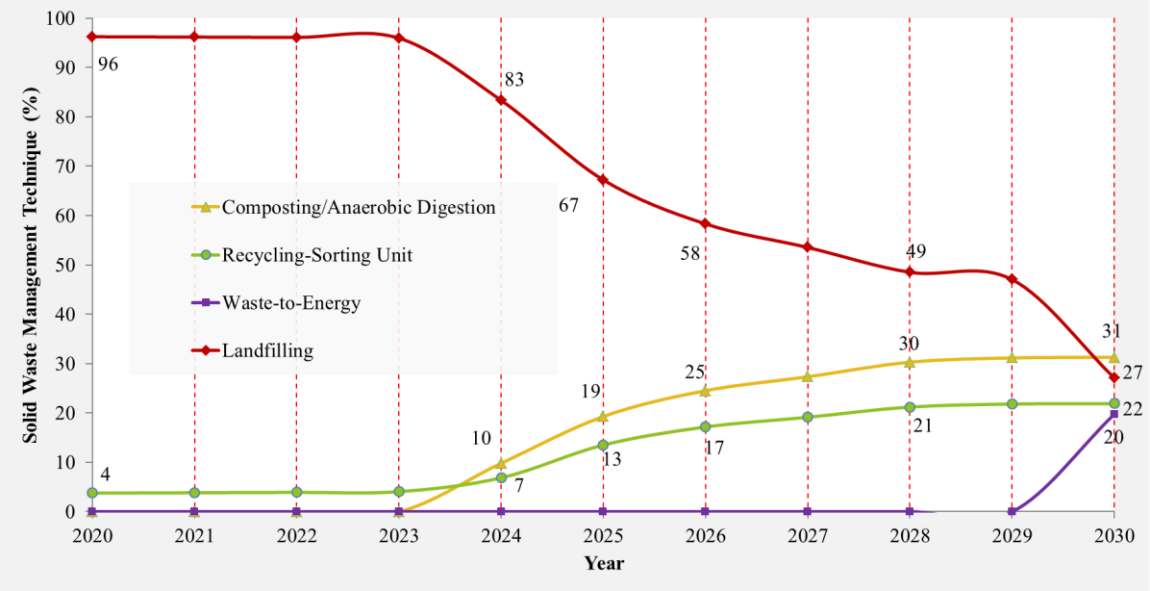


Figure 10. Technological options for solid waste management: 2020 - 2030.
(Source: Mr A. Beerachee. 2020. Solid Waste Management. Solid Waste Management Division, MESWMCC)

Three mitigation strategies have been identified for SWM as described below:

- Strategy 1: Increase in the quantity of solid waste that is composted or anaerobically digested as shown in Figure 10. It is assumed that solid waste diverted from the landfill will be comprised of 50% garden waste and 50% food waste;[46]
- Strategy 2: Increase in the quantity of waste that is recycled above the baseline value of 4% as shown in **Figure 10**. A mass balance exercise has been used to allocate different types of waste for recycling using latest breakdown of recycled waste for 2019/2020;[47] and
- Strategy 3: This includes the diversion of 20% of total solid wastes for a waste-to-energy (WTE) project in 2030. For the purposes of calculating avoided methane at landfill, a mass balance exercise was carried out to calculate the amount of organic waste that would be used for WTE. Over and above plastic waste, 3.35 Gg of paper waste and 2.14 Gg of wood waste are assumed to be diverted from landfilling.

5.3 Mitigation actions, enabling measures and finance needs

The mitigation actions for SWM related to the three mitigation strategies are given in **Table 16**. The corresponding enabling measures and capital investment needs are given in **Table 17**. The investments required for implementing the mitigation actions are estimated to be at least USD 16.3 million. The expected total GHG emission reductions expected from the three strategies by 2030 are 42.3 $ktCO_{2e}$ relative to the BAU, which is related to avoidance of methane emissions from landfill. Reductions in

[46] This assumption was arrived following discussions with the SWMD in order to keep recyclable and compost waste mutually exclusive (from a mass balance perspective). For instance, paper/carton and textiles wastes can be composted but would rather be recycled.
[47] It is assumed that 38% of paper and 16% of textiles wastes will be recycled.

emissions related to electricity generation (10 MW) from municipal solid waste are accounted under Energy Industries (**Table 9**).

Table 16. Mitigation Strategies and Actions for SWM.

SOLID WASTE MANAGEMENT (SWM) OUTCOME: Avoided emissions at landfill from a circular waste economy TARGET: Reduce emissions relative to BAU by 42.3 ktCO2e in 2030				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
SWM1	Composting of the putrescible fraction of solid waste [36.3 ktCO2e ER]	SWM1.1. Composting of 31% of municipal solid waste in 2030	2024 - 2030	SWMD; PS
SWM2	Recycling of municipal solid waste [5.8 ktCO2e ER]	SWM2.1. Recycling of 22% of municipal solid waste by 2030	2022 - 2030	SWMD; PS
SWM3	Energy recovery from municipal solid waste [0.2 ktCO2e ER]	SWM3.1. Twenty percent (20%) of municipal solid waste recovered for waste-to-energy	2030	SWMD; CEB; MEPU; PS

Source: Author's elaboration

Table 17. Enabling measures and financing needs, Solid Waste Management.

SOLID WASTE MANAGEMENT (SWM)	
SWM1.1. Composting of 31% of municipal solid waste in 2030	**USD 16.28 million**
• Measure 1.1.1. Recovery of 50% food waste (17.28 Gg) and 50% garden waste (34.13 Gg) in 2030	
SWM2.1. Recycling of 22% of municipal solid waste by 2030	**To be determined**
• Measure 2.1.1. Recovery of 8.36 % paper (9.72 Gg) and 3.52% textiles waste (1.44 Gg) in 2030	
SWM3.1. Twenty percent (20%) of municipal solid waste recovered for waste-to-energy • Recovery of 2.88 % paper (3.35 Gg) and 5.48% wood waste (2.14 Gg) in 2030	**No cost** (capital cost covered under Energy Industries)

Source: Author's elaboration

5.4 Mitigation scenarios

In order to align the mitigation analyses described below with historical data produced in the BUR1, all model parameters have been aligned with those used in the BUR1 up to 2020. The BAU situation assumes that landfilling and recycling of solid waste will continue at the same pace as it was in 2020. The quantity of waste is assumed to grow at 1.82% per year, which is the projected rate of waste generation assumed by the SWMD to 2030. The same rate of growth is used for the post-2030 timeline. All else being equal, the BAU scenario exhibits a monotonically increasing trend in emissions by 35.3% between 2019 and 2030. For the post-2030 mitigation scenarios, the percentage allocation of wastes given in **Figure 10** is frozen at their 2030 values.

The results of the mitigation scenario analyses are shown in **Figure 11** and the emission reductions accruing from the three strategies relative to the BAU situation are summarised in **Table 18**.

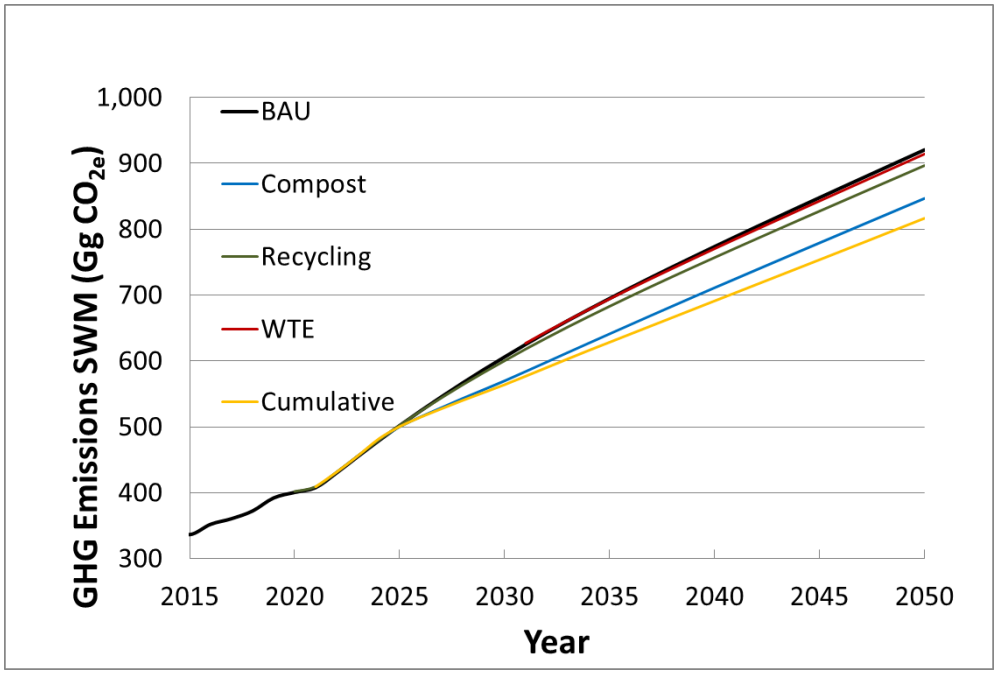


Figure 11. GHG emission scenarios for solid waste management.
(*Source: Author's elaboration*)

Table 18. Emission reductions relative to BAU scenario, $ktCO_{2e}$.

Relative to BAU	2020	2030	2040	2050
Composting/anaerobic disgestion	0.0	36.25	62.62	73.71
Recycling	0.0	5.80	16.66	23.79
WTE	0.0	0.2	3.27	6.33
Cumulative effect	0.0	42.05	82.55	103.83

Source: Author's elaboration

6 Wastewater Management

6.1 Sectoral emission profile

The main source of GHG emissions in Wastewater Management is methane. Data from BUR1 shows that total emissions from wastewater management has decreased from 206.37 ktCO2e in 2000 to 182.70 $ktCO_{2e}$ in 2016 (the most recent inventory year).[48] The inventory also revealed large uncertainties in emissions calculations because of large uncertainties in activity data.[49] Because of uncertainties in industrial wastewater treatment, the mitigation scenario analyses have focused on domestic wastewater treatment that is under the control of the Wastewater Management Authority (WMA). Regarding domestic wastewater management, historical emissions between 2006 and 2016 (using data from BUR1) have been fairly constant between 127.3 $ktCO_{2e}$ (2006) and 136 $ktCO_{2e}$ (2011).[50] This level of emission is similar to that from Agriculture (food crops and livestock) representing around 2% of national emissions. All else being equal, emissions were modelled (see 'Mitigation scenarios' below) to be around 132.6 $ktCO_{2e}$ in 2019, and increasing to 138.3 $ktCO_{2e}$ by 2030.

The WMA operates a wastewater management network comprised of 755 km of sewer lines and ten wastewater treatment plants that treat 132,000 m^3 of wastewater on a daily basis. As of July 2022, there were 81,454 registered customers (i.e. households) connected to the sewer system.[51] Details about the wastewater treatment plants are given in **Table 19**. The total flow design of the four large treatment plants is 170,500 m^3 per day. Taking into consideration the maximum average daily flow values given in **Table 19**, the four large treatment plants can accommodate at least an additional 36,000 m^3 of wastewater daily. The focus will be on extending the sewer network and to make use of the existing wastewater treatment plan tcapacity.

Table 19. Characteristics of wastewater treatment plants.

Treatment plant	Average actual flow (m^3/day)	Level of Treatment	Use of treated effluent
Montagne Jacquot	33,000 – 38,000	Advanced primary; influent undergoes coagulation and flocculation process followed by primary sedimentation; primary sludge extracted from the primary sedimentation tanks are thickened and dewatered in a belt filter press and stabilized with hydrated lime prior to landfilling.	Sea outfall
St Martin	55,000 – 59,000	Tertiary; the sludge generated from the primary settling tank and secondary treatment are thickened and undergo stabilization through anaerobic digestion; a Combined Heat & Power system for the heating of sludge for digestion and power generation; 65 MW is produced per month corresponding to about 20%-25% of the total plant energy consumption.	Irrigation of sugar cane and sea outfall
Grand Baie	2,000 – 2,500	Tertiary; treatment in three (3) stages at the plant comprising inter alia of the primary (aerated chamber to remove grease and grit), secondary (Activated Sludge Plant for nutrients removal) and tertiary treatment process (Disc Filters and Chlorination).	Irrigation of sugar cane and borehole injection

[48] Republic of Mauritius (2021) National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.
[49] The uncertainty in activity data for CH4 and N2O inventories was 107.35% and 95%, respectively. With an uncertainty of 42.43% for the emission factor, the combined uncertainty in CH4 emissions from wastewater was 115.43%.
[50] Ibid.
[51] https://www.wmamauritius.mu/ - accessed 18 November 2022.

Baie du Tombeau	33,000 – 38,000	Preliminary treatment whereby the influent undergoes grit removal and screening.	Sea outfall
Small treatment plants (total of 6)	270 – 550 Cumulative – 1,160	Secondary followed by chlorination	Leaching field

Source: https://www.wmamauritius.mu/treatment-plants/ - accessed 18 November 2022

6.2 Sectoral strategies and targets

Strategic development in Wastewater Management is geared towards large infrastructure projects related to household and commercial sewer connections. There is less emphasis on low-carbon water treatment technologies. Hence, for this sub-sector, only one mitigation strategy has been identified based on inputs from sector stakeholders. In the BAU scenario, sewer connectivity is expected to continue at the same relatively low pace as witnessed over the past 3-4 years – i.e. ~2,000 households per year. The penetration levels of the four wastewater treatment technologies are listed in **Table 20**. The technology utilisation levels for the period 2031 to 2050 are frozen at their 2030 values, and will have to be identified in future studies.

Table 20. BAU scenario level of utilisation of four wastewater treatment technologies (%).

Technology	2020	2030	2040	2050
Anaerobic digester	0.02	0.01	0.01	0.01
Septic system	0.94	0.97	0.97	0.97
Latrine	0.03	0.01	0.01	0.01
Aerobic system	0.01	0.01	0.01	0.01

Source: Author's elaboration

In the mitigation strategy, the level of utilisation of the four treatment methods is assumed to gradually shift towards the lower emission technologies as listed in **Table 21**. The utilisation levels used for 2025 are relatively conservative and reflect the anticipated short-term technological development in the sector. The utilisation levels reflect a number of projects that are in the pipeline and that would materialise before 2025. The higher levels of low-carbon technologies after 2030 will require detailed technical feasibility studies.

Table 21. Mitigation scenario level of utilisation of wastewater treatment technologies (%).

Technology	2020	2025	2030	2040	2050
Anaerobic digester	0.02	0.03	0.035	0.06	0.135
Septic system	0.94	0.93	0.92	0.9	0.8
Latrine	0.03	0.02	0.015	0.005	0
Aerobic system	0.01	0.02	0.03	0.035	0.065

Source: Author's elaboration

6.3 Mitigations actions, enabling measures and finance needs

The mitigation actions for Wastewater Management are given in **Table 22**, and their enabling measures are given in **Table 23**. Feasibility studies for the introduction of low-carbon wastewater treatment technologies will be required to inform the level of investments needed to implement the mitigation actions. Based on the conservative assumptions used for mitigation scenario analyses, only 6 $ktCO_{2e}$ is expected to be reduced relative to the BAU by 2030. In any case, it can be anticipated that the carbon abatement cost will be quite high given the high capital infrastructure costs in this sub-sector.

Table 22. Mitigation Strategy and Actions for Wastewater Management.

WASTEWATER MANAGEMENT (WWM) OUTCOME: Avoided emissions in wastewater management from adoption of low-carbon technologies TARGET: Reduce emissions relative to BAU by 6 ktCO2e in 2030				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
WWM1	Reduced methane emissions from adoption of low-carbon water treatment technologies [6 ktCO2e ER]	WWM1.1. Increasing utilisation level of aerobic treatment from 0.01 (BAU) to 0.03 in 2030	2021 - 2030	Wastewater Management Authority (WMA); MEPU; PS
		WWM1.2. Increasing utilisation level of anaerobic treatment from 0.01 (BAU) to 0.035 in 2030	2021 - 2030	WMA; MEPU; PS

Source: Author's elaboration

Table 23. Enabling measures and financing needs, Wastewater Management.

WASTEWATER MANAGEMENT (WWM)	
WWM1.1. Increasing utilisation level of aerobic treatment from 0.01 (BAU) to 0.03 in 2030	To be confirmed following feasibility study
WWM1.2. Increasing utilisation level of anaerobic treatment from 0.01 (BAU) to 0.035 in 2030	To be confirmed following feasibility study
Cross-cutting measures (CcMWWM) • CcMWWM 1. Feasibility study, including cost-benefit analysis of adoption of aerobic and anaerobic treatment technologies • CcMWWM 2. Identification and mobilisation of resources for capital and operational expenditures	

Source: Author's elaboration

6.4 Mitigation scenarios

The results of the scenario modelling are shown in **Figure 12**. Because the emission factor for centralised aerobic system is zero, it has the largest effect on reducing GHG emissions. Based on the utilisation values given in **Table 21**, emission reductions are marginal in 2025 (2.5 $ktCO_{2e}$) and reaching 5.9 $ktCO_{2e}$ in 2030. For all practical purposes – i.e. compared to emission reductions in the Energy Industries, Land Transport and Solid Waste Management, such decreases are not significant.

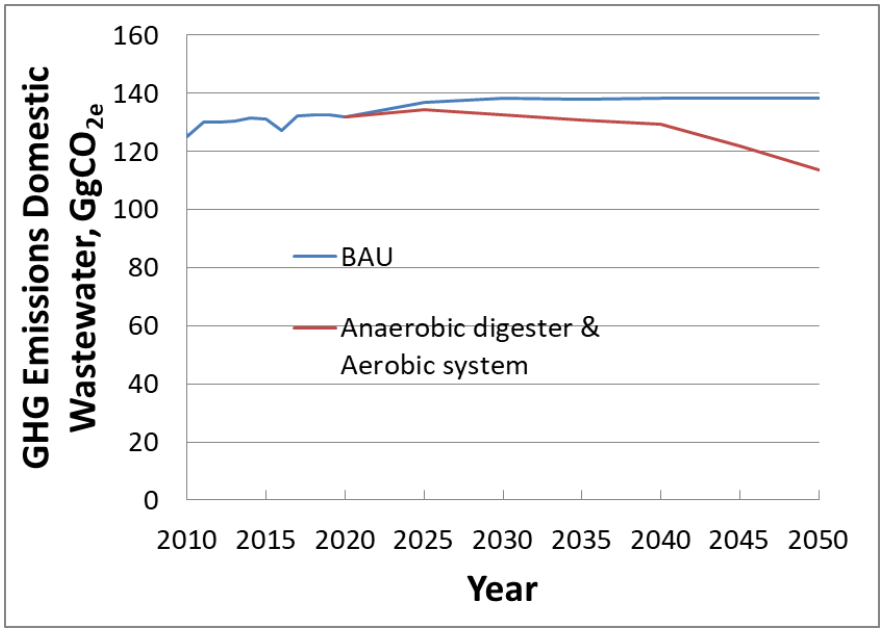


Figure 12. Mitigation scenario analyses for wastewater management.
(*Source: Author's elaboration)*

7 Industrial Processes and Product Use

7.1 Sectoral emission profile

Emissions from the IPPU sector consists of the release of GHGs from industrial processes that chemically or physically transform materials, and GHGs, such as refrigerants and aerosols that are used in products. The updated National Inventory Report (NIR) in BUR1 has shown that, in 2016, product uses as substitutes for Ozone Depleting Substances (ODS) – i.e. hydrofluorocarbons used as refrigerants – accounted for 90.7% of total IPPU-related emissions.[52] This was followed by the metal industry, constituted by iron and steel production industries at 6.9%, and non-energy products from fuels and solvent use which represent a further 2.5% of the IPPU emissions. Over the years the emission of carbon dioxide from lime production has dwindled, and production ceased in 2015. It is also noted that the relatively larger increase in the use of HFC refrigerants over the past two decades has implied an increasingly smaller share of the metal industry and non-energy products in the total IPPU emissions.

The IPPU sector in Mauritius is mainly dominated by the emissions due to leakage of refrigerants used in the refrigeration and air conditioning (RAC) sub-sector. Although there was only 48.77 ktCO2e (or 0.8% of total) emissions reported in 2019[53], the updated National Inventory Report (NIR) in BUR1 2013-2016 has noted an increase in RAC emissions by a factor ~6 that would make it about three times as large an emitting sector as Agriculture. In 2016, products used as substitutes for ODS, which is HFC, accounted for 282.1 $ktCO_{2e}$ of total IPPU emissions (311.18 $ktCO_{2e}$).[54] Also, the trend was a rising share over time, which is also due to the decline in emissions from other activities such as lime, and iron and

[52] Republic of Mauritius (2021) National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.
[53] Statistics Mauritius (2020).
[54] Republic of Mauritius (2021) National Inventory Report (NIR) to the United Nations Framework Convention on Climate Change, Ministry of Environment, Solid Waste Management and Climate Change, Port Louis.

steel production. Hence, the focus of mitigation strategies is on the RAC sub-sector that will cover both stationary and mobile uses of refrigerants.

GHG emissions from the RAC sub-sector to 2050 have been studied, and the results are shown in **Figure** 13.[55] Based on current trends and a predicted increasingly hotter climate in Mauritius, the GHG will more than double by 2050 to over 7 $MtCO_2e$. It needs to be noted that the Business As Usual (BAU) GHG emission scenario is based on an energy mix which continues to rely on fossil fuels to power the RAC appliances[56]. This data includes CO_2 emissions that are emitted from the combustion of fossil fuels to power the refrigeration and air conditioning equipment and appliances, and not just emissions related to refrigerants. The direct emissions from refrigerants in the CTCN study[57] were 260 $ktCO_{2e}$ in 2015, which is close to the value of 269.03 $ktCO_{2e}$ reported in the BUR1 for 2015.

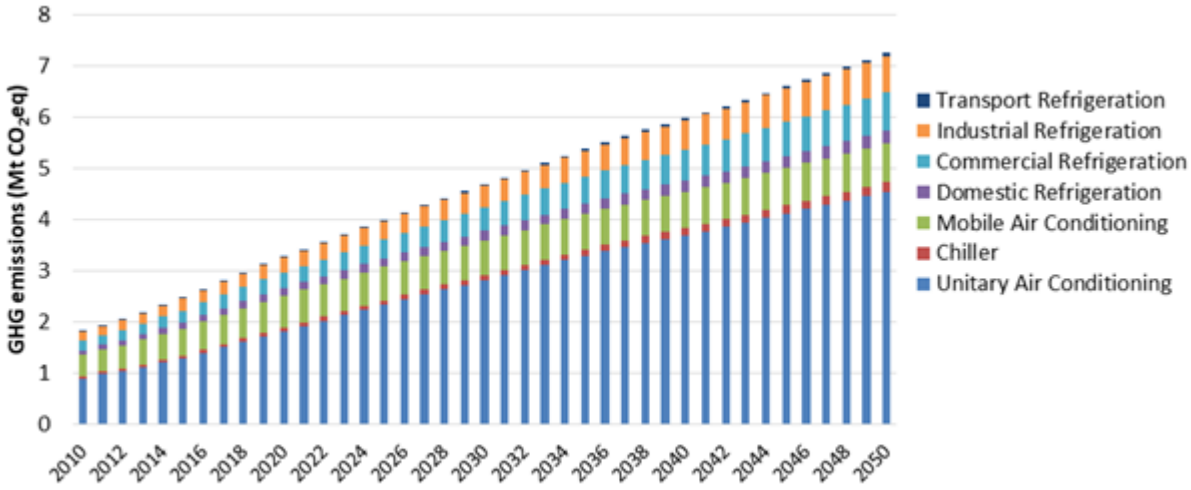


Figure 13. Projected emissions in the RAC sub-sector in Mauritius: 2010 - 2050.
Source: CTCN (n.d.). Green Cooling Africa Initiative Interim Report II – Refrigeration and Air Conditioning Greenhouse Gas Inventory and Technology Gap Analysis Draft Report for Mauritius.

7.2 Sectoral strategies and targets

Underlying the low-carbon scenario analysis is that in nearly all sub-sectors there are technology alternative RAC systems available, operating without hydrofluorocarbons (HFCs) and with zero or very low global warming potential (GWP) refrigerants (e.g. R717, R290, R600a etc…). In alignment with the need to protect both the ozone layer and climate systems, Mauritius is implementing a hydrofluorocarbon (HFC) phase out plan, whereby concerned stakeholders, such as importers, trainers and technicians are being empowered to shift from HCFC and HFC to climate-friendly refrigerants.[58] With the Kigali Amendment, developing Countries (A5 countries under the Montreal Protocol) have

[55] In the IPPU sector, regarding projections of GHG emissions till 2050 from Refrigeration and Air Conditioning sub sector, the demarcation between actual emissions and potential emissions should be taken into account. Potential emissions assume that all emissions from activities occur during the current year whereas actual emissions include delays in emissions or banks due to the cumulative difference between the amount of chemical consumed in an application and that which has already been released.
[56] See also Government of Mauritius (2010) Mauritius Second National Communication' table 4.3
[57] CTCN (n.d.). Green Cooling Africa Initiative Interim Report II – Refrigeration and Air Conditioning Greenhouse Gas Inventory and Technology Gap Analysis Draft Report for Mauritius.
[58] Republic of Mauritius (n.d.) HCFC Management Plan 2011-2025 (document shared by the CCD, MESWMCC on 6 February 2021).

to gradually phase down HFCs. In this respect, Mauritius will soon embark on the formulation of a HFC Phase Down Management Plan.

The mitigation strategies and associated targets for the RAC sub-sector taken by government as budgetary policy decision in 2019, and as per commitments under the Kigali Amendment are listed in **Table 24**.

Table 24. Mitigation strategies and targets for the Phase Down and Phase Out of fluorinated ODS.

Strategies	Description of actions
Phase down of HFCs	1. Freeze imports of HFCs as from 2024 using the average import for the years 2020, 2021 and 2022 for baseline calculation 2. Reduction will start with refrigerants with high GWP such as R404 A; ammonia and hydrocarbon-based refrigerants such as R290a and R600a will be promoted 3. Targets: Reduce by 10% (of baseline value) by 2029; 30% by 2035; 50% by 2040; 80% by 2045
Equipment Phase Out	4. Policy to ban refrigerators using HFCs and non-inverter type air conditioner with capacity above 36,000 BTU in 2024 5. Policy to ban all RAC equipment running on HFCs by 2029 6. The above policies will contribute to the HFC Phase Down targets given above
Environmentally-sound disposal of HFC refrigerants	7. Recovery and recycling of HFC refrigerant

Source: National Ozone Unit

7.3 Mitigation actions, enabling measures and finance needs

The mitigation actions for IPPU (RAC sub-sector) are given in **Table 25**, and their enabling measures are given in **Table 26**. Based on the target for Phase Down of HFCs, 103 $ktCO_{2e}$ emission reductions are estimated by 2030. An initial amount of USD 150,000 is estimated for the preparation of a Kigali Implementation Plan (KIP) for establishing the enabling conditions such as regulatory framework and coordination of market actors, and for carrying out the market and technical feasibility of the island-wide recovery and safe disposal of HFCs in retired equipment. The aim is to phase down of HFCs.

Table 25. Mitigation Strategy and Actions for IPPU.

IPPU (IP) **OUTCOME: Reducing the use of HFCs according to Kigali Amendment to the Montreal Protocol** **TARGET: Reduce emissions relative to BAU by 103 ktCO2e in 2030**				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
IP 1	Phase Down of HFCs in Mauritius	IP1.1. Reducing HFCs by 10% of the baseline value (2024) by 2029	2025 - 2030	National Ozone Unit (NOU); MRA (Customs); PS
IP 2	Phase out of equipment using HFCs (in support of IP1)	IP2.1. Import ban on non-inverter type air conditioner with capacity above 36,000 BTU as from 2022 in a phased manner for the total ban in 2024.	2025 - 2030	NOU; MRA (Customs); PS

IP 3	Environmentally-sound disposal of HFC refrigerants (in support of IP1)	IP3.1. Recovery and safe disposal of HFCs in retired stock of RAC equipment based on KIP	2025 - 2030	NOU; PS

Source: Author's elaboration

Table 26. Enabling measures and financing needs, IPPU.

IPPU	
IP1.1. Reducing HFCs by 10% of the baseline value (2024) by 2029	**>USD 170,000**
• Measure 1.1.1. Formulate the HFC phase-down plan • Measure 1.1.2. Freeze imports of HFCs as from 2024 using the average import for the years 2020, 2021 and 2022 for baseline calculation • Measure 1.1.3. Start Phase Down by substituting most potent HFCs (e.g. R404A, R134a) with ammonia and hydrocarbon-based refrigerants	
IP2.1. Import ban on non-inverter type air conditioner with capacity above 36,000 BTU as from 2022 in a phased manner for the total ban in 2024.	**Covered under IP1.1**
• Measure 2.1.1. Introducing necessary regulation and legal provision for ban (following Measure 1.1.1)	
IP3.1. Recovery and safe disposal of HFCs in retired stock of RAC equipment based on the Kigali Implementation Plan (KIP)	Investments to be confirmed following completion of HFC phase-down plan
• Measure 3.1.1. Feasibility study on the most appropriate system of recovery and disposal (completed under Measure 1.1.1)	

Source: Author's elaboration

7.4 Mitigation scenarios

The mitigation analyses are shown in **Figure 14** for the reduction and elimination of HFCs in the RAC sub-sector, which as mentioned earlier comprises close to 92% of IPPU GHG emissions. Historical data up to 2020 were used with linear extrapolation to obtain the projected level of HFC-related emissions to 2050. All else being equal, emissions would increase from 347 $ktCO_{2e}$ in 2020 to 521 $ktCO_{2e}$ in 2030 to 899 $ktCO_{2e}$ in 2050. Emissions reductions are measured against the 2024 baseline level using the targets given in **Table 24**. It is assumed that substitutes will be refrigerants having zero or very low global warming potential (GWP) refrigerants (e.g. R717, R290, R600a). The amount of GHG emission reduction is estimated at 103 $ktCO_{2e}$ by 2030; 382.5 $ktCO_{2e}$ by 2040 and 771.7 $ktCO_{2e}$ by 2050.

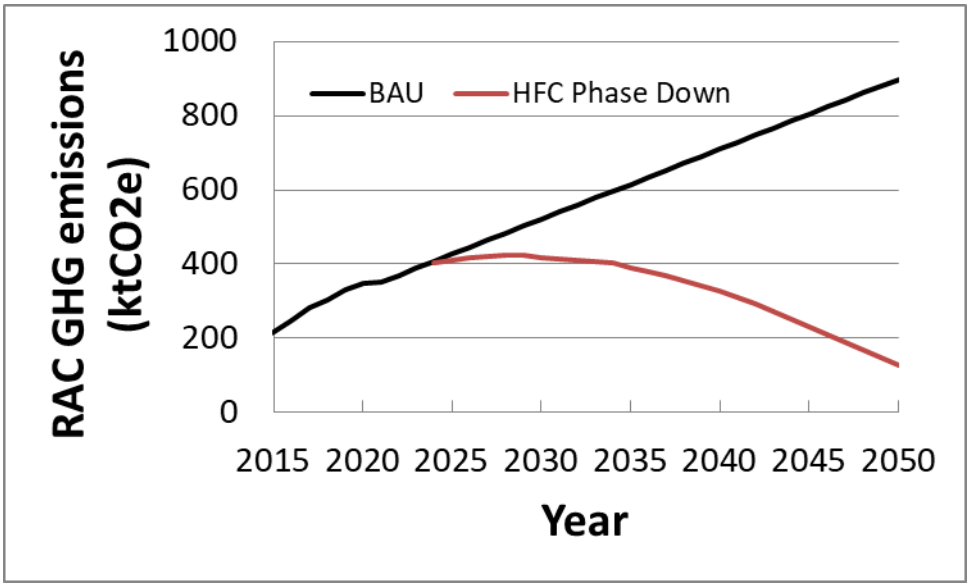


Figure 14. Mitigation scenarios for the Phase Down of ODS.
(*Source: Author's elaboration*)

8 Agriculture and Livestock

8.1 Sectoral emission profile

Agriculture is the smallest emitting sector in Mauritius accounting for only 2% (or 116.37 $ktCO_{2e}$) in 2019.[59] It is pointed out that most of the mitigation actions being developed and promoted in the agricultural sector involve and rely heavily on farmers' behavioural change.

In 2021, there were 7,922 ha of land under food crop cultivation, and a total of 101,537 tonnes of fresh produce were harvested. The main categories of crops that were produced are creepers (25,922 tonnes), mixed vegetables (13,459 tonnes), potato (12,910 tonnes), banana (9,629 tonnes), tomato (9,603 tonnes), pineapple (6,547 tonnes), and onion (5,590 tonnes). Other food crops such as maize, cabbage, groundnut, brinjal, garlic, ginger, chillies, and beans and peas were produced in range of 31 tonnes and 3,520 tonnes.[60] Agricultural production also comprised 2,669,667 tonnes of sugar cane planted on 43,711 ha of land, and 5,034 tonnes of tea leaves cultivated on 685 ha of land. One of the main inputs in crop production is nitrogen-based chemical fertilizers that produce nitrous oxide emissions. The consumption of fertilisers in Mauritius is shown in **Table 27**.

Table 27. Utilisation of chemical fertilisers (tonnes) in Mauritius: 2017-2021.

Year	2017	2018	2019	2020	2021
Weight (tonnes)	35,000	29,802	29,664	24,843	34,425

Source: Digest of Agricultural Statistics 2021

For the same year, the production of beef from live cattle was 1,823 tonnes. Beef production from the slaughter of imported cattle, accounting for 99.4% of the total production, was 1,812 tonnes. Year-on-year changes saw local beef production going down by 38.9% from 18 tonnes (2020) to 11 tonnes

[59] Statistics Mauritius, 2020. Environment Statistics – 2019, Ministry of Finance, Economic Planning and Development, Mauritius.
[60] Statistics Mauritius, 2022. Agricultural and Fish Production – 2021, Ministry of Finance, Economic Planning and Development, Mauritius.

(2021). Goat meat and mutton produced also decreased albeit by a much smaller amount of 2.4% from 42 tonnes in 2020 to 41 tonnes in 2021. The production of pork slao decreased by 4.0% from 598 tonnes in 2020 to 574 tonnes in 2021. In contrast, the production of poultry increased by 3.4% from 47,500 tonnes in 2020 to 49,100 tonnes in 2021.[61]

8.2 Sectoral policies and targets

The most recent agricultural policy document that addresses climate change issues in Agriculture is the Strategic Plan 2016 - 2020 for the Food Crop, Livestock and Forestry. Although Agriculture does not contribute significantly to GHG emissions, it is highly vulnerable to climate extremes and climate variability, which give rise to disasters and results in lower agricultural productivity, crop loss or crop failure, and highlighted the urgency to implement adaptation and mitigation strategies for climate change. While the Strategic Plan is being updated, its broad orientations together with expert judgements from sector stakeholders have been used to identify the mitigation strategies and targets for the production of food crops and livestock. A strong emphasis is placed on food security as reflected in the targets, including for livestock. The mitigation strategies for Agriculture are listed in **Table 28**.

Table 28. Mitigation strategies and targets, Agriculture.

<table>
<tr><th>Strategies</th><th>Description of actions</th></tr>
<tr><td colspan="2">Agriculture (food crops)</td></tr>
<tr><td>Baseline situation</td><td>The use of chemical inputs increases by 2% per annum based on historical trends.</td></tr>
<tr><td>Strategy 1: Reducing chemical inputs in crop production</td><td>The Russia-Ukraine War has increased the prices of chemical fertilisers. This strategy is aligned with Government measures to reduce dependency on imported chemical inputs in agricultural production. It is assumed that the reduction in use of chemical inputs starts in 2021 by 1% absolute per year until 2030. At this rate of decrease, chemical inputs reach 90% of the value in 2020. Thereafter, the decrease is 5% every 5 years with chemical inputs reaching 80% and 70% of the 2020 value in 2040 and 2050, respectively.</td></tr>
<tr><td>Strategy 2: Application of compost in crop production</td><td>In a biofarming system and other sustainable practices, it is unlikely that the use of chemical fertilizers will be reduced without any substitution. This strategy implies the co-use of compost produced from Municipal Solid Waste (MSW) and other sources in food crop cultivation as from 2024 using the following amounts (kilo tonne):
<table>
<tr><td>2024</td><td>2030</td><td>2040</td><td>2050</td></tr>
<tr><td>2.95</td><td>9.83</td><td>11.05</td><td>12.43</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Agriculture (livestock)</td></tr>
<tr><td>Baseline situation</td><td>A quasi-stagnating livestock sector is assumed after 2020. The model assumes that the technological options used for livestock manure management remains unchanged from that used in 2015 (i.e. old technology) up to 2050.</td></tr>
<tr><td>Policy scenario (enhanced food security)</td><td>Increase in the number of livestock heads using data provided to 2030 by the livestock section of the Food and Agricultural Research and Extension Institute (FAREI). Post-2030 values are extrapolations using changes between 2020 and 2030, with the increase in number of livestock heads</td></tr>
</table>

[61] Ibid.

<table>
<tr><td></td><td>decreasing between 2040 and 2050. The manure management technology was kept constant at the 2015 values (i.e. as in Baseline situation)</td></tr>
<tr><td>Mitigation scenario (enhanced food security with low-carbon manure management technologies)</td><td>Policy scenario with new technologies used for the management of manure produced by dairy cows, other cattle and pig husbandry. The manure management technologies are solid storage, aerobic digestion and anaerobic digestion, and their utilisation levels are given below with values for pig husbandry shown in brackets. The utilisation levels for dairy cows and other cattle are the same.
<table>
<tr><td></td><td>2015</td><td>2020</td><td>2030</td><td>2040</td><td>2050</td></tr>
<tr><td>Solid storage</td><td>0.97 (0.5)</td><td>0.9 (0.4)</td><td>0.83 (0.4)</td><td>0.7 (0)</td><td>0.49 (0)</td></tr>
<tr><td>Aerobic digestion</td><td>0.01 (0.25)</td><td>0.03 (0.3)</td><td>0.07 (0.3)</td><td>0.13 (0.4)</td><td>0.24 (025)</td></tr>
<tr><td>Anaerobic digestion</td><td>0 (0.25)</td><td>0.05 (0.3)</td><td>0.08 (0.3)</td><td>0.15 (0.6)</td><td>0.25 (0.75)</td></tr>
</table></td></tr>
</table>

Source: Author's elaboration

8.3 Mitigation actions, enabling measures and finance needs

The actions related to the mitigation strategies for Agriculture are given in **Table 29**, and the enabling measures and finance needs are shown in **Table 30**. As expected the emissions reductions from food crop production is relatively small at 2.7 $ktCO_{2e}$ by 2030. The emphasis on food security in livestock production results in GHG emissions from an increasing livestock heads outstripping emission reductions from the adoption of low-carbon manure treatment technologies. In this case, there is an increase of 4.4 $ktCO_{2e}$ relative to BAU by 2030. Hence, there is a combined marginal increase in GHG emissions of 1.7 ktCO2e by 2030. Finance estimated at USD 7.06 million is needed to implement the mitigation actions. This is a lower limit that excludes capital investments in scaling up low-carbon manure treatment systems.

Table 29. Mitigation Strategy and Actions for Agriculture.

AFOLU				
AGRICULTURE (A) **OUTCOME: Reducing emissions from good agricultural practices** **TARGET: Reduce emissions relative to BAU by 2.7 ktCO2e in 2030**				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
A1	Reducing chemical inputs in crop production [3.42 ktCO2e ER]	A1.1. Reducing chemical inputs by 1% absolute per year until 2030 (bio-farming practices)	2021 - 2030	Ministry of Agro Industry and Food Security (MAIFS) ; FAREI; PS (planters and importers of chemical fertilisers)

A 2	Implementation of bio-farming scheme [-0.8 ktCO2e ER]	A1.2. Application of compost produced from MSW and other sources in crop cultivation	2022 - 2030	MAIFS; FAREI; PS (farmers & producer of compost)
LIVESTOCK (L) **OUTCOME: Improved food security with application of mitigation technologies for livestock waste management** **TARGET: Limiting increased emissions relative to BAU to 4.4 ktCO2e in 2030**				
L 1	Improved food security with adoption of environmentally-sound animal excrement management technologies	L1.1. Increase in livestock heads for increased food security with low-carbon excrement management technologies	2022 - 2030	FAREI; farmers

Source: Author's elaboration

Table 30. Enabling measures and financing needs, Agriculture.

AFOLU	
AGRICULTURE (A)	
A1.1. Reducing chemical inputs by 1% absolute per year until 2030 (bio-farming) • Measure 1.1.1. Develop and promoting the concept of Integrated Plant Nutrition System (IPNS) • Measure 1.1.2. Develop composting technologies, including vermicomposting, and promote organic waste recycling at farm level • Measure 1.1.3. Development and promotion of Organic Farming and related agro ecological and natural systems of crop production, which prohibit or decrease chemical fertiliser use, as well as increase C stock in the soil solum • Measure 1.1.4. Substitution of chemical fertilisers with compost from sea grass and sea- weeds	**USD 1.01 million**
A1.2. Application of compost produced from MSW in crop cultivation	**USD 4.65 million**
Cross-cutting Measures Agriculture (CmMA) • Capacity building to entice farmers to adopt MauriGAP (Mauritius Good Agricultural Practices) • Crop diversification on marginal and abandoned sugar cane plantation, having co-benefit potential of carbon sequestration such as *macadamia* plantation • Economic and financial incentives for farmers to adopt good agricultural practices, including adoption of low-carbon techniques	
LIVESTOCK (L)	
L1.1. Increase in livestock heads for increased food security with low-carbon excrement management technologies	**USD 1.40 million**
• Measure 1.1.1. Technology transfer of aerobic and anaerobic (with biogas production) treatment of waste at the expense of solid storage	

- Measure 1.1.2. Capacity building of farmers on the use of aerobic and anaerobic animal waste technologies
- Measure 1.1.3. Economic and financial incentives provided to farmers for the adoption of low-carbon technologies

Source: Author's elaboration

8.4 Mitigation scenarios

While the process of updating the Strategic Plan 2016 – 2020[62] is ongoing, the approach used to model mitigation scenarios in agriculture is the continuation of the broad orientations of the existing Strategic Plan.

Food crops

The BAU scenario has been taken as the situation of no implementation of the policies, strategies and actions proposed in the Strategic Plan 2016 – 2020. In this scenario, it is assumed that chemical fertiliser use increases at 2% per year after 2020. As shown in **Figure 15**, there is an increase in GHG emissions from 99.9 $ktCO_{2e}$ in 2020 to ~101 $ktCO_{2e}$ in 2030, and reaching ~105 $ktCO_{2e}$ by 2050. These relatively small changes are mainly due to an increase in chemical inputs. Reducing chemical inputs causes a decrease in direct N_2O emission as shown in **Table 31**. The addition of compost as a substitute for chemical fertilisers as from 2024 results in a slight increase in GHG emissions due to the release of N_2O from the compost. The use of compost also includes the increase in manure applied to soil with increasing livestock heads to enhance food security under the policy option. The curve shows the combined effect of reduced use of chemical fertilizers and use of compost, including the calculation of both direct and indirect N_2O emissions.

The GHG emissions from the different strategies relative to the BAU is summarised in **Table 31**. As it can be seen, the total GHG emissions reduction in 2030 is only 2.7 $ktCO_{2e}$ that would increase by a factor of 2.7 by 2050.

[62] Ministry of Agro-Industry and Food Security (2016) Strategic Plan 2016 – 2020 for the Food Crop, Livestock and Forestry Sectors.

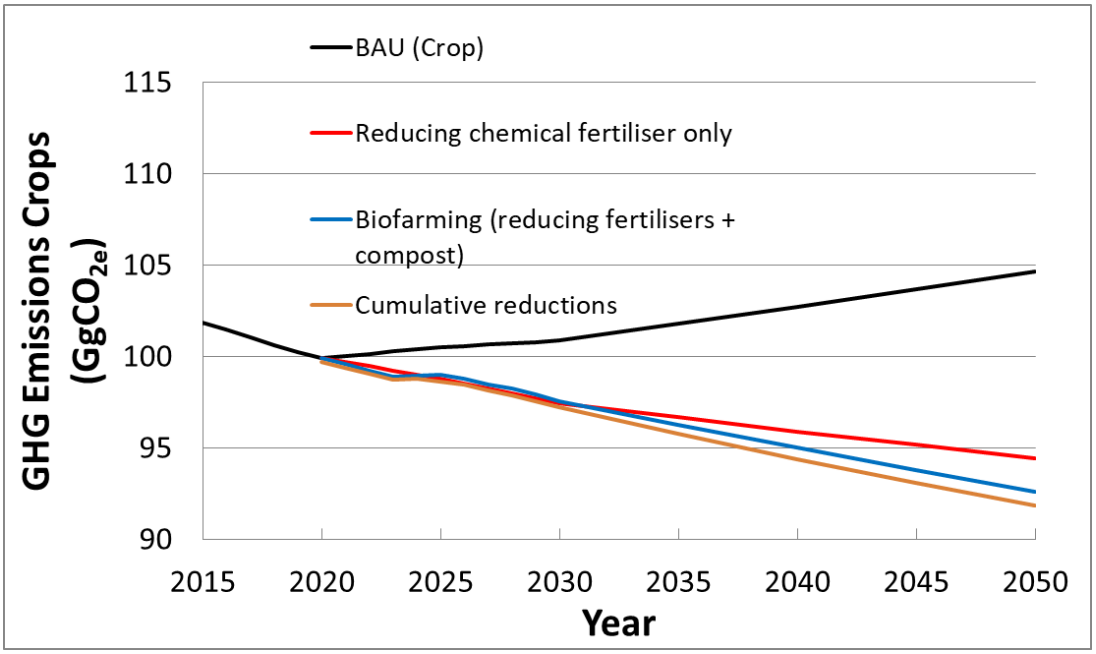


Figure 15. Mitigation scenarios for Agriculture (food crops).
(*Source: Author's elaboration*)

Table 31. Summary of relative GHG emissions reductions for food crops, $GgCO_{2e}$.

Scenario description	2020	2030	2040	2050
Reducing chemical inputs relative to BAU	0.0	3.42	6.83	10.25
Use of compost (incremental effect)	0.0	(0.75)	(1.82)	(2.88)
Cumulative effect	0.0	2.7	5.64	8.11

Source: Author's elaboration

Livestock

The results of mitigation analyses are given in **Figure 16**. Both GHG emissions and emission reductions (with adoption of lower-carbon manure management technologies) are very small in this sub-sector. It is also the sector that exhibits policy-induced increase in total emissions. The BAU scenario reflects a quasi-stagnant sub-sector with emissions increase marginally from 28.6 $GgCO_{2e}$ (or $ktCO_{2e}$) in 2020 to 30.6 $GgCO_{2e}$ in 2030. The policy scenario that is geared towards increasing local production to enhance food security results in an increase in emissions to 35 $GgCO_{2e}$ in 2030 and 41.4 $GgCO_{2e}$ in 2050 with no evolution in lower-carbon manure management technologies. With the adoption of lower-carbon manure management technologies, emission in 2030 is virtually unchanged and it is marginally lower at 39.9 $GgCO_{2e}$ in 2050.

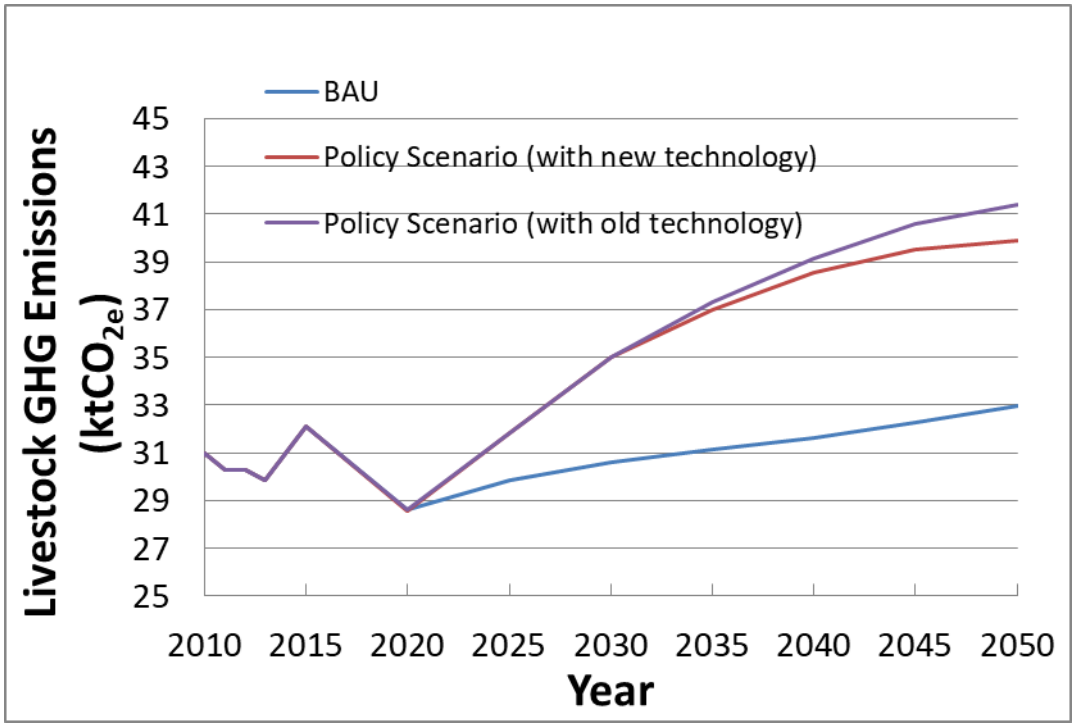


Figure 16. Mitigation scenarios for livestock manure management.
(*Source: Author's elaboration*)

9 Forestry and Other Land Use

9.1 Sectoral emission profile

Forestry (and Other Land Use) represents a carbon sink that totaled 360.9 $ktCO_{2e}$ in 2019.[63] This level of carbon sink has been fairly constant in the past decade revealing a state of unchanging stock of primary and secondary forests in Mauritius.[64]

In 2021, the total extent of forest cover in Mauritius was 47,006 ha, out of which around 25,000 ha were under private ownership and the remaining 22,006 ha on State Lands.[65] The Forestry Service (FS) has jurisdiction of 14,540 ha of State Forest Lands; 7,233 ha under that of the National Parks and Conservation Service and 275 ha are managed by the Vallée d'Osterlog Endemic Garden Trust. The FS also has surveillance oversight over 6,540 ha of privately-owned mountain and river reserves.[66] Approximately 14,613 hectares of 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.[67] Around 16,196 ha of land are found in Terrestrial

[63] Statistics Mauritius, 2020.
[64] It is pointed out that most land use changes involving forest cover took place in the 18th and 19th century.
[65] Statistics Mauritius (2022) Environment Statistics – Year 2021, Ministry of Finance, Economic Planning and Development, Port Louis.
[66] Although privately-owned, these reserves are protected under the Forests and Reserves Act 1983.
[67] Forestry Service (2018) Annual Report of the Forestry Service 2018, Ministry of Agro-Industry and Food Security, Port Louis.

Protected Areas in 2021,[68] including 46 ha of wetlands and 599 ha of protected off-shore islets. The largest protected areas are National Parks (7,071.2 ha) and privately-owned mountain and river reserves (6,553 ha). There were 11,774 ha of forest plantation for silviculture.[69] However, the production of timber is gradually being phased out with more emphasis placed on conservation, protection and the sustainable management of remaining forests for enhancing ecosystem functions such as reducing soil erosion, enhancing carbon sequestration, conservation of biodiversity & genetic resources, recreation & ecotourism.[70] The area of mangroves amounted to 160.06 ha in 2018.[71]

9.2 Sectoral strategies are targets

While the process of updating the Strategic Plan 2016 – 2020[72] is ongoing, the approach used to model mitigation scenarios for forestry is the continuation of the broad orientations of the existing Strategic Plan (as in the case of Agriculture). In the BAU situation, there is no implementation of the policies, strategies and actions proposed in the Strategic Plan 2016 – 2020. The parameters used for the BAU scenario are given in **Table 32**.

Table 32. Selected parameters used to model the forestry BAU scenario.

		2015	2020	2030	2040	2050
Mangrove forest (ha)		159.4	160.1	160.1	160.1	160.1
Wood removal (m^3/year)	DLL Eucalyptus	528	478	300	200	100
	WUL pine>20 yr	708	650	550	300	100
Fuelwood removal (m^3/year)	DLL Eucalyptus	1,769	1,204	557	400	100
	WUL pine>20 yr	1,587	1,125	565	350	100

Source: Forestry Services, Ministry of Agro-Industry and Food Security; Digest of Environment Statistics 2019

Two mitigation strategies have been proposed as described in **Table 33**.

Table 33. Mitigation strategies and targets, Forestry.

Mitigation strategies	Description of actions
Strategy 1: Tree planting	The tree planting targets are given below, and they related to a Master Plan Greening and Embellishment of motorways M1 and M2 to plant 600,000 over a period of 7 years along the M1/M2 motorways. It is estimated that around 40% of the plants will be of woody biomass that will be effective carbon stocks. It is also assumed that planting will take place between 2022 and 2028.
	Parameters / 2020 / 2022-2028 (annually) Area planted (ha) / 20 / 35 Number of trees / 22,000 / 38,500
Strategy 2: Afforestation	The strategy consists of investigating the impact of afforesting 1,750 ha of abandoned sugar cane land. It is assumed that all of the 1,750 ha of land is available in the agro-ecological zone of Dry Lowland (DLL). Afforestation it added in the analysis as an indicative measure for increase carbon sinks in Mauritius (against a quasi-stagnating baseline). The parameters used for modelling this scenario are given below assuming a 1:1 ratio of native species to exotic species.
	Time period / / Area planted with exotic trees (ha/yr)

[68] Statistics Mauritius (2022) Environment Statistics – Year 2021, Ministry of Finance, Economic Planning and Development, Port Louis.
[69] Statistics Mauritius (2022) Environment Statistics – Year 2021, Ministry of Finance, Economic Planning and Development, Port Louis.
[70] Ibid, pg. 11.
[71] Information provided by Department of Environment, MESWMCC.
[72] Ministry of Agro-Industry and Food Security (2016) Strategic Plan 2016 – 2020 for the Food Crop, Livestock and Forestry Sectors.

	Area planted with native tree species (ha/yr)	Araucaria	Eucalyptus	Tabebuia
2021-2025	5	1.25	2.5	1.25
2026-2030	20	5	10	5
2031-2035	30	7.5	15	7.5
2036-2040	35	8.75	17.5	8.75
2041-2045	40	10	20	10
2046-2050	45	11.25	22.5	11.25

Source: Author's elaboration

9.3 Mitigation actions, enabling measures and finance needs

The actions related to the mitigation strategies for Forestry are given in **Table 34**, and the enabling measures and finance needs are shown in **Table 35**. The total increase in carbon sink resulting from the two mitigation strategies is 9.5 $ktCO_{2e}$ in 2030. The finance needed to implement the mitigation actions has been estimated at USD 7.3 million.

Table 34. Mitigation Strategy and Actions for Forestry.

FORESTRY (F) **OUTCOME: Increasing the sink capacity of Mauritius** **TARGET: Enhancing sink capacity relative to BAU by 9.5 ktCO2e in 2030**				
ID	**Strategy**	**Action**	**Time Frame**	**Main stakeholders**
F1	Planting trees in urban areas [4.3 ktCO2e ER]	F1.1. Planting of 600,000 trees over a period of 7 years along the M1/M2 motorways	2022 - 2028	MAIFS; Forestry Service (FS); MESW MCC
F2	Afforestation of abandoned agricultural land [5.2 ktCO2e ER]	F2.1. Afforesting 1,750 ha of abandoned sugar cane land with a combination of endemic by 2030	2022 - 2030	FS; PS

Source: Author's elaboration

Table 35. Enabling measures and finance needs, Forestry.

FORESTRY (F)	
F1.1. Planting of 600,000 trees over a period of 7 years along the M1/M2 motorways	**USD 5.33 million**
F2.1. Afforesting 1,750 ha of abandoned sugar cane land with a combination of endemic by 2030	**USD 1.97 million**
Cross-cutting Measures Forestry (CcMF) • CcMF1. Improved coordination between stakeholders involved in tree planting activities • CcMF2. Develop integrated land use plan for zoning afforestation projects	

Source: Author's elaboration

9.4 Mitigation scenarios

Figure 17 shows the results of the mitigation scenarios. The BAU scenario shows marginally increasing carbon stocks for a constant area of forest land (408 $ktCO_{2e}$ in 2020; 411 $ktCO_{2e}$ in 2030; 412 $ktCO_{2e}$ in 2040; 414 $ktCO_{2e}$ in 2050). The increase in carbon sink for the two mitigation strategies relative to the BAU case is given in **Table 36**. Planting trees and afforestation will increase the sink of carbon by 4.34 $ktCO_{2e}$ and 5.20 $ktCO_{2e}$ by 2030, respectively. The cumulative effect of the two strategies in 2030 represents an increase in carbon sink by 2.3%, with the increase becoming more pronounced by 2050 (7.7%) especially due to the effect of afforestation.

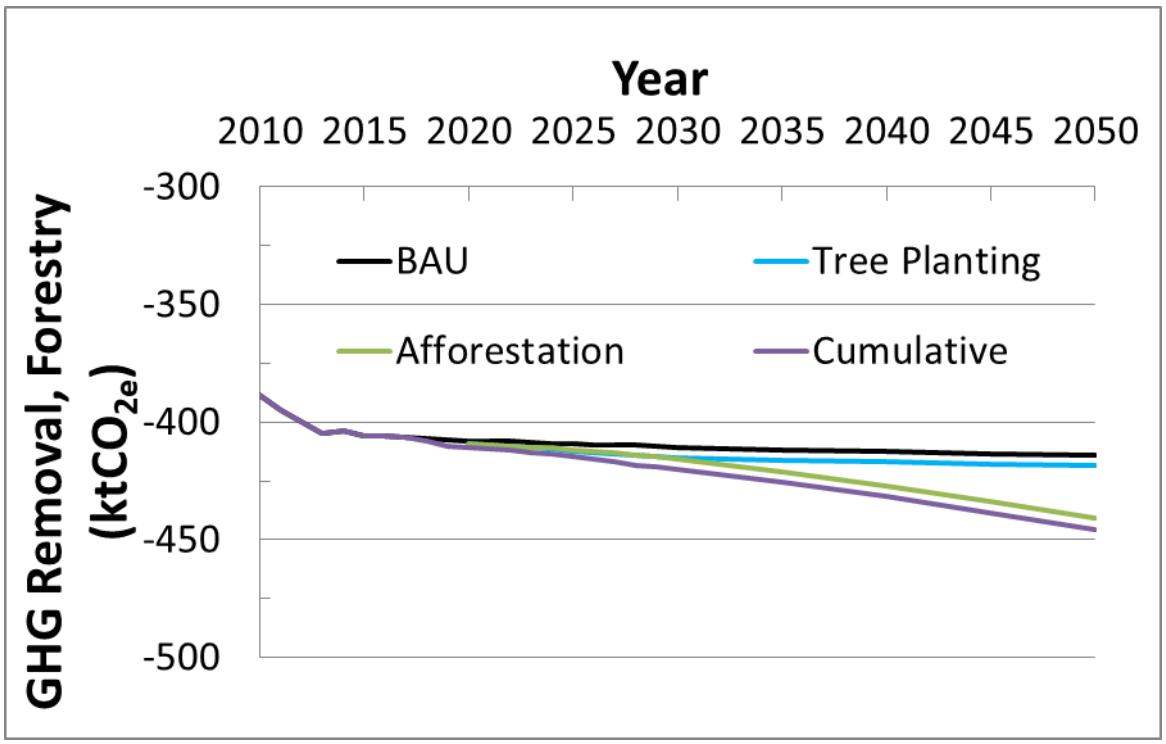


Figure 17. Enhanced levels of carbon sink in Forestry.
(*Source: Author's elaboration*)

Table 36. Increase in carbon sequestration, $GgCO_{2e}$.

Relative to BAU	2020	2030	2040	2050
Tree planting	-	4.34	4.44	4.68
Afforestation	-	5.20	14.66	27.13
Cumulative	-	9.54	19.1	31.81

Source: Author's elaboration

10 Enhanced Transparency and effective implementation through Measuring, Reporting and Verification

Monitoring and evaluation (M&E) Framework is proposed from two perspectives, namely: (i) actions to achieve the reporting requirements under Article 13 of the Paris Agreement, and (ii) tracking progress in implementing the NCCMSAP, including the sustainable development benefits. Outcomes and measures will undergo a measurement, reporting and verification (MRV) process facilitated by

the online Mauritius NDC Registry (MauNDC Registry), which is being developed under the NAMA project. The information collected will be used to monitor progress of implementation and achievement of the mitigation goals stated in the NDC and NCCMSAP, contributing to the reporting of progress in implementing the NDCs to UNFCCC, but also facilitating the assessment of the effectiveness of national policies and measures, and their contribution to national sustainable development.

10.1 Reporting Requirements under the UNFCCC

With the Paris Agreement and its Article 13, the Enhanced Transparency Framework (ETF) for action and support was established. The modalities, procedures and guidelines for Article 13 provide operational details on how to report on the information on national GHG inventories, tracking of progress of implementation and achievement of NDCs, climate change impacts and adaptation efforts, support provided and received for implementing the PA, and general functioning of the ETF. The Strategies and Actions to achieve these reporting requirements are shown in **Table 37**, and will take place in conjunction with the relevant Legal and Institutional interventions (e.g. LI3.1). While the focus of the Strategy is on the requirements under the UNFCCC, the Actions are supportive of cooperation and data sharing as provisioned under Section 17 of the CCA 2020.

Table 37. Strategies and Actions to meet the reporting requirements under the Paris Agreement.

REPORTING REQUIREMENTS (RR) UNDER THE UNFCCC				
	Strategy	**Action List**	**Time Frame**	**Owner**
RR1	Enhanced Transparency Framework established and operational	**RR1.1.** Online MauNDC Registry for reporting on the implementation of mitigation contributions in NDC, and support received is established and operationalised	2022	DCC
		RR1.2. Capacity building of institutional stakeholders to use the online Mauritius NDC Registry	2021 - 2022	DCC
		RR1.3. Human and institutional strengthening to produce Biennial Transparency Reports (BTRs)	2023 - 2024	DCC

Source: Author's elaboration

10.2 MauNDC Registry

The MauNDC Registry[73], launched in 2022, will assist in the systematic and regular collection, preparation and reporting of data on climate action and support in Mauritius. The transition to an online information system (**Figure 18**) will make the process more efficient, reliable, systematic and

[73] Hyperlink to be inserted when activated

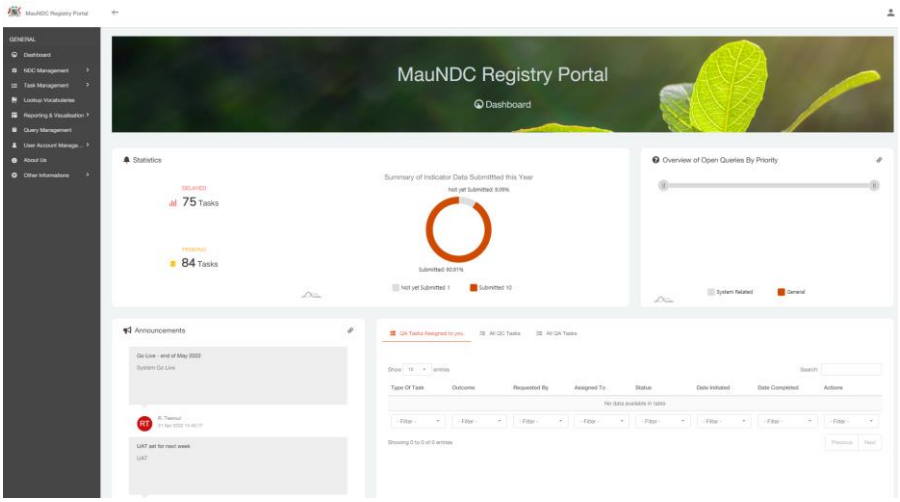
traceable by assembling, storing, processing and delivering relevant and useful information to stakeholders. 

Figure 18. Visualisation of the MauNDC Registry Dashboard
(*Source: PwC, 2022*)

The registry is currently designed to allow for reporting on the following elements:

- **Outcomes**, including mitigation, adaptation and cross-cutting outcomes
- **Interventions** (measures) to be linked to the achievement of outcomes
- **Indicators** to track the implementation of the interventions, outcomes and sustainable development
- **Support** needed and received (Financial, Technical, Capacity Building and Transparency related) towards the achievement of interventions and outcomes

MauNDC Registry will facilitate the visualization of progress on climate action, and the generation of reports that will ultimately contribute to the biennial reporting to the UNFCCC through BTRs. In addition, the MauNDC Registry has been customized to allow the addition of new modules, such for GHG inventories.

The system has interrelated human and computer elements. While the computer elements will be responsible for processing and storing data, as well as handling data retrieval and data management requests, the human aspects include, keying in the relevant data, editing data, doing data cross-checking and quality control, and interpreting information. The ultimate functioning and benefits of the MauNDC Registry are therefore dependent on the inputs from the relevant stakeholders. The main typologies and roles of stakeholders necessary for the functioning of the MauNDC registry are illustrated in **Figure 19**.

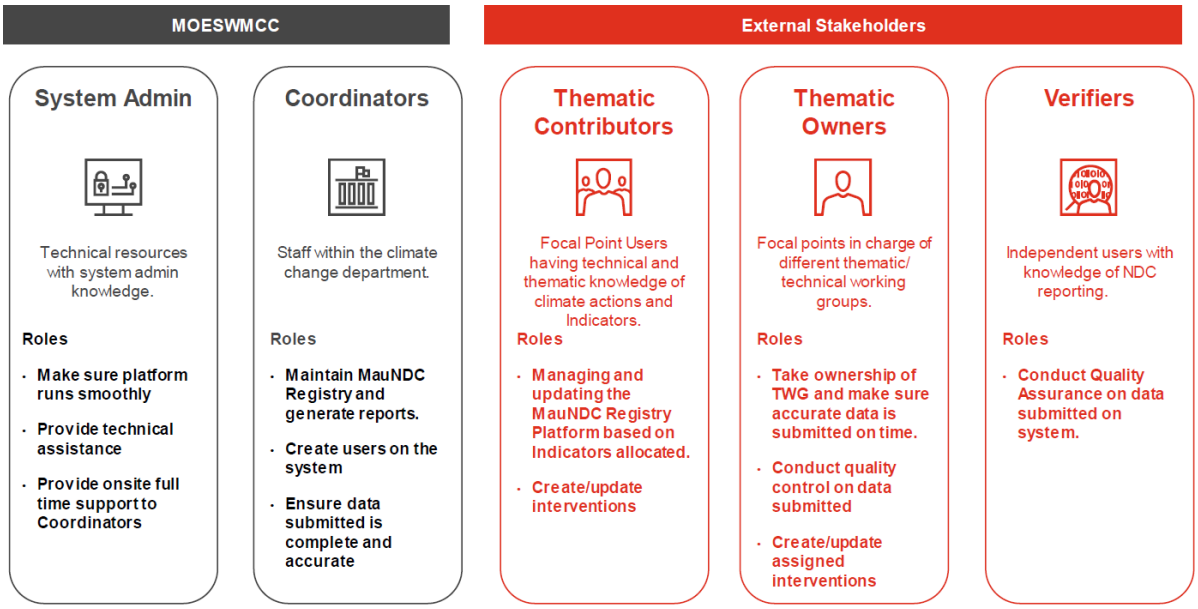


Figure 19: Typology and roles of stakeholders relevant for the MauNDC Registry.
(*Source: PwC, 2022*)

10.3 Indicators for M&E of the NCCMSAP

The monitoring and evaluation of the NCCMSAP 2022-2030 take into account the economic, social and environmental – i.e. sustainable development - objectives of interventions. The process for the monitoring of progress is contained in an integrated policymaking approach. Typically, climate change mitigation should be framed following a policy cycle including (1) the definition of issues (or agenda setting), (2) policy formulation, (3) decision-making, (4) implementation, and (5) evaluation.[74] A description of the three types of indicators that inform the integrated policy cycle is given in **Table 38**. The M&E Framework given in **Table 39** applies the three types of indicators to support the implementation and review of the NCCMSAP as part of the adaptive management of sectoral mitigation strategies and actions.

Table 38. Three types of indicators in M&E Framework.

Agenda setting indicators	Formulation indicators	Evaluation indicators
State of the environment and impacts of economic activity. → Indicators to identify issues related to the environment – e.g. GHG emission levels - resulting from economic activities, as well as from climate change feedbacks. → Indicators selected to best identify the baseline problem and its causes (e.g. socioeconomic reasons underlying mitigation)	*Policy cost and reach.* → Indicators to assess the potential cost and performance of various interventions actions → For CC mitigation, it could be the abate cost of CO_2, and net savings from avoided energy use	*Policy impacts on economic, social and environmental progress and overall human well-being.* → Indicators to assess the success of interventions → Indicators may include the overall progress of human well-being; adaptation co-benefits; and social advancements (i.e. jobs creation, poverty alleviation, social inclusiveness, gender and youth mainstreaming)

Source: Author's elaboration

[74] UNEP (2009) Integrated Policymaking for Sustainable Development – A reference manual. UNEP, Geneva.

Table 39. M&E Framework for the NCCMSAP.

Sector	Problem	Indicator of issue identification	Indicator of policy/strategy formulation	Indicator of policy/strategy evaluation	Responsible Party
Cross-sectoral indicators	1. Socioeconomic impacts of climate change mitigation and policy-induced interventions	1. Number of persons impacted by and influencing climate change mitigation disaggregated by gender, children and youth in all emission sectors	1. Number and share of children receiving formal education on climate change mitigation and interventions 2. Number of persons (disaggregated by sex, youth and children) participating in design, planning and monitoring of climate mitigation actions 3. Number of young women and men supported in studies/training on disciplines related to climate mitigation 4. Number of young women and men supported in climate mitigation plans along with national poverty reduction policies and action plans	1. Share of renewable energies in the total primary energy consumption 2. Share of energy bill in total importation bill of the country 3. Gender-differentiated green jobs created 4. Carbon intensity of the economy (1000 units of GDP/ tCO_{2e})	MEPU MFEPD MESWMCC METEST Ministry of Labour, Industrial Relations and Employment (MLIRE)
Agriculture	1. Poor application of good agricultural practices in crop production	1. Amount of fertilizer/pesticides used (tonne/year) 2. Agricultural soil loss or deterioration (tonne/ha/yr) 3. Average nitrate and pesticide concentration in surface and groundwater (mg/l)	1. Number of capacity building activities on good agricultural practices, including low-carbon methods of agriculture 2. Investments in low-carbon climate technologies for agriculture (USD/year) 3. Number of soil management plans implemented 4. Amount of tax exemptions on organic fertilizers, soil conditioners, and bio-pesticides (USD/year)	1. Decrease in C content of agricultural production (tCO_{2e}/t(produce)) 2. Reduction in yield variability (%) 3. Number of farmers adopting MauriGAP, and agriculture land area under sustainable farming (ha) 4. Carbon stock in soil (tonne/ha)	MAIFS FAREI
	2. Use of traditional and inefficient technologies for managing animal waste	1. Livestock production (number of heads and tonnes of different animals per year) 2. Methods of excrement management (% utilization for waste management)	1. Number of farmers adopting low-carbon technologies for managing animal excrements 2. Investment in training and dissemination of new technology for waste management (USD/year) 3. Number of capacity building programmes implemented on sustainable livestock production	1. Reduction of GHG emissions per unit of product (tCO_{2e}/kg of meat) 2. Increases in livestock production for enhanced food security (kg of meat/year) 3. Amount of treated sludge and animal manure composting (tonne/year)	MAIFS FAREI
Energy (energy industries)	1. Rising energy costs due to heavy reliance on imported fossil fuels (supply side)	1. Per capita energy bill (US$/person/year) 2. Fossil fuel use (% of total final energy and electricity consumption) 3. Fossil fuel subsidies (US$/year)	1. Share of renewables in electricity production (%) 2. Economic and financial incentives (USD/year) to invest in renewable energy sources and energy storage technologies 3. Investments in grid strengthening (USD/year)	1. Reduced costs of energy imports (USD/year) 2. National and household energy savings (USD/year) 3. Emissions from electricity generation and consumption (tCO_{2e}/year)	MEPU CEB MARENA

Sector	Problem	Indicator of issue identification	Indicator of policy/strategy formulation	Indicator of policy/strategy evaluation	Responsible Party
		4. Share of floor area of green buildings in total park of buildings (%)	4. Installed capacity of different types of renewables (MW) 5. Number of persons trained in renewables value chains (sex disaggregated)	4. Grid emission factor (tCO_{2e}/MWh) 5. Number of green jobs created in the electricity supply and demand value chains	
	2. Low adoption of end-use energy efficiency (demand side management)		1. Amount of incentives to energy efficient appliances (USD/year) 2. Number of energy efficiency performance standards and labels, including building energy codes, that are enforced 3. Number of persons trained in demand side management value chains (sex disaggregated) 4. Number of annual energy audits and energy value (GJ / GWh) carried out in manufacturing, and commercial and distributive trades 5. Number of registered energy auditors 6. Investments in urban green infrastructure (USD/year)		MEPU EEMO MNICD
Energy (Transport)	1. Unsustainable access and mobility in land transport	1. Number of commuters using public transport	1. Investment in transport infrastructure (e.g. light rail system/Metro Express, carpooling, park-and-ride etc.) to enhance accessibility and mobility	1. Number of commuters using public transport 2. GHG emissions from transport sector (tCO_{2e}/yr) 3. Percentage of fuel consumption (in tons per year) 4. Distance travelled in 1000-km per day per type of vehicle 5. Emission factor per type of vehicle	MLTLR NLTA MEL
	2. Aggravated transport of goods within the country	1. The volume of freight transport per unit of Gross Domestic Product (GDP)	1. Investment in improving and developing the national road network to curb congestion	1. GHG emissions from transport of goods (tCO_{2e}/yr)	MLTLR NLTA TMRSU
	3. Unaffordability of low-carbon modes of passenger transport	1. Number of hybrid and electric vehicles in both public and private transport 2. Fuel consumption per type at the maritime transport and aviation	1. Economic and financial incentives (USD/year) to invest in low-carbon vehicles 2. Existence of regulatory framework for taxing private vehicles based on carbon emissions and labelling 3. Investments to promote the use of alternative low-carbon fuels (USD/year)	1. Number of hybrid and electric (and other low-carbon) vehicles in both public and private transport 2. GHG emissions from passenger transport and maritime transport and aviation (tCO_{2e}/yr)	MLTLR NLTA Mauritius Shipping Corporation Mauritius Ports Authority

Sector	Problem	Indicator of issue identification	Indicator of policy/strategy formulation	Indicator of policy/strategy evaluation	Responsible Party
					Department of Civil Aviation
	4. Low transport efficiency	1. Number of commuters using private transport 2. Volume of air travel routes	1. Number and types of incentives for the reduction use of private passenger travel 2. Investments in low-carbon carriers at domestic air travel routes (USD/year)	1. GHG emissions from domestic and air travel routes (tCO_{2e}/yr)	MLTLR NLTA Department of Civil Aviation
Forestry (and natural capital)	1. Weak institutional capacity for sustainable forest management	1. Percentage of forest areas and degraded ecosystems 2. Area of forest and conservation land affected by invasive species 3. Rate of deforestation (ha/yr) 4. Number of protected and conservation areas 5. Coastal erosion and flooding related to degradation of ecosystem services	1. Investments on forestation projects (USD/year) 2. Development of forest protection policy framework, strategy and action plan 3. Enforcement of forest protection laws 4. Capacity building of forest and parks conservators on climate change mitigation (e.g. GIS-based inventory, scenarios modeling, vulnerability assessments and climate impact studies on stock of forests) 5. Incentives/investments on afforestation of abandoned / marginal land 6. Investments on conservation measures for climate threatened species and habitats (USD/year) 7. Investments in restoration and new mangrove plantation (USD/year and ha restored/planted)	1. GHG sinks in inventories (tCO_2/yr) 2. Percentage of forest area 3. Number of rehabilitated forests/abandoned land (ha) 4. Rate of deforestation (ha/yr) 5. Percentage of forest area impacted by pest and diseases 6. Count and distribution of fauna and flora species 7. Number of implemented Ecosystem Based Adaptation (EbA) tools and measures 8. Area of mangrove plantations (ha)	MAIFS FS MESWMCC
Solid Waste	1. Embryonic circular waste economy	1. Amount of produced/treated/cycled/reused solid waste (tonne/year) per source and type	1. Investments on enhancing the national circular waste economy taking into account all waste management operations (USD/year) 2. Investments on energy production/recovery from solid waste (USD/year)	1. Energy produced from solid waste management (MWh/year) 2. GHG emissions from solid waste sector (tCO_{2e}/year) 3. Quantity and types of wastes recycled and/or treated for environmentally-sound disposal 4. Jobs created in the circular waste economy	MESWMCC SWMD
Waste Water	1. Waste water treatment with low focus on GHG emissions	1. Amount of produced/treated/ waste water (tonne(BOD)/year) by source and by type of treatment	1. Investments on low-carbon treatment facilities, including capacity building (USD/year) 2. Investments on energy production/recovery from solid waste (USD/year)	1. GHG emissions from waste water management (tCO_{2e}/year) 2. Amount of treated sludge (tonne/year) and methane recovered (tCH_4/year)	MEPU WMA

Sector	Problem	Indicator of issue identification	Indicator of policy/strategy formulation	Indicator of policy/strategy evaluation	Responsible Party
				3. Energy produced from waste water management (MWh/year)	
IPPU	1. Shifting focus from minimising ozone depletion to be inclusive of climate change	1. Amount of refrigerants, including HFCs imported (tonne/year) and identification of end uses 2. Number and type of equipment imported that use HFCs as refrigerants	1. Phase-down plan for HFCs, including regulations/legal mandate for implementing the Kigali Amendment to the Montreal Protocol 2. Investments in new equipment that use GWP-free refrigerants (USD/year). 3. Number of stakeholders capacitated in the use of GWP-free refrigerants and method of HFC recovery and disposal	1. GHG emissions from refrigerants (tCO_{2e}/year) 2. Number and type of equipment using HFCs retired from the market 3. Amount of HFCs recovered for safe disposal (tonne/year)	MESWMCC NOU

Source: Author's elaboration

11 Financial Aspects and Enabling Factors

It is estimated that USD 2 billion will be required by 2030 for an effective implementation of Mauritius' NDC (2021) related to mitigation, and USD 4.5 billion will be required for adaptation, for a total of USD 6.5 billion. 35% percent of this amount would be covered by government resources and private sector contributions, with the remainder expected to be covered by donors and other external sources. The needed investment for mitigation has, in the analysis for the NCCMSAP, been adjusted up to 3.082 USD billion with an expected 7,6% contribution from national public sources.

11.1 Financing of mitigation measures

According to stakeholder consultations made through the NDC update activities there is a large variation in the investment maturity of various identified mitigation measures. The analysed mitigation measures can be divided into the following general categories of investment maturity:

1. Investment ready (IR)

These mitigation measures include projects already under implementation with intended scale-up and replication underway, projects with clear technical specification, existing feasibility studies, and where there either are existing budgeted national funds available and/or secured financing from national and/or international sources of finance. Examples are the installation of 10 MW Roof-top Solar Capacity through CEB own funds and a loan from Abu Dhabi Fund for Development, and Installation of 1000 kit of 2 kW for commercial consumers under tariff 215, where the tender for the second phase is under preparation.

2. Needs support for implementation (SI)

These mitigation measures include projects where the technology and scope is known, where government has already decided to implement the projects, but where financing sources are still not identified and/or implementation modalities still under design. Examples are Purchase of Electrical Energy from 30-40 MW Wind Farm Projects, where the tender is under preparation, and Renewal of Alteo coal bagasse contract to a dedicated biomass contract, where the project proposal has been submitted, but there are still uncertainties regarding the tariff structure.

3. Needs support for preparation (SP)

These mitigation measures include projects where the scope is known, but the exact technical specifications and financial information is still unknown. Many of these projects are expected to be implemented during the period 2025-2030. Examples include decrease in landfill emissions through recycling and composting, where the feasibility study is ongoing in connection with the setting-up of composting plants and sorting units, scheduled from 2024, and adoption HFC alternatives in the Refrigeration and Air- Conditioning sector, where the alternative technologies exist, but policy formulation is at its infancy.

4. Needs support for development and preparation (DP)

These mitigation measures include a wide range of different projects and concepts. Some are known technologies, but where there is a lack of local studies and planned implementation modalities, while other are less mature technologies, or where implementation modalities are still unknown. The majority of these measures are envisioned to be implemented during the period 2025-2030. Examples are many of the envisioned measures to achieve the 10% economy wide energy efficiency

improvements, including the establishment of an Energy Efficiency Financing Scheme, and setting up of Energy Performance Contracting, and off-shore wind farms and measures in the wastewater sector.

Table 40 list the mitigation measures classified by level of investment maturity. Investment ready measures are deemed to not be in need of financial support, although they might need some form of funding for technical or capacity building support for an effective implementation. Measures classified as in need of support for implementation are the ones where it is relevant to reach out to national and international sources of climate finance, to attract financial support for investments in the activities and technologies. Most of the measures are deemed to be in need for funding and support for preparation, meaning that there are clear concepts established, but they lack a clear definition of implementation arrangements and intended financial mechanisms for implementation. Measures in need of support for development and preparation are deemed to be at early conceptual stage. Measures in need of support for preparation and development and preparation should first focus on seeking funding for preparation through international support providers focusing on technical assistance to achieve a higher level of investment maturity, before identifying appropriate sources of financial support for investments.

Table 40: Mitigation measures by level of investment maturity

Sector / Status	IR	SI	SP	DP
EI2.1. Installation of additional 29 MW utility scale PV	x			
EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions)	x			
LT4.1. Operationalisation of the Light Rail System between Curepipe and Port Louis	x			
F1.1. Planting of 600,000 trees over a period of 7 years along the M1/M2 motorways	x			
EI2.4. Increase biomass generation capacity by 100 MW (hybrid facility)		x		
LT3.2. Increasing the share of electric cars to 4.5% of total passenger travel demand in 2030		x		
L1.1. Increase in livestock heads for increased food security with low-carbon excrement management technologies		x		
EI2.3. Installation of additional 32 MW floating solar PV			x	
EI2.8. Installation of 100 MW new RE hybrid facility (solar + battery)			x	
EI2.9. Installation of 40 MW new RE hybrid facility (small scale solar + battery)			x	
EI2.10. Installation of 100 MW new RE hybrid facility (solar + wind + battery storage)			x	
LT3.1. Increasing the share of hybrid cars to 8.31% of total passenger travel demand in 2030			x	
SWM1.1. Composting of 31% of municipal solid waste in 2030			x	
SWM2.1. Recycling of 22% of municipal solid waste by 2030			x	
IP1.1. Reducing HFCs by 10% of the baseline value (2024) by 2029			x	
IP2.1. Import ban on refrigerators using HFCs in 2024, and all Refrigeration and Air Conditioning (RAC) equipment running on HFCs by 2029			x	
IP3.1. Recovery and safe disposal of HFCs in retired stock of RAC equipment			x	
F2.1. Afforesting 1,750 ha of abandoned sugar cane land with a combination of endemic by 2030			x	
EI2.5. Renewable Energy (RE) from waste project for 10 MW				x
EI2.6. Installation of 50 MW off-shore wind energy				x
EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal)				x
LT1.1. Increased fuel economy at a rate of 0.5% per year				x
LT2.1. High Occupation Vehicles lane for uninterrupted flow along M2				x
LT2.2. Substituting ATCS for single timing traffic signalling to enhance real-time decision making				x
LT2.3. Promoting active transportation				x
LT2.4. Promoting car pooling				x
SWM3.1. Twenty percent (20%) of municipal solid waste recovered for waste-to-energy				x

WWM1.1. Increasing utilisation level of aerobic treatment from 0.01 (BAU) to 0.03 in 2030				x
WWM1.2. Increasing utilisation level of anaerobic treatment from 0.01 (BAU) to 0.035 in 2030				x
A1.1. Reducing chemical inputs by 1% absolute per year until 2030 (bio-farming practices)				x
A1.2. Application of compost produced from MSW in crop cultivation				x
EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030 with 2019 as base year				x

A: Agriculture; EI: Energy industries; F: Forestry; IP: Industrial Processes; LT: Land Transport; SWM: Solid Waste Management; WWM: Wastewater Management. IR: Investment ready; SI: Needs support for implementation; SP: Needs support for preparation; DP: Needs support for development and preparation

11.2 Marginal Abatement Revenue Curves of Mitigation Measures

Marginal Abatement Cost Curves (MACC) presents the costs related to different mitigation options, alongside the expected emission reductions from their implementation, and are a useful tool to inform decisions about investment strategies. Inverting a MACC switches the focus from costs to revenues, in practice generating an abatement revenue curve (MARC), which easily identifies the mitigation options that potentially generate revenues alongside emission reductions when implemented, compared to a BAU scenario. The MARC gives a quick graphical comparison among the mitigation measures in terms of their cost efficiency in reducing greenhouse gas emissions.

A MARC has been calculated for the target 2030 (Figure 20)[75]. The curve was created based on the expected revenue or savings of each mitigation measure per tCO_2e reduced USD/tCO_2e (y-axis), and the GHG emission reduction impact of the mitigation measure in 2030 $ktCO_2e$/year (x-axis). All measures located above the X-axis are "win-win" options, allowing mitigation and cost savings in comparison to the BAU scenario. The size of the area of each mitigation measure in the graphs is proportional to the total amount of greenhouse gas emissions reduced by the measure.

All measures for the energy industries have been analysed, but the remaining mitigation measures presented in this NCCMSAP were not included in the MARC curve, as the data needed by the model to either estimate investments needs or monetary benefits for the remaining options were not available. The results of the analysis can assist in decisions related to where to prioritise investment to maximise emission reductions, and identifying financial support needed from the international community, to support mitigation measures which represent incremental costs compared to the baseline.

For the analysed measures in the energy industries, the expected capital investments needed for the implementation of mitigation measures is approximately 1.75 billion USD, and a reduction of approximately 1.94 $MtCO_2e$[76]. The analysis illustrates that Energy Efficiency and solar technologies are the options leading to the largest emission reductions, while also leading to savings (including expected operation and maintenance costs), compared to the BAU scenario. Wind, biomass and waste to energy are also a win-win option with large yearly expected emission reductions, and considerable cost savings compared to the BAU. Marine renewables and small-scale solar power with battery storage have

[75] The analysis was made using the Greenhouse Gas Abatement Cost Model (GACMO) developed by the UNEP Copenhagen Climate Centre. The model includes default values for the mitigation potential parameters and economic-financial parameters of each mitigation option and their corresponding reference option in the baseline situation. The mitigation and economic-financial parameters have been adjusted as far as possible to the Mauritian context, but some discrepancies exist.

[76] The investments required and capacity additions were sourced through the *Renewable Energy Roadmap 2030 for the Electricity Sector*. Electricity generation potential of the various technologies is based on expected daily insolation, examples of technologies in existing CDM projects and IPCC Special Report on Renewable Energy (2011). Electricity prices to calculate revenues are assumed to be 0,2 USD/kWh, while emission reductions are calculated based on a grid emission factor of 0,9915 tCO_2e/MWh.

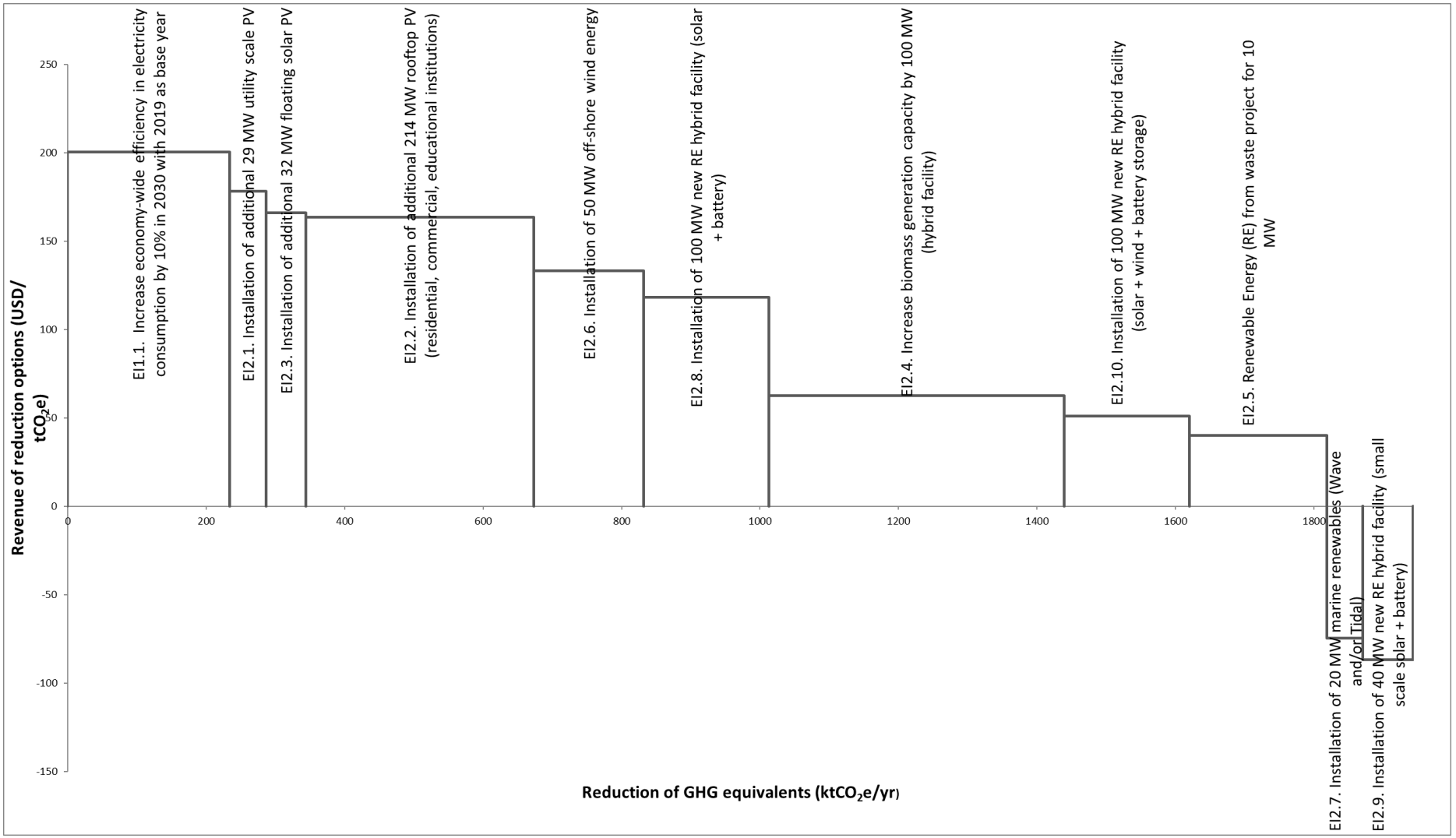
considerable emission reductions, but negative return on investment per reduced ton CO_2e, compared to the BAU.

Table 41 lists all mitigation options included in the analysis, and their related savings /revenue per ton CO_2 reduced. In order to maximise savings and revenues, the actions should be prioritised in descending order, while prioritisation of emission reductions can be based on identifying the measures with largest expected emission reductions per year. Although, it is important to note that data on costs savings compared to the BAU can in some cases be with a degree of uncertainty, e.g. for energy efficiency and associated investments in energy efficient technologies to be introduced. Although, the energy efficiency analysis illustrates that energy efficiency measures would yield the highest emission reductions, and should therefore be identified as a strategic priority. In general terms, energy efficiency investments yield positive returns on investments with reasonable payback time. Many of the measures presented in the NCCMSAP, deemed as a result of improved regulation could not be analysed as they didn't represent investments in physical assets, technologies etc., but are still expected to yield a noticeable amounts of expected emission reductions.

Table 41: Mitigation measures and related revenues and emission reductions

Options included in MAR Curve		
Reduction option	**Revenue /Saving USD/tonCO_2e**	**Emission reduction in 2030 per option ktCO_2e/year**
EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030 with 2019 as base year	200.35	234.00
EI2.1. Installation of additional 29 MW utility scale PV	178.35	52.48
EI2.3. Installation of additional 32 MW floating solar PV	166.06	57.90
EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions)	163.43	329.15
EI2.6. Installation of 50 MW off-shore wind energy	133.24	158.64
EI2.8. Installation of 100 MW new RE hybrid facility (solar + battery)	118.06	180.95
EI2.4. Increase biomass generation capacity by 100 MW (hybrid facility)	62.63	426.35
EI2.10. Installation of 100 MW new RE hybrid facility (solar + wind + battery storage)	51.14	180.95
EI2.5. Renewable Energy (RE) from waste project for 10 MW	40.09	198.24
EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal)	-74.58	52.11
EI2.9. Installation of 40 MW new RE hybrid facility (small scale solar + battery)	-86.75	72.38

Figure 20: MARC for mitigation measures 2030



11.3 Enhancing investment readiness through national channels

A NDC Coordination Committee on Resource Mobilization for Climate Finance (RMCF) was set up by the IMCCC under the chairmanship of the Ministry of Finance, Economic Planning and Development (MOFEPD) to implement the NDC. The RMCF work will also be central for planning resource mobilization of the NCCMSAP. The National Environment and Climate Change Fund (NECCF) established under the Environment Protection Act is another relevant initiative that can be used to mobilize finance for implementation of the NCCMSAP.

Based on the analysis of investment maturity and the GACMO analysis the RMCF and NECCF should focus their efforts in the short term towards measures with high expected impact and return on investment per ton CO_2e, with needs for support for implementation. For the medium term the focus should be on measures with high expected impact and return on investment per ton CO_2e, with needs for support for preparation. Remaining measures can be the focus of longer-term planning until 2030. Actions related to e.g. Large scale solar PV are already in the pipeline and are receiving support through projects such as the Green Climate Fund and others as general support to renewable energy technologies. The gaps to achieving investment maturity for increased biomass generation, increased share of electric cars and increased use of landfill gas should be addressed in the short term, and support for implementation sought from appropriate international sources of climate finance. The remaining activities are in need of support for preparation, and the RMCF should consider reaching out to potential funding sources to support feasibility studies and investment plan development. The RMCF could also in dialogue with the NECCF identify strategic funds to be used for project preparation of priority actions with low level of investment maturity, such as on-shore wind and composting of municipal solid waste.

Table 42 provides an attempt to cross analyse investment maturity of the different mitigation measures with the MARC analysis to provide guidance on short-, medium- and long-term investment efforts. Investment ready measures with high emission reduction and revenue impacts are prioritized for the short term. Measures in need for support for implementation and preparation with high and medium emission reduction and revenue impacts are prioritized for the medium term, while measures in need for preparation and development that have an expected additional cost under current analysed conditions are set as long-term priorities.

Table 42: Assessment of investment maturity and emission and revenue potential for prioritization of mitigation measures

Sector / Status	IR	SI	SP	DP	MARC High	MARC Med	MARC Neg	Priority
EI2.1. Installation of additional 29 MW utility scale PV	x				x			Short-term
EI2.2. Installation of additional 214 MW rooftop PV (residential, commercial, educational institutions)	x				x			Short-term
EI2.4. Increase biomass generation capacity by 100 MW (hybrid facility)		x				x		Medium-term
EI2.3. Installation of additional 32 MW floating solar PV			x		x			Medium-term
EI2.8. Installation of 100 MW new RE hybrid facility (solar + battery)			x		x			Medium-term
EI2.6. Installation of 50 MW off-shore wind energy				x	x			Medium-term
EI2.10. Installation of 100 MW new RE hybrid facility (solar + wind + battery storage)			x			x		Medium-term

EI2.5. Renewable Energy (RE) from waste project for 10 MW				x		x		Medium -term
EI1.1. Increase economy-wide efficiency in electricity consumption by 10% in 2030 with 2019 as base year				x	x			Medium -term
EI2.9. Installation of 40 MW new RE hybrid facility (small scale solar + battery)			x				x	Long-term
EI2.7. Installation of 20 MW marine renewables (Wave and/or Tidal)				x			x	Long-term

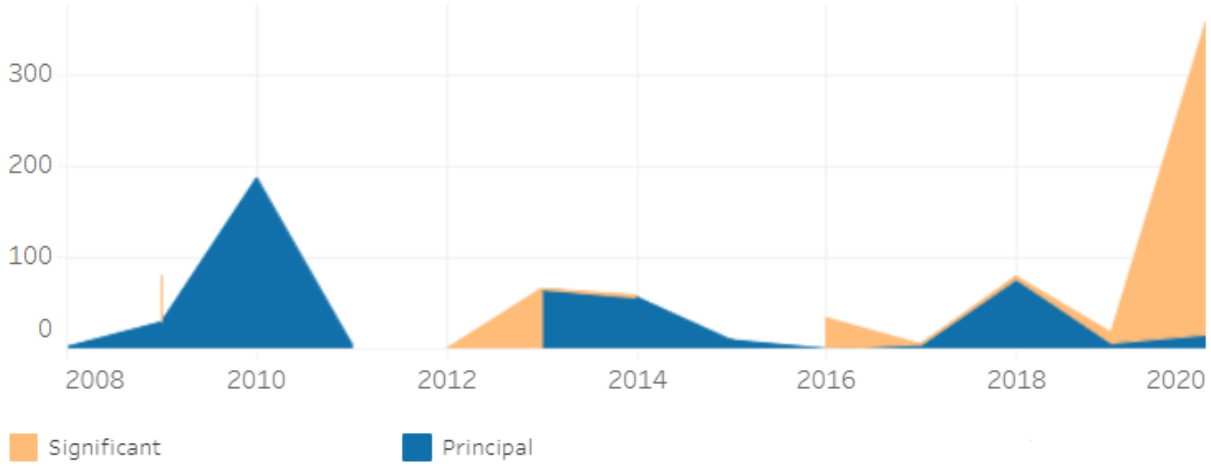
EI: Energy industries; IR: Investment ready; SI: Needs support for implementation; SP: Needs support for preparation; DP: Needs support for development and preparation; MARC High: High emission reduction and revenue impact; MARC Med: Medium emission reduction and revenue impact; MARC Neg; Low emission impact and negative revenue

11.4 Identification of International Source of Climate Finance

Mauritius has a long-standing strategic relationship with a wide range of international partners providing financial support for climate change mitigation activities, including those related to technology development and transfer, and capacity building. Mauritius has been able to mobilise around USD 90 million of grant funding from all development partners for both mitigation and adaptation over the period 2016-2021.

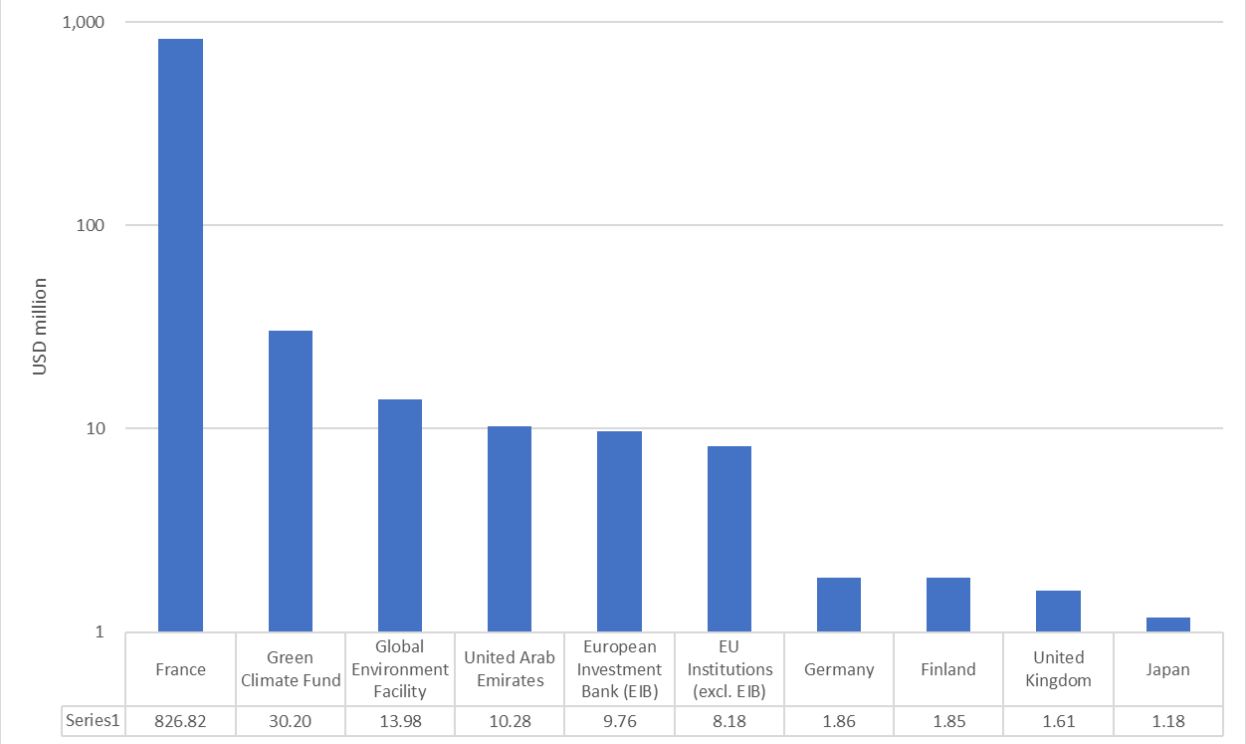
Looking at the information reported from donors can provide a broader perspective on amounts, scope, financial instruments used, and indication of donor priority in financing mitigation. For the period 2008-2020 donors have reported having provided just above 1 billion USD of climate related development finance to Mauritius, of which most part was mitigation related (906 million USD, of which some projects were also cross-cutting with adaptation). Figure 21 illustrates the total amounts of mitigation related development finance provided to Mauritius as reported by OECD development finance statistics. The support provided is divided into S*ignificant* and *Principal* categories, where Principal signifies that the support provided directly and explicitly addresses climate change mitigation, while Significant signifies support where climate change mitigation is explicitly stated as an objective, but it is not the fundamental driver for the support provided.

Figure 21: Mitigation related development finance provided to Mauritius 2008-2020 in USD million, 2020 constant prices. Source: OECD DAC External Development Finance Statistics, 2022



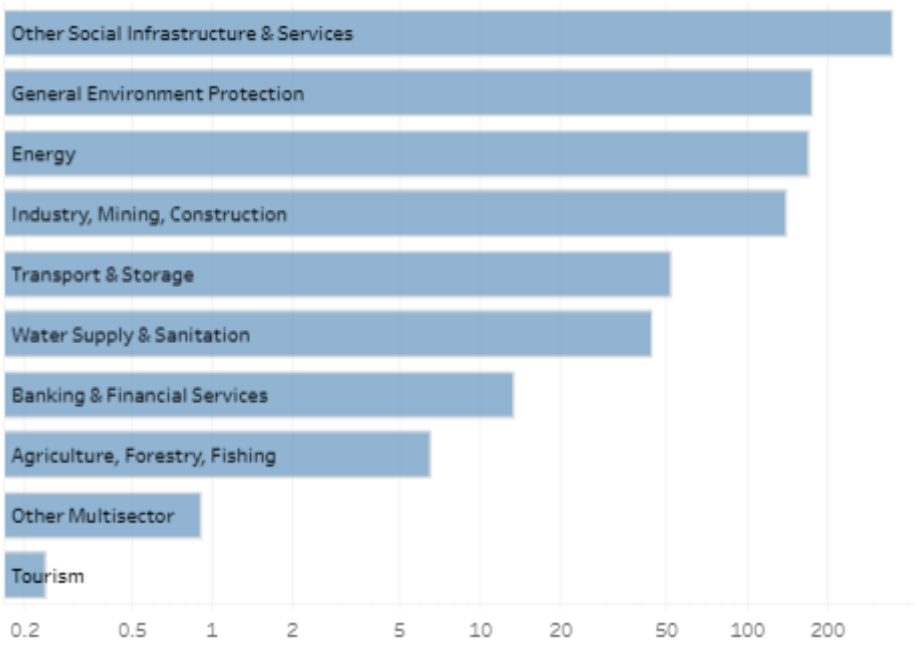
No specific trend on the success of securing mitigation related support can be identified from Figure 21. Although, there might be a general increase in the share support provided where climate change mitigation is not the fundamental driver but part of the objective. This might be attributed to increased efforts in streamlining climate change into national policies, therefore making climate change mitigation a significant component of national programmes for which support is secured. The spikes in 2010 and 2020 are mainly attributed to support received from the French Development Agency. The large support provided in 2020 by the French Development Agency is deemed to only have a significant climate component, as the main purpose of the support provided was directed towards Covid-19 responses. The prevalence of bilateral assistance and the French Development Agency is also illustrated by Figure 22, listing the top 10 financial support providers of mitigation finance to Mauritius between 2008 and 2020.

Figure 22: Top 10 support providers for mitigation related development finance to Mauritius, by source in USD million, 2020 constant prices (logarithmic scale). Source: OECD DAC External Development Finance Statistics, 2022



The financial instrument most used is concessional debt, accounting for 89% of all mitigation finance received, 11% is grants, and only 1 project financed by the Finnish Fund for Industrial Cooperation used alternative financial instruments (Equity and shares in collective investment vehicles). Figure 23 provides an overview of the top recipient sectors for mitigation related finance in Mauritius, as reported by donors for the period 2008 to 2020. Again, there is probably an overrepresentation of *Social infrastructure and services* due to a large tranche of climate related finance mainly directed to Covid-19 response.

Figure 23: Overview of top 10 sectors towards which donors reported climate related finance was provided 2008-2020. Source: OECD DAC External Development Finance Statistics, 2022



Mauritius should continue pursuing further cooperation with its existing partners, but given the large variety of bilateral and multilateral sources of climate finance available, the RMCF should explore additional funding opportunities, and also consider diversifying the financial instruments used to facilitate investments in mitigation measures.

Table 43 list a selection of relevant financial instruments, their advantages and potential disadvantages and typical providers, while Table 44 and Table 45 provide an overview of relevant sources for funding and financing climate measures.

Table 43: Examples of financial instruments, advantages, disadvantages and typical providers. Source: GCF, Lütken, S. 2014

Financial Instrument	Definition	Advantage / Disadvantage	Typical providers
Grants	Provision of funds without expectation of repayment e.g. to cover certain up-front cost of projects such as feasibility studies and technical assistance. A grant can also be repayable, e.g. dependent on the generation of revenues from the project.	Advantage: Provides technical assistance and capacity building. Gives viability to a project and complement other instruments. Disadvantage: There are no reflows of the funds, and the size and scope of the grant is usually quite limited.	Multilateral and bilateral donors, philanthropic funds.
Debt / Loans	Traditional finance repaid with interests. Loans can be on standard terms (market rate and tenor), but also concessional, i.e. to be repaid on favorable conditions like lower interest rates, longer repayment and/or grace periods, or a mix of them.	Advantage: There is a reflow of funds, and can be of considerable sizes, allowing for large scale investments. Concessional loans are used when market financing conditions are not sufficient to make the investment viable.	Banks, development banks, climate funds and bilateral donors.
Repayable advances	A repayable advance is similar to a reimbursable grant. It is a loan which repayment is usually made	Advantage: A repayable advance potentially mitigates the expense for the financier and lowers risk for	Multilateral and bilateral donors,

	depending on the outcome of the financed project e.g. generation of positive cash flows.	the recipient compared to standard debt. It can be larger in size compared to grants .	development banks and climate funds.
Equity	Injection of capital to grow operation of a project or a firm, made by investors that take ownership in accordance with their provision of capital.	Advantage: Leverages resources and mitigates risk for other investors. Disadvantage: Has potentially high opportunity cost compared to debt	Private companies, venture funds, pension funds, some climate funds and development banks
Risk cover instruments, Guarantees	Instruments provided mostly in the form of insurances against certain events. E.g. political guarantees, technical risk cover, currency fluctuation guarantees etc. They are normally paid as a fee (except government guarantees)	Advantage: Attracts debt capital on better terms by lowering risks. Disadvantage: It is hard to quantify risks	Export credit agencies, insurance companies, governments, development banks and climate funds
Result based payments / Pay for result prizes	Financial rewards (prizes) in the form of grants and/or concessional finance, awarded to one or more competing entities that demonstrate they have accomplished predefined targets (e.g. emission reductions.)	Advantages: Rewards successful implementation of projects, with low risk for the financier. Disadvantage: Funds are provided after implementation making it harder to leverage finance up-front.	Bilateral and multi-lateral donors and climate funds

International support providers should be targeted strategically for the scope of the support i.e. investment or preparation and development, and the financial instruments offered. Generally for mitigation measures grants are usually provided for preparatory activities such as feasibility studies, elements of pilot projects and technical support for capacity, policy development etc., while for investments in assets, especially the ones where future cash flows or savings are expected, debt instruments, risk mitigation instruments e.g. guarantees, and equity are normally applied. Some support providers mainly provide support for upstream preparatory activities through grants, while many have a focus on downstream support i.e. implementation, while also providing support for preparatory activities for making projects investment ready.

Table 44: Selected international climate finance sources with mitigation measure preparation focus

Name of Fund or Source	**Relevant Details on Fund's Focus Area**	**Financial instruments**
Climate & Clean Air Coalition	The Coalition helps partners and stakeholders create policies and practices that deliver substantial reductions in short-lived climate pollutant emissions. It also funds projects through calls for proposals.	Grants
Climate Action Enhancement Package	NDC Partnership Climate Action Enhancement Package delivers fast-track support and readiness funds for countries to plan and implement their NDCs and Paris Agreement-related strategies.	Grants
Climate Technology Centre and Network	The Centre and Network is the operational arm of the UNFCCC Technology Mechanism. It supports the accelerated transfer of climate technologies at the request of developing countries. It provides technology solutions, capacity building and advice on policy, legal and regulatory frameworks.	Grants
Global Climate Change Alliance Plus	This SIDS targeted EU initiative supports adaptation and mitigation efforts towards a climate-resilient, low-carbon future through multi-	Grants

	year programmes with an average contribution of EUR 5 million per project.	
Green Climate Fund - Readiness Program	The Green Climate Fund (GCF) Readiness Program provides resources for readiness, including mitigation measure preparation. Resources may be provided in the form of grants up to USD 1 million per country per year or technical assistance.	Grants
Global Environment Facility	The GEF funds projects and programmes to meet the objectives of the international environmental conventions and agreements. Mauritius has a dedicated allocation of funds for climate action for GEF activities.	Grants

Table 45: Selected international climate finance sources with mitigation measure implementation and/or preparation focus

Name of Fund or Source	**Relevant Details on Fund's Focus Area**	**Financial instruments**
African Development Bank	The bank has a strong focus on energy and green bonds for climate infrastructure projects. It intends to invest at least USD 6.4 billion over the next five years on climate finance.	Debt Equity Guarantees Grants
AfricaGoGreen Fund	The Fund provides support for investments in Energy Efficiency, Renewable Energy within the areas of Green Mobility, efficient appliances and solutions, industrial energy efficiency and green buildings.	Debt Guarantees Grants
AgResults Initiative	AgResults designs and implements Pay-for-Results (PfR) prize competitions to "pull" the private sector to overcome deep-rooted market failures in agricultural systems.	Pay-for-Results prize
CIF Accelerating Coal Transition Investment	The Program offers a comprehensive toolkit for transitioning from coal to clean energy. The program works with public sector utilities and private sector operators to define paths to advance transitions.	Debt Equity Guarantees Grants
CIF Clean Technology Fund (CTF)	The Fund provides scaled-up financing to contribute to demonstration, deployment and transfer of low-carbon technologies.	Debt Equity Guarantees Grants
European Investment Bank	The European Investment Bank provides large-scale climate finance through energy and urban funds.	Debt Equity Guarantees Grants
FISP-Climat	Led by the French Facility for Global Environment, the fund focuses on projects led by private actors in partnership with local actors. It provides repayable advances to address the challenge of scaling-up.	Repayable advances
CIF Forest Investment Programme	The programme supports efforts to reduce deforestation and forest degradation and promoting sustainable forest management. It also provides scaled-up financing for readiness reforms and public and private investments.	Debt Equity Guarantees Grants
French Development Agency	The agency supports large-scale climate finance projects in mitigation and adaptation, lately focusing on solar technologies and nature-based solutions.	Debt Guarantees Grants

French Facility for Global Environment	For 2019-2022, the facility focuses its action on five priority themes: (1) Protection and enhancement of biodiversity (2) Sustainable forests and agricultural lands (3) Resilience of aquatic ecosystems (4) Energy transition and resilient cities (5) Product life cycle, pollution, and wastes	Repayable advances Grants
German Development Bank	The bank provides finance for climate interventions in developing countries. It focuses on investment projects that enhance mitigation and adaptation replicable activities through large-scale projects.	Debt Grants
Green Climate Fund	The fund is established by the UNFCCC to make funding available to developing countries in order to enable climate action. Mauritius has already successfully engaged with the Fund and further opportunities are in the pipeline.	Debt Equity Guarantees Grants
International Climate Initiative (IKI)	IKI provides funding for climate action and biodiversity conservation through calls for proposals. The funding amount per project can range from 5 to 30 million Euros. Next Call May-June 2022	Debt Equity Guarantees Grants
NAMA Facility	The NAMA Facility funds innovative projects that tackle local challenges for reducing emissions in sectors and countries with strong potential for up-scaling, replication, and the ability to influence wider sectoral changes.	Grants