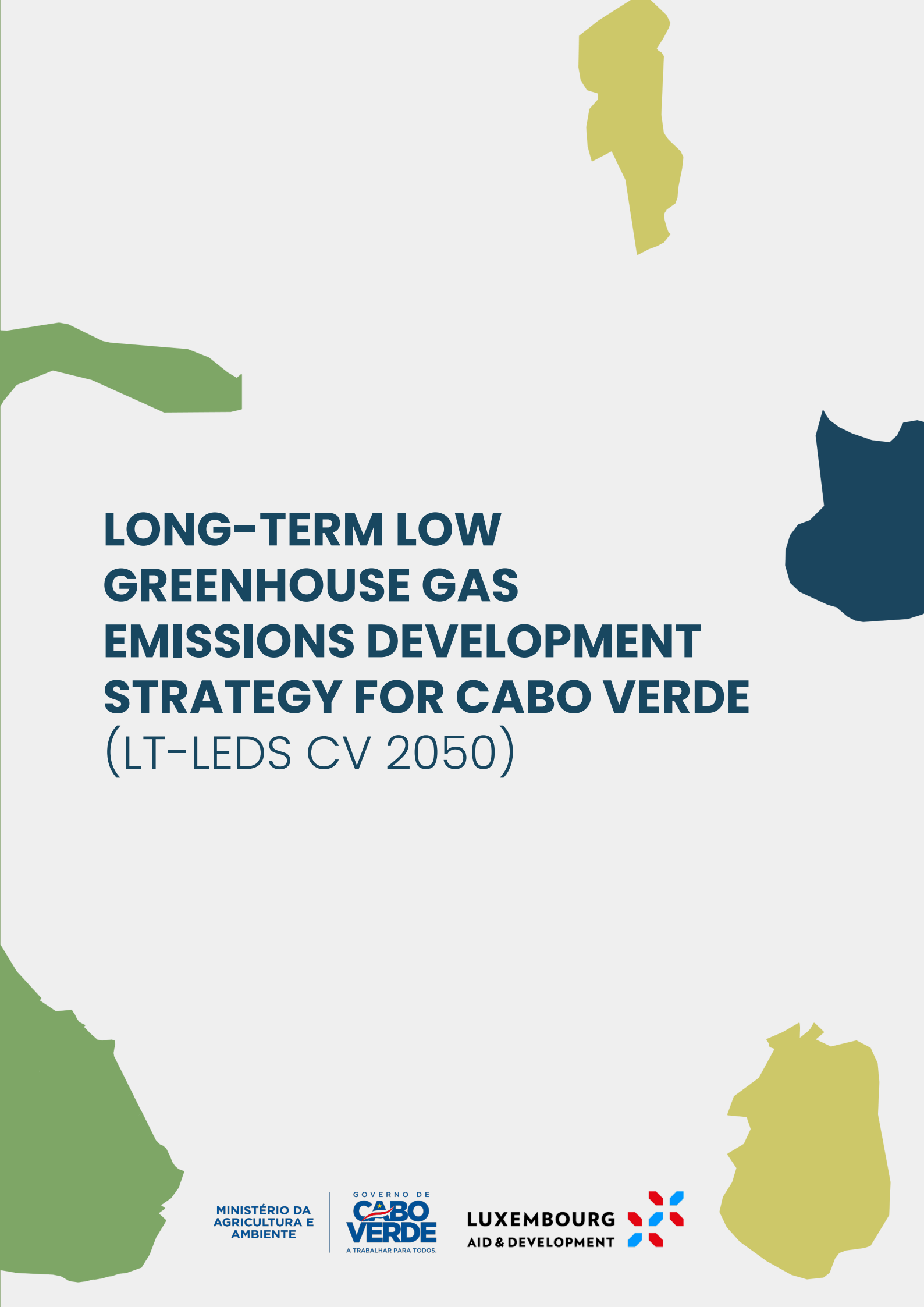




LONG-TERM LOW GREENHOUSE GAS EMISSIONS DEVELOPMENT STRATEGY FOR CABO VERDE (LT-LEDS CV 2050)

MINISTÉRIO DA
AGRICULTURA E
AMBIENTE

GOVERNO DE
**CABO
VERDE**
A TRABALHAR PARA TODOS.

LUXEMBOURG
AID & DEVELOPMENT



Cape Verde, 2024

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4 LT-LEDS CV 2050

Index

Technical Sheet	3
Acknowledgements	6
Acronyms and Abbreviations	7
Executive Summary	11
1. Introduction	23
1.1 Background	24
1.2 Document structure	24
2. Framework	27
2.1 International context	28
2.2 Cabo Verde’s response to climate change	29
3. Vision and Principles	31
3.1 The role of the long-term strategy	32
3.2 Vision and principles	33
4. BAU Emission Projections	35
4.1 GHG emissions profile	36
4.2 Energy	41
4.3 Industrial waste and processes	42
4.4 Agriculture and LULUCF	44
4.5 Economy-wide projection	46
5. Mitigation Assessment	49
5.1 Identification of mitigation measures	50
5.2 Mitigation potential	53
5.2.1 Energy	53
5.2.2 Waste and industrial processes	63
5.2.3 Agriculture and LULUCF	66
5.3 Socio-economic potential	69
5.3.1 Cost-benefit analysis	69
5.3.2 Marginal abatement costs	71
6. Decarbonisation Pathway	75
6.1 GHG reduction potential	76
6.2 Financing requirements	78
6.3 Moving towards net zero	81
6.3.1 Balancing GHG emissions and removals	81
6.3.2 Carbon dioxide removal methods (CDR)	82
6.3.3 What CDR options could apply to Cabo Verde?	83

Republic of Cabo Verde 5

7. Climate Impacts and Adaptation	89
7.1 Country profile of climate risks and impacts	90
7.2 Adaptation co-benefits of mitigation measures	92
8. Roadmap for Implementation	97
8.1 Overview	98
8.2 Stakeholders’ roles and responsibilities	98
8.3 Energy	103
8.4 Industrial waste and processes	107
8.4.1 Sustainable waste management	107
8.4.2 Industrial processes	111
8.5 Agriculture and LULUCF	111
8.5.1 Agriculture	112
8.5.2 LULUCF	113
9. Financing the Transition	115
9.1 The need to mobilise funding for climate action	116
9.2 Climate finance flows to date	117
9.3 Covering the funding gap	118
9.3.1 Increasing international climate finance	118
9.3.2 Sources of climate finance	119
9.4 Obstacles and challenges	120
9.4.1 Macroeconomic and development challenges	122
9.4.2 Challenges to mobilising private funding	122
9.4.3 Challenges in accessing international climate finance	123
9.5 A strategic approach to financing climate action	125
10. Monitoring and Evaluating Progress	129
10.1 Monitoring progress	130
10.1.1 Why track progress?	130
10.2 Institutional provisions	131
10.2.1 Overview	132
10.3 National monitoring and reporting system	133
10.4 National efforts to strengthen MRV and transparency	135
10.5 Table of progress indicators	136
References	145
ANNEX – Implementation Plan	147

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Acronyms and Abbreviations

ACCF	African Climate Change Fund
AdR	Água de Rega
AF	<i>Adaptation Fund</i>
ANAS	National Water and Sanitation Agency
BAU	Business as usual
BECCS	Bioenergy with Carbon Capture and Storage
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CA	Corresponding adjustments
CAD	Development Assistance Committee
CDR	Carbon Dioxide Removal
CEEE	Energy Efficiency in Buildings Code
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
CoM SSA	Covenant of Mayors for Sub-Saharan Africa
COP	Conference of the Parties
CRDF	Financing Climate-Related Development
CRT	Common Reporting Tables
CSO	Civil Society Organisation
CTF	Common Tabular Formats
DACCS	Direct Air Carbon Capture and Storage
DGASP	Directorate-General for Agriculture, Forestry and Livestock
EDEC	Cabo Verde Electricity Distribution Company

ESCO	Energy Services Company
ETF	Enhanced Transparency Framework
EV	Electric Vehicle
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHGI	Greenhouse Gas Inventory
GWP	Global Warming Potential
HFC	Hydrofluorocarbons
HFO	Heavy fuel oil
ICF	Luxembourg International Climate Finance
ICTU	Information necessary for clarity, transparency and understanding
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPPU	Industrial Processes and Product Use
ITMO	Internationally Transferred Mitigation Outcome
LT-LEDS	Long-term Low Emission Development Strategy
LULUCF	Land Use, Land Use Change and Forestry
M	Million
M&E	Monitoring and evaluation
MACC	Marginal Abatement Cost Curve
MEPS	Minimum Energy Performance Standards
Mol	Means of Implementation
MPG	Modalities, procedures and guidelines
MRV	Monitoring, Reporting and Verification
MW	Megawatt

MWh	Megawatt hours
NDC	Nationally Determined Contribution
NIR	National Inventory Report
NMT	Non-motorised transport
ODA	Official Development Assistance
ODS	Ozone Depleting Substances
PENGeR	National Strategic Plan for Waste Management
PISCCA	Cabo Verde Sustainable Waste Management plan
PNAER	National Action Plan for Renewable Energy
PNSE II	National Program for Energy Sustainability (Second edition)
REFLOR-CV	Cabo Verde Reforestation Project
SAF	Sustainable aviation fuel
SDGs	United Nations Sustainable Development Goals
SIDS	Small Island Developing States
t	Tonne
T&D	Transport and Distribution
TACCC	Transparency, accuracy, integrity, consistency and comparability
UAE	United Arab Emirates
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	US Dollar
VRE	Variable Renewable Energy



Executive Summary

Vision and principles

The Government of Cabo Verde (GoCV) is committed to taking urgent action to mitigate and adapt to the effects of climate change. As a party to the United Nations Framework Convention on Climate Change (UNFCCC), the country seeks to contribute to the goals of the Paris Agreement to limit global warming to 1.5°C, as reaffirmed by the Glasgow Climate Pact and the UAE Consensus. Although Cabo Verde's contribution to climate change in the form of greenhouse gas (GHG) emissions is relatively small, the country is determined to play its part in achieving the goals of the Paris Agreement, in a manner consistent with its status as a developing country and the need to provide sustainable economic growth.

As part of global efforts to reach net-zero emissions by mid-century, the Paris Agreement and the Glasgow Climate Pact invite parties to develop and communicate long-term low-emission development strategies (LT-LEDS). After submitting its first Nationally Determined Contribution (NDC) to the UNFCCC and its update, Cabo Verde has developed its LT-LEDS, setting out the country's vision for a just transition to a low-carbon economy. This includes the country's goal of becoming net zero¹ by 2050.

Cabo Verde's long-term strategy has been developed according to its national circumstances and is guided by the following five principles:

- 1. Ensure alignment with national policy objectives and priorities:** The transition to a low-carbon path must be consistent with Cabo Verde's policies, programmes and strategic priorities, both at national level and at sectoral planning level. This includes the overall framework provided by the Strategic Plan for Sustainable Development (PEDS) as well as sectoral strategies such as the Electricity Sector Master Plan 2018-2040, the National Strategic Plan for Waste Management (PENGeR), and the strategic plan for the development of sustainable tourism.
- 2. Contributing to the fulfilment of the United Nations Sustainable Development Goals (SDGs):** The Paris Agreement recognises that achieving the ambitions of the UN SDGs will require collective and concerted action on climate change. Similarly, climate change measures adopted by all Parties should seek to be closely aligned with the seventeen SDGs to ensure that they are environmentally sustainable, equitable and aligned with the goals of reducing poverty and gender inequality.
- 3. Prioritise the implementation of cost-effective measures that maximise co-benefits for communities:** Given Cabo Verde's development priorities, there is a need to focus first on implementing those projects, policies and programmes that are most efficient and least costly (on a socio-economic basis), and which can have important co-benefits such as revenue and green job creation, and reduced foreign fuel imports.
- 4. Securing financing conditions and increasing investment levels:** The realisation of the measures contained in the long-term strategy will require significant levels of investment with the right conditions to unlock private and public funding sources. The successful implementation

¹ The concept of net zero means to achieve a balance between the amount of GHGs emitted and the amount removed from the atmosphere.

of the measures will need to be accompanied by adequate sources and volumes of funding and international support through appropriate national structures and incentives.

5. Contribute to national resilience and capacity to adapt to the vulnerabilities and impacts of climate change: Cabo Verde is highly vulnerable to the impacts of climate change, and climate modelling indicates that this vulnerability is likely to increase in the coming decades. Its long-term low-carbon pathway and choice of mitigation measures must therefore be closely aligned with its adaptation planning and seek to reinforce and support its priorities for increasing national resilience.

The Glasgow Climate Pact reiterates the important role of countries' long-term strategies in global efforts to tackle climate change and calls for them to be updated regularly. The long-term strategy outlined in this document will therefore be reviewed and updated in response to changing national and international circumstances, the increased availability of information, data and scientific evidence, and the ongoing development and implementation of Cabo Verde's projects, plans and policies.

Cabo Verde's GHG emissions

Cabo Verde's total net emissions² in 2019 are estimated at 0.91 million tonnes of carbon dioxide equivalent (tCO₂e), contributing less than 0.002% to the global total. Under a business-as-usual (BAU) scenario, total emissions are expected to more than double in the 2019–2050 period, rising to 1.97 MtCO₂e (Figure ES-1).

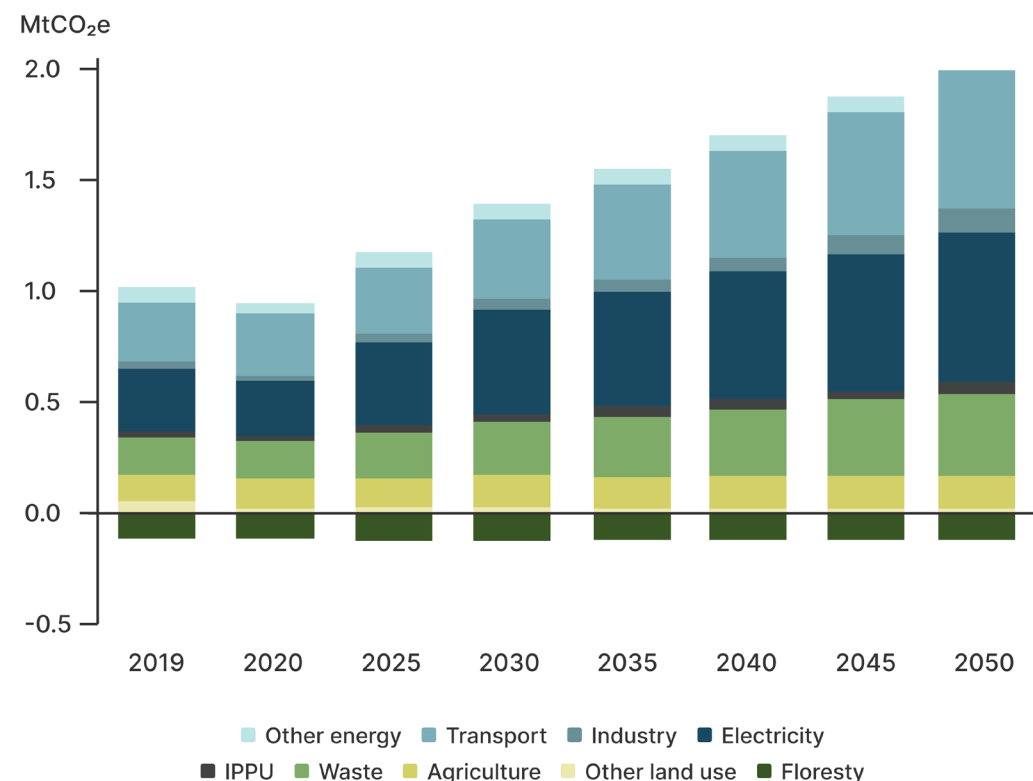


Figure ES-1: BAU reference case: GHG emissions and removals 2019–2050

² Net emissions correspond to total emissions from sources minus total emission removals from forestry.

The main points are as follows:

- **Energy** use is by far the largest current source of national emissions and is also expected to grow the fastest, increasing its contribution to total emissions from 65% in 2019 to 68% in 2030 and 72% in 2050. Most energy-consuming sectors will see substantial growth, although the increase in demand for electricity produced from fossil fuels and road vehicles over the coming decades will contribute the most to the total projected increase.
- **Waste** and **Industrial Processes and Product Use (IPPU)** emissions are expected to increase roughly in line with the overall growth in total emissions, as rising urban population rates boost waste production and expectations of new post-COVID19 growth lead to an increase in IPPU emissions.
- In contrast, emissions from **agriculture** show only a small increase over the forecast period, resulting in a decrease in the percentage of global emissions from 11% in 2019 to 8% in 2050. Despite the expected increases in emissions from livestock and crop management, this trend reflects the limited potential for increasing domestic production due to land restrictions.
- **Land use land use change and forestry (LULUCF)** registers a modest increase in expected removals, largely reflecting the assumptions regarding the conservation of Cabo Verde's existing forest areas and the gradual decrease in carbon emissions resulting from changes in land use.

The expected increase in national GHG emissions forecast over the period, combined with changes in sectoral contributions, can be understood primarily in terms of the assumptions made around economic and population growth. Together with the assumption of a continued post-COVID-19 recovery, gradually increasing urbanisation rates and the growth of the tourism sector, these factors are expected to create an ever-increasing demand for services such as transport and reliable energy supply as Cabo Verde continues to develop. These trends have also been observed in several emerging economies in recent decades, resulting in economic growth and rising living standards, but also resulting in significant increases in GHG emissions globally. The central challenge underlying the development of an LT-LEDS for Cabo Verde is therefore how to sustain long-term economic growth along a low-carbon pathway.

Mitigation measures and decarbonisation pathway

A comprehensive list of potential emission reduction projects and measures was developed through a thorough analysis of national documents and mitigation studies, and discussions and consultations with government officials, sector experts and other partners in Cabo Verde (Table ES-1).

Table ES-1: Mitigation measures				
SECTOR	AREA	MITIGATION MEASURES	SHORT DESCRIPTION	MITIGATION EFFECT
Energy	Decarbonised electricity supply	Wind energy	240 MW of new wind capacity additions, as provided for in the Electricity Sector Master Plan, including through large-scale IPP wind farms and small-scale distributed generation.	Replacing electricity production from fossil fuels
		Photovoltaic (PV) solar energy	315 MW of new solar photovoltaic capacity additions, as provided for in the Electricity Sector Master Plan, namely through large-scale IPP solar photovoltaic projects accompanied by battery and pumped storage and small-scale distributed generation.	
		Reducing transport and distribution losses (T&D)	Investment in a series of cost-effective measures to improve the efficiency of the national electricity transmission system, reducing losses from around 20% to 10%.	
	Low-carbon transport	Electric mobility	Increase the share of the national road vehicle fleet from electric vehicles (EVs) to replace conventional internal combustion engine (ICE) vehicles, aiming for 100% of all vehicle registrations by 2050. Accompanied by a range of on-grid and off-grid solar photovoltaic charging infrastructure.	Replacement of ICE vehicles in all types of vehicles, reducing the use of fossil fuels in transport (diesel and petrol); accompanied by an increase in the use of electricity from the grid.
			Transition to electric mobility in artisanal fishing	Transition to vessels powered by renewable energy in artisanal fishing.
		Modal shift	Modal shift from private vehicles to non-motorised transport (NMT) and public transport through new investments in urban infrastructure and public campaigns.	Diversification of energy sources, making fishermen less vulnerable to fluctuations in fossil fuel prices.
				Switching from journeys with higher emissions to journeys with lower greenhouse gas emissions (per km)
		Sustainable aviation fuels (SAF)	Increasing the mix of imported SAF with conventional aviation paraffin, in line with the European Union's objectives, from 5% in 2030 to 63% in 2050.	Gradual reduction in paraffin for jet engines used in domestic aviation.

Energy	Energy efficiency measures	Measures in the residential sector	Range of measures, including the Code for Energy Efficiency in Buildings (CEEE), the Minimum Energy Performance Standards (MEPS) and the creation of energy service companies (ESCOs).	Reducing electricity production from fossil fuels
		Measures in the tourism sector	Programme for Energy Efficiency in Industry and Tourism, together with the implementation of CEEE, MEPS and ESCOs.	
		Energy-efficient street lighting	Energy Efficiency in Public Lighting Programme (replacement of public lighting with LEDs); Energy Efficiency in Public Administration and Sustainable Schools Project.	
		Efficient water use and supply	Improving energy efficiency in water use and supply, including energy-efficient renewable pumping and desalination units.	
Waste	Sustainable waste management	Recycling and reusing waste	Waste reduction, recycling and reuse in line with the National Strategic Waste Management Plan (PENGeR), resulting in a reduction in the disposal and burning of plastics, paper and glass.	Avoided emissions from solid waste disposal and open burning of waste
		Sustainable composting	Diversion of organic waste to community composting in order to reduce the use of imported chemical fertilisers such as urea.	Emissions avoided due to the use of chemical fertilisers
		Biogas for energy	Introduction of small-scale biogas plants on livestock farms, waste disposal sites and wastewater treatment facilities with the potential to produce electricity, in accordance with the National Strategic Plan for Waste Management (PENGeR).	Avoided methane emissions and grid-based electricity generation
IPPU	Reduction of high GWP gases	Replacing fluorinated gases with low-GWP alternatives	Replacement of imported fluorinated gases with alternative substances with lower global warming potential (GWP), in accordance with the Kigali amendment to the Montreal Protocol.	Reduction of fluorinated gas emissions (industrial process).
Agriculture and LULUCF	Forestry and land use	Reforestation and restoration	Long-term afforestation of 7,500 hectares and reforestation of 3,250 hectares using diversified, resistant and adapted tree and shrub species, namely through REFLOR-CV and other initiatives.	Increased carbon removal (C-stock) by planting trees and shrubs.
		Agroforestry	Establishment of 3,250 ha of new agroforestry systems using fruit tree species adapted to arid and semi-arid zones.	

The figure below shows the emissions projections for the BAU reference scenario and an alternative long-term mitigation scenario which includes the mitigation measures (Figure ES-2).

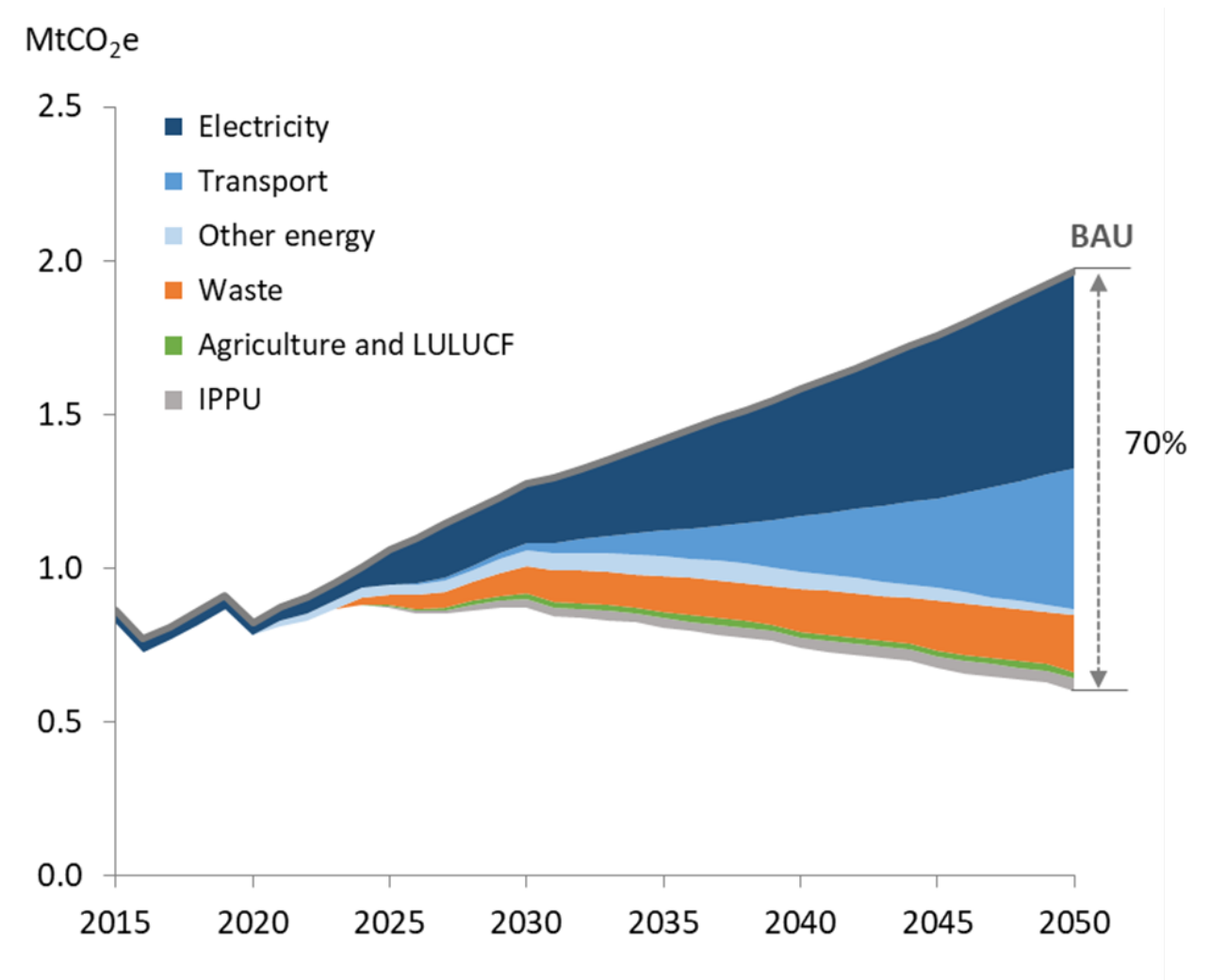


Figure ES-2: GHG reduction pathway of mitigation measures by 2050

The projection shows that in the BAU scenario, emissions are expected to more than double in the long term, from around 0.82 million tonnes of CO₂e in 2020 to 1.97 million tonnes of CO₂e in 2050. According to the alternative low emissions trajectory, with the application of the mitigation measures identified, it is estimated that emissions would increase to around 0.61 million tonnes of CO₂e in 2050. This is a much lower level than today and represents a very significant reduction of around two thirds compared to the current situation.

The analysis shows how the vast majority of emission reductions are expected to come from changes in energy use. By 2030, around two-thirds of the mitigation potential is attributed to low-carbon energy interventions, of which low-carbon transport and electricity production from renewable sources represent the largest percentages. The importance of these actions increases even more in the long term, accounting for more than 80% of the total mitigation potential by 2050. The projections clearly show how the relative contributions are expected to change over time, with energy efficiency actions having the greatest benefits over the next decade and low-carbon transport sector measures playing an increasing role in the longer term, with the gradual expansion of electric vehicles, modal shift and the use of sustainable aviation fuel.

Although low-carbon energy measures dominate the predicted mitigation potential, actions taken to increase the sustainability of the waste sector also contribute an important part of the total effort. Sustainable waste management, including reuse and recycling, composting and biogas energy, accounts for 22% of reductions in 2030 and 14% in 2050. The reduction of fluorinated gases and forestry measures account for the remainder.

The analysis shows how it is possible to make deep and ambitious cuts in the country’s emissions over the coming decades. However, it also shows how additional actions are likely to be needed to reach net zero. Like many other countries that have adopted net-zero emissions targets as part of global climate policy efforts, Cabo Verde will have to make difficult choices about how any remaining or “hard to abate” emissions can be offset by carbon removals. The potential scale and feasibility of many of these removal options remain highly uncertain at present, both globally and for Cabo Verde.

For Cabo Verde to achieve net zero, whereby its remaining emission sources are offset by an equal amount of carbon removals, more efforts will be needed to assess the potential for carbon dioxide removal (CDR) in greater detail. This would help identify potential projects and provide the basis for a CDR roadmap of actions designed to help the country achieve its long-term goal.

Financing the transition

Financing plays a crucial role in the transition to a low-carbon economy that is resilient to climate change. The transition to sustainable practices and climate change mitigation in the context of Small Island Developing States (SIDS) requires significant investments in clean energy, green infrastructure and adaptation measures. Without effective targeting of finance, climate goals will not be achieved. The Paris Agreement emphasises that financial flows must be consistent with a trajectory that leads to low GHG emissions and climate-resilient development³.

The total financing needs for the mitigation measures in this strategy are estimated to amount to around 3.4 billion dollars by 2050.⁴ These represent the additional investment costs in the mitigation scenario compared to the BAU scenario required for new plants, facilities, equipment and assets, as well as additional ongoing costs such as training, maintenance and support needs. Estimates show that mitigation measures in the energy sector are expected to dominate funding needs, accounting for more than 95% of the total. Despite the efforts made to date, the scale of the gap between existing flows and the estimated levels needed to implement the mitigation measures in this strategy is very large. The size of the gap is particularly noticeable in the renewable energy and electric mobility sector, where mitigation projects typically require large sums of upfront investments to fund infrastructure and new equipment and technologies.

A number of barriers are restricting the country’s ability to access existing and emerging sources of finance and create an enabling environment for low-carbon and climate-resilient investments. There is an urgent need for action involving all stakeholders. The long-term strategy identifies eight action points to improve access to climate finance and its implementation:

³ Paris Agreement. Article 2 (UNFCCC, 2015)
⁴ Financing needs are estimated in real terms (i.e. 2023 USD) and represent initial investments and running costs additional to the BAU baseline scenario

- 1. Strengthen coordination and integration of key actors:** More efforts need to be made to ensure better coordination between government institutions, donor partners and the private sector in order to support the programme implementation of climate finance.
- 2. Create a working group to mobilise support mechanisms for climate action:** The gaps in institutional and human capacity represent a major obstacle to mobilising support mechanisms for climate action in Cabo Verde, particularly during the project identification and development phase. Assisted by donor support, such a group can provide an invaluable supportive role in developing high quality proposals aligned with national priorities and representing viable projects to funders.
- 3. Developing a project portfolio and a cross-sectoral approach to project prioritisation:** A strategic approach is needed to prioritise projects in various mitigation sectors that have important co-benefits in terms of adaptation. Capital investment should be incentivised in technological and implementation choices that support a long-term development path compatible with the Paris Agreement.
- 4. Strengthening the private sector's contribution to financing climate action:** The government's institutional capacity limitations and lack of budget mean that private sector financing will be needed to boost funding levels, especially for renewable energy projects. Private sector participation and investment can best be encouraged by raising awareness and advocating for public-private partnerships (PPPs).
- 5. Promoting a strong national climate fund and leveraging domestic climate finance:** Cabo Verde has created the Climate and Environment Fund (FCA). But in addition to facilitating the transfer and management of funds from bilateral and multilateral mechanisms, the FCA must be structured in such a way as to mobilise domestic resources to finance climate projects in Cabo Verde.
- 6. Explore alternative funding sources and opportunities:** Cabo Verde, as a middle-income country, may face challenges in accessing traditional grant-based financing due to its classification. However, the country can explore alternative financing mechanisms, such as access to international carbon markets, to mobilise resources for climate change mitigation and adaptation projects.
- 7. Developing systems to track and report financial flows and outcomes:** It is important to improve transparency, accountability and data sharing in order to give potential funders confidence and to assess results and the contribution to meeting climate goals.
- 8. Unlocking the potential of climate (including green and blue) bonds:** For Cabo Verde, being a SIDS vulnerable to the impacts of climate change, climate bonds can play a crucial role in financing sustainable and resilient initiatives. It is essential to align bond issuance with the country's sustainable development goals and, at the same time, fulfil international standards to attract a diverse range of investors.

Monitoring and evaluating progress

Finally, a robust Monitoring and Evaluation (M&E) framework is essential to track and report on the progress of Cabo Verde's mitigation actions and targets, consistent with the country's long-term goal of achieving net zero. In order to monitor global progress on climate change, the Paris Agreement established certain monitoring and reporting requirements for all signatory Parties, which have since been elaborated through a set of agreed rules and procedures including the Enhanced Transparency Framework (ETF). In addition, evaluating the performance of policies and progress in their implementation is key to designing and reviewing best practices.

This long-term strategy therefore establishes a framework for monitoring Cabo Verde's progress. It builds on existing national institutional arrangements and the climate governance framework and ongoing efforts to improve transparency and MRV systems, including in relation to Cabo Verde's NDC under the Paris Agreement. The framework builds on existing provisions and indicators, such as those in the updated NDC, but aims to provide a more comprehensive and long-term approach aligned with sectoral strategic planning, as well as international requirements and best practice.



Cidade da Praia Santiago's Island



Cidade da Praia Santiago's Island

01.

Introduction

1.1 Background

The Government of Cabo Verde (GoCV) is committed to taking urgent action to mitigate and adapt to the effects of climate change. As a party to the United Nations Framework Convention on Climate Change (UNFCCC), the country seeks to contribute to the goals of the Paris Agreement to limit global warming to 1.5°C, as reaffirmed by the Glasgow Climate Pact and the UAE Consensus. Although Cabo Verde’s contribution to climate change in the form of greenhouse gas (GHG) emissions is relatively small, the country is determined to play its part in achieving the goals of the Paris Agreement, in a manner consistent with its status as a developing country and the need to provide sustainable economic growth.

As part of global efforts to reach net-zero emissions by mid-century, the Paris Agreement and the Glasgow Climate Pact invite parties to develop and communicate long-term low-emission development strategies (LT-LEDS). After submitting its first NDC to the UNFCCC, Cabo Verde has developed its LT-LEDS, setting out the country’s vision for a just transition to a low-carbon economy. This includes the country’s goal of becoming net zero by 2050.

This document presents Cabo Verde’s LT-LEDS. Its development was carried out in two major phases with contributions from across government, academia, development partners and civil society. The first phase provided technical and economic analyses in order to identify and evaluate potentially suitable GHG mitigation measures for Cabo Verde and their role in reducing national emissions by 2050. The second focused on the implementation of the mitigation measures through the development of an Implementation Plan (a roadmap of key actions, roles and responsibilities), Financing Strategy and Monitoring and Evaluation (M&E) framework of indicators to track implementation progress. The strategy was prepared through close consultation with national experts and stakeholders and was developed to align closely with policies and sectoral priorities and plans in Cabo Verde.

1.2 Document structure

The document is organised as follows:

- **Chapter 2** sets out the framework for Cabo Verde’s LT-LEDS, including the international political context and global efforts to tackle climate change, and the country’s response in light of its national circumstances.
- **Chapter 3** describes the vision for the LT-LEDS and the key principles that shape its priorities, the choice of interventions and the overall strategy for achieving a long-term low-carbon development pathway.
- **Chapter 4** presents the development of a GHG emissions projection under a business-as-usual (BAU) scenario through 2050, in which mitigation measures are not implemented.

- **Chapter 5** describes an assessment of the mitigation measures identified for inclusion in the strategy. A series of projects, programmes and strategies covering all sectors of the economy are quantified in terms of their mitigation and socio-economic potential.
- **Chapter 6** describes an alternative decarbonisation pathway for Cabo Verde, showing the estimated mitigation contribution of the identified mitigation measures by 2050 compared to the BAU scenario, along with the estimated financing requirements. The chapter also includes a discussion of how the country could achieve its ambition of net zero emissions by 2050.
- **Chapter 7** describes the main areas of vulnerability and climate impacts for Cabo Verde in the long term as a Small Island Developing State (SIDS). The chapter includes a description of the important links between adaptation and mitigation.
- **Chapter 8** presents a roadmap for implementing the strategy, outlining key milestones and identifying the roles and responsibilities, and specific actions, needed to achieve the mitigation measures.
- **Chapter 9** sets out a finance strategy including the estimated funding needs, the identification of national and international sources of funding and support, and a strategic framework of actions to overcome economic and financial barriers.
- **Chapter 10** describes a Monitoring and Evaluation (M&E) framework for the mitigation measures described in the strategy in line with Cabo Verde’s international reporting requirements and its national circumstances.

The Annex to this document describes the strategy’s Implementation Plan in more detail through sectoral tables that describe the responsible government ministries and implementing entities, the expected timelines, estimated funding needs until 2050, adaptation co-benefits and the contribution to achieving the United Nations Sustainable Development Goals (SDGs).



Topo da Coroa Santo Antão Island

02.

Framework

This section presents the context for Cabo Verde’s LT-LEDS, including an overview of the international policy framework and the country’s response to tackling climate change in light of its national circumstances.

2.1 International context

At the 21st Conference of the Parties (COP21) in Paris on 12 December 2015, the Parties to the UNFCCC reached an agreement to combat climate change and accelerate the actions and investments needed to achieve a sustainable low-carbon future. The Paris Agreement entered into force in November 2016, following the universal adoption of the Agreement by the Parties. Under the terms of the Agreement, both developed and developing countries made individual commitments to transition towards a climate resilient and low-emissions future.

The Paris Agreement sets three long-term objectives (UNFCCC, 2015): ⁵

- keep global warming well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C;
- increase the capacity to adapt to the adverse effects of climate change and fostering resilience; and
- make financial flows consistent with a path towards low GHG emissions and climate resilient development.

These targets were reaffirmed at COP26 in November 2021, as reflected in the Glasgow Climate Pact (UNFCCC, 2021).⁶ In addition to reaffirming the need for Parties to fulfil mitigation and adaptation efforts, the Glasgow Climate Pact noted the failure of developed countries to meet their climate finance targets and urged them to fully meet the \$100 billion target. Following the results of the first Global Stocktake, the need to increase the ambition of global mitigation efforts was emphasised within the framework of the UAE Consensus in 2023.

The Paris Agreement states that in order to tackle global warming it will be necessary to achieve carbon neutrality in the second half of this century, an objective reaffirmed in Glasgow and Dubai. To this end, the Agreement establishes a framework according to which all countries must progressively prepare and communicate more ambitious NDCs for the global mitigation effort. As well as submitting their first NDCs setting out their short-term commitments, the Paris Agreement invites Parties to submit long-term low GHG emissions development strategies (LT-LEDS)⁷

The Paris Agreement represents a new era of global efforts to tackle climate change and represents a paradigm shift in the implementation of the UNFCCC, with a clear recognition that only with a concerted global response from all countries will it be possible to overcome the challenge of climate change. Limiting the increase in the global average temperature to 1.5 °C will require an unprecedented transformation of society and deep emission reductions in all sectors, as well as changes in behaviour and the involvement of all Parties.

⁵ Paris Agreement. Article 2.1 (UNFCCC, 2015)
⁶ Glasgow Climate Pact. Draft decision -/CMA.3 (UNFCCC, 2021)
⁷ Paris Agreement. Article 4.19 (UNFCCC, 2015)

While a global response is needed to achieve the goals agreed in Paris, the framework also recognises the importance of different national circumstances. To achieve carbon neutrality at a global level, it is recognised that countries must follow a just transition to reduce their emissions in light of national circumstances. Both the Paris Agreement and the Glasgow Climate Pact recognise that long-term goals must be achieved on the basis of equity and in the context of sustainable development and efforts to eradicate poverty ⁸.

2.2 Cabo Verde’s response to climate change

As part of global efforts to tackle climate change, the Republic of Cabo Verde signed the Paris Agreement in April 2016 and presented its first updated Nationally Determined Contribution (NDC), submitted to the United Nations Framework Convention on Climate Change UNFCCC in April 2021, setting out its mitigation and adaptation contributions until 2030 (MAA, 2021a).

Despite the country’s very low per capita greenhouse gas (GHG) emissions and overall contribution to global emissions, the updated NDC presents an ambitious range of mitigation measures that go beyond the initial NDC to deliver an estimated reduction of between 18 and 24% (%) in relation to business as usual (BAU) emissions in 2030. The document affirms Cabo Verde’s determination to take aggressive measures to combat and adapt to climate change, taking into account the country’s national circumstances which include the need to eradicate poverty, its demographics, geography and insularity. The document is closely aligned with the development goals of the Cabo Verde 2030 Ambition and describes how the contributions are socially inclusive, cross-cutting in nature and tailored to benefit Cabo Verde’s most vulnerable people.

Cabo Verde’s response to climate change is highly determined by its status as a highly vulnerable Small Island Developing State (SIDS). The country has seen an increase in periods of drought, soil erosion, saline intrusion and desertification in recent years, so climate resilience is fundamental to the updated NDC which recognises that mitigation commitments directly produce a series of significant co-benefits in terms of adaptation and resilience, and vice versa. Cabo Verde’s comprehensive and ambitious response to climate risks is also defined in the recently published National Adaptation Plan (NAP) (MAA, 2021b).

The NDC defines a wide range of policies and action programmes for mitigation up to 2030, with a strong focus on reducing the carbon intensity of national energy use which is the main source of GHG emissions, namely by increasing electricity production from renewable sources (wind, solar photovoltaic, pumped storage, biogas), improving energy efficiency in all sectors and replacing fossil fuel-based transport with electricity and greater use of non-motorised mobility (walking, cycling). Although the contributions are not quantified under the 2030 targets, the NDC also defines a series of measures aimed at strengthening national carbon sinks, including commitments to increase forest areas through reforestation and afforestation, to protect the country’s important wetlands, to reduce and replace the unsustainable use of firewood, and to reduce forest fires. There are also important contributions related to improving waste management and sustainable tourism.

⁸ Paris Agreement. Article 4.1 (UNFCCC, 2015) ; Glasgow Climate Pact. Para. 50 (UNFCCC, 2021)



03.

Vision and Principles

This section sets out Cabo Verde’s vision for the LT-LEDS and the principles that shape its priorities, as well as the overall strategy for achieving a low-carbon development path by 2050, based on national circumstances and strategic priorities.

3.1 The role of the long-term strategy

The Paris Agreement establishes a framework according to which countries will regularly communicate their NDCs. The Agreement requires that each successive NDC represents a progression beyond the country’s current NDC and reflects its highest possible ambition, “as well as its common but differentiated responsibilities and respective capabilities, in light of different national circumstances”. Each NDC cycle therefore requires Parties to assess whether their mitigation contributions reflect their highest possible ambition and whether they could do more to contribute to collective efforts to achieve the long-term goals of the Paris Agreement.

Cabo Verde’s first NDC outlines its priority measures for the short term. In accordance with the framework established by the Paris Agreement, its subsequent NDCs will describe improved actions and how these can provide additional emissions mitigation. In this context, the LT-LEDS provides a long-term framework according to which successive NDCs can progressively move the country towards a GHG emissions reduction pathway consistent with the goals of the Paris Agreement (Figure 3-1).

The Glasgow Climate Pact reiterates the important role of countries’ long-term strategies in global efforts to tackle climate change and calls for them to be updated regularly. The long-term strategy outlined in this document will therefore be reviewed and updated in response to changing national and international circumstances, the increased availability of information, data and scientific evidence, and the ongoing development and implementation of Cabo Verde’s projects, plans and policies.

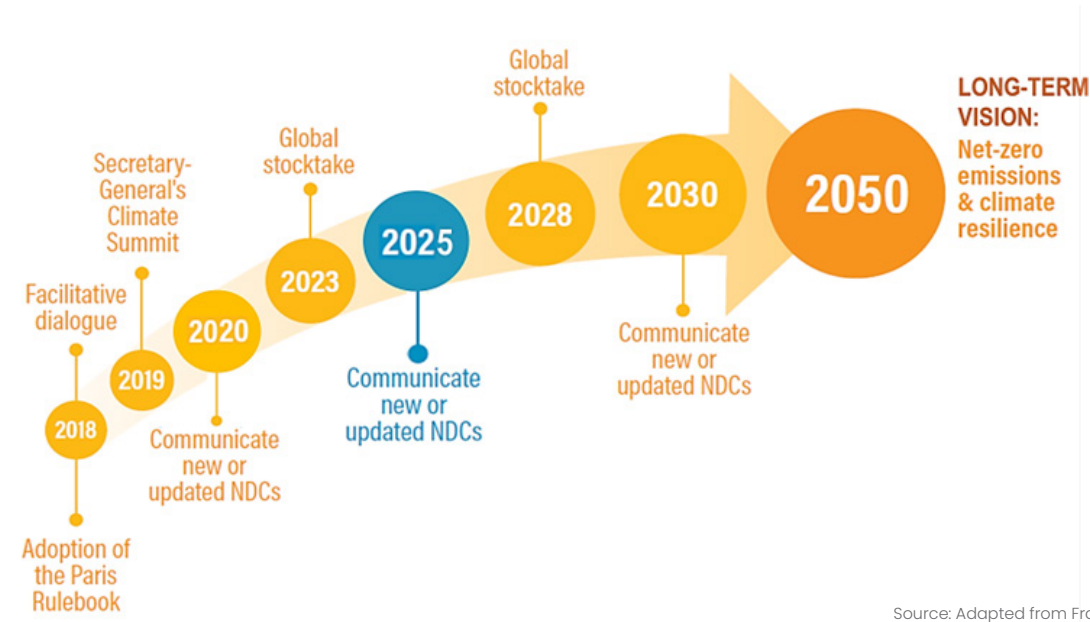


Figure 3-1: NDCs and LT-LEDS under the Paris Agreement

Cabo Verde’s long-term strategy contains the following components:

- 1. **Description of mitigation measures** in all sectors of the economy through 2050 (policies, programmes, projects)
- 2. **A decarbonisation pathway** showing the long-term mitigation potential until 2050 against a business-as-usual (BAU) scenario
- 3. **Implementation Plan** with specific strategies and actions for each sector and **Finance Strategy** to support low-carbon projects and plans
- 4. **Monitoring framework** to track the implementation of mitigation measures consistent with the requirements of the UNFCCC and the Paris Agreement

This structure is aligned with the NDC, since Parties are obliged to communicate these same aspects within their contributions. For both the LT-LEDS and the NDC, each of these components has been drawn up on a sectoral basis, identifying the interventions, actions, organisations and stakeholders at sectoral level needed to implement the measures by 2050.

3.2 Vision and principles

The LT-LEDS provides the long-term strategic vision for the country’s mitigation efforts, helping to place short-term actions in the context of the long-term structural changes that require part of a just transition to a low-carbon and resilient economy by 2050.

Cabo Verde’s long-term strategy vision is fully aligned with its current climate and economic development goals, namely to promote low-carbon development and the green economy consistent with the country’s status as a developing country and its need to deliver sustainable economic growth. This is consistent with the Paris Agreement and the Glasgow Climate Pact and means moving towards a low-carbon path in a way that does not impact on securing economic growth, resource development and improving livelihoods – but instead helps to create new and additional employment opportunities and green revenues, along with eradicating poverty.

The long-term strategy provides insights into key future trends involving all sectors of the economy and society in order to move towards a low-carbon pathway through a socially just and cost-efficient transition, strengthening the competitiveness of the national economy, promoting job creation and increasing co-benefits for all. Because climate change is a global problem, it requires a global response. At the same time, the Paris Agreement recognises that each country must develop its own contribution best suited to its national circumstances and stage of economic development.⁹

Cabo Verde’s long-term strategy has been developed according to its national circumstances and is guided by the following five principles:

⁹ Paris Agreement. Article 4.19: “All Parties shall endeavour to formulate and communicate long-term low greenhouse gas emission development strategies” ... “taking into account their common but differentiated responsibilities and respective capabilities in the light of different national circumstances.” (UNFCCC, 2015).

1. **Ensure alignment with national policy objectives and priorities:** The transition to a low-carbon path must be consistent with Cabo Verde's policies, programmes and strategic priorities, both at national level and at sectoral planning level. This includes the overall framework provided by the Strategic Plan for Sustainable Development (PEDS) as well as sectoral strategies such as the Electricity Sector Master Plan 2018-2040, the National Strategic Plan for Waste Management (PENGeR), and the strategic plan for the development of sustainable tourism.
2. **Contributing to the fulfilment of the United Nations Sustainable Development Goals (SDGs):** The Paris Agreement recognises that achieving the ambitions of the UN SDGs will require collective and concerted action on climate change. Similarly, climate change measures adopted by all Parties should seek to be closely aligned with the seventeen SDGs to ensure that they are environmentally sustainable, equitable and aligned with the goals of reducing poverty and gender inequality.
3. **Prioritise the implementation of cost-effective measures that maximise co-benefits for communities:** Given Cabo Verde's development priorities, there is a need to focus first on implementing those projects, policies and programmes that are most efficient and least costly (on a socio-economic basis), and which can have important co-benefits such as revenue and green job creation, and reduced foreign fuel imports.
4. **Securing financing conditions and increasing investment levels:** The realisation of the measures contained in the long-term strategy will require significant levels of investment with the right conditions to unlock private and public funding sources. The successful implementation of the measures will need to be accompanied by adequate sources of funding and international support through appropriate national structures and incentives.
5. **Contribute to national resilience and capacity to adapt to the vulnerabilities and impacts of climate change:** Cabo Verde is highly vulnerable to the impacts of climate change, and climate modelling indicates that this is likely to increase in the coming decades. Its long-term low-carbon pathway and choice of mitigation measures must therefore be closely aligned with its adaptation planning and seek to reinforce and support its priorities for increasing national resilience.



04.

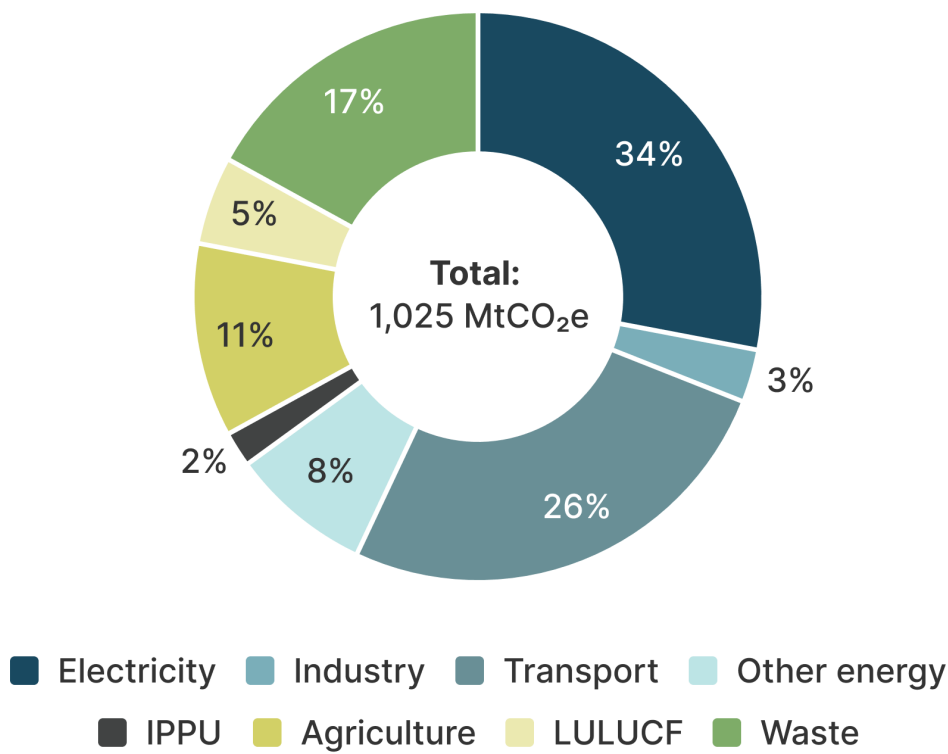
BAU Emission Projections

This section describes a projection of GHG emissions for Cabo Verde up to 2050. Firstly, a profile of existing GHG emissions for the reference year 2019 is described. Emissions are then projected to 2050 under a BAU scenario whereby national mitigation policies and actions are not implemented. This projection constitutes the reference scenario against which emission reductions resulting from mitigation actions under alternative GHG reduction pathways can be estimated.

The BAU modelling approach is based on detailed long-term forecasts developed for each sector. These reflect a series of assumptions that determine changes in factors such as future energy supply and demand, agricultural output, waste production and transport demand. To this end, national strategies and plans were assessed and experts from the relevant government departments, agencies and organisations were consulted. BAU projections are presented according to each of the main emitting sectors of energy, waste, industry, agriculture and land use land use change and forestry (LULUCF), followed by an aggregate BAU projection for the whole economy up to 2050.

4.1 GHG emissions profile

Cabo Verde’s GHG emissions for the reference year 2019 are summarised below in Figure 4 1 (before removals) with a more detailed breakdown provided in Table 4-1.



Source: National GHG Inventory, 2024

Figure 4-1: National GHG emissions by source in 2019 (before removals)

Table 4-1: National GHG emissions by source in 2019				
CATEGORIES			ktCO ₂ e	MtCO ₂ e
Energy	Fuel combustion activities	Electricity production	286.4	0.286
		Industry	30.9	0.032
		Transport	266.1	0.263
		Other sectors	78.2	0.081
IPPU	Non-energy products from the use of fuels and solvents	Use of lubricants	0.900	0.0009
		Use of paraffin waxes	0.113	0.0001
	Use of products as substitutes for ozone-depleting substances	Refrigeration and air conditioning	25.09	0.025
Agriculture	Livestock	Enteric fermentation	47.6	0.048
		Manure management	13.5	0.013
	Aggregate sources and sources of non-CO2 emissions in the soil	Urea application	2.04	0.002
		N2O Directly managed soils	36.1	0.036
		N2O indirect soil management	12.3	0.012
		Agricultural waste	0.004	0.000
LULUCF	Land	Forest area	-114.6	-0.115
		Pasture	32.2	0.032
		Settlements	4.5	0.005
		Other uses	19.1	0.019
Waste	Solid waste	Unmanaged disposal sites	17.0	0.017
	Incineration and open burning	Open burning	62.9	0.063
	Wastewater treatment and discharge	Domestic	86.6	0.087
	Wastewater treatment and discharge	Industrial	3.4	0.003
Total emissions: Energy			662.0	0.662
Total emissions: IPPU			26,1	0.026
Total emissions: Agriculture			111.5	0.112
Total emissions: LULUCF ¹⁰			55.8	0.056
Total emissions: Waste			169.9	0.170
Total emissions (before removals)			1.025.3	1.025
Total removals: forestry			-114.6	-0.115
Total net emissions (emissions minus removals)			910.7	0.911

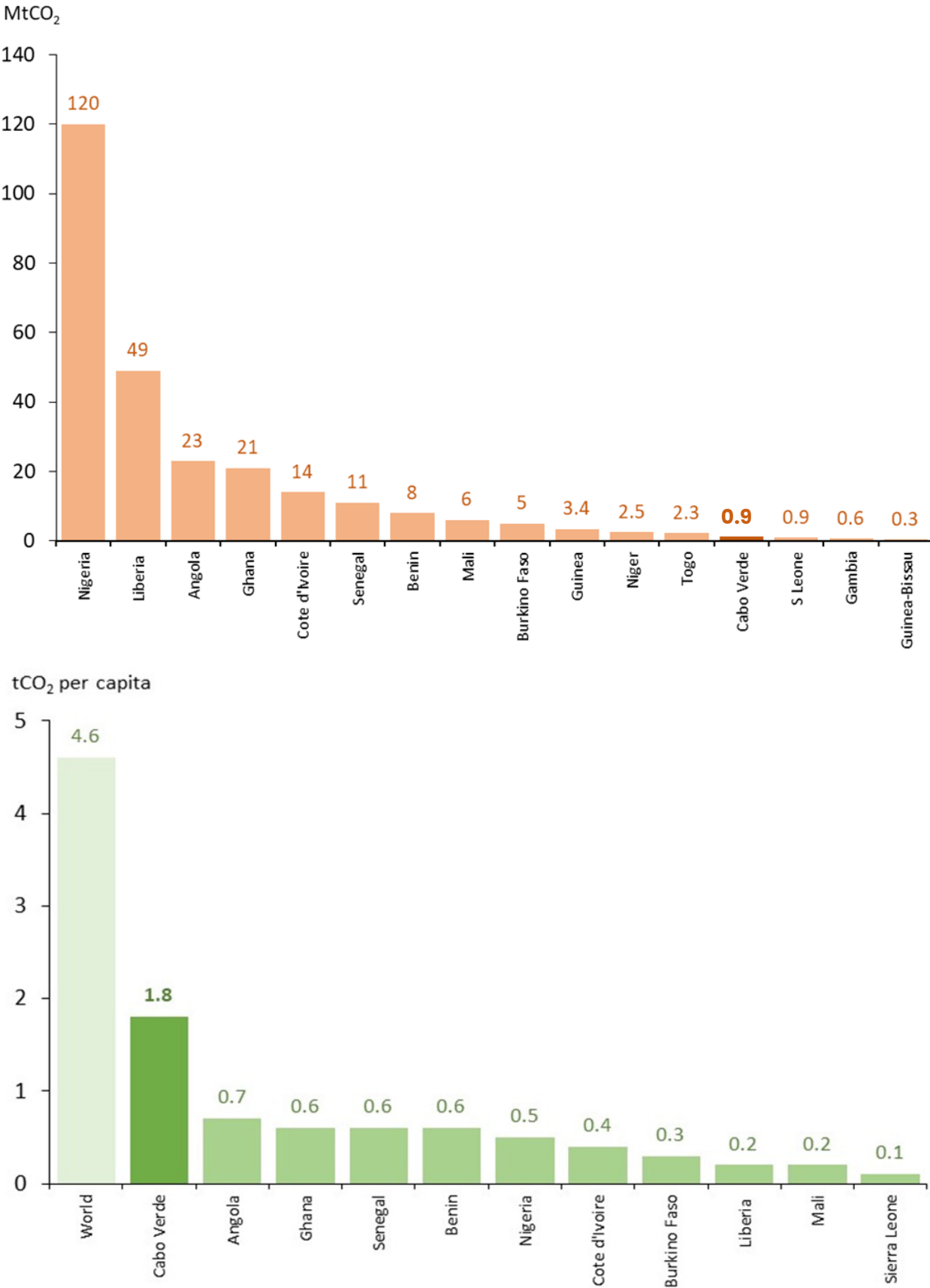
10 Net emissions: -0.059 MtCO2e

Source: National GHG Inventory, 2024

Total net emissions¹¹ in 2019 are estimated at **0.911 million tonnes of carbon dioxide equivalent (tCO₂e)**, with the following sectoral contributions:

- **Energy** accounted for 65% of the total (0.66 million tCO₂e), mainly due to emissions from energy combustion in electricity production (diesel and fuel oil) and road transport (diesel and petrol), followed by fuel use in manufacturing and construction, households and sectors such as fishing.
- **Waste** accounted for around 16% of the total (0.17 million tCO₂e), mainly due to emissions resulting from the discharge of wastewater from the residential and industrial sectors (fishing and beverages), followed by open burning of waste and disposal of solid waste.
- **Agriculture** accounted for around 11% of the total (0.11 million tCO₂e); emissions from livestock (methane from livestock enteric fermentation and emissions from manure management) accounted for the largest share, followed by the use of fertilisers on crops (application of urea).
- **Land Use, Land Use Change and Forestry (LULUCF)** accounted for just 5% (0.056 million tCO₂e), with GHG emissions from agricultural land accounting for the largest share. Total emissions were lower than carbon removals from forest land in the same year (0.115 million tCO₂e removals), meaning that net emissions from the land use sector were negative in 2019 (0.059 million tCO₂e removals).
- **Process Industries and Other Products (IPPU)** accounted for only 2% of the total (0.026 million tCO₂e), mainly due to the use of hydrofluorocarbons (HFCs) for refrigeration and air conditioning in buildings.

Cabo Verde’s GHG emissions contribute less than 0.002% to the global total¹². The country is also a relatively small emitter at a regional level. This is shown in Figure 4-2 below, which compares Cabo Verde’s total GHG emissions with other West African countries. The data shows that Cabo Verde has relatively high per capita emissions (around 1.8 tCO₂e) compared to other countries in the region, reflecting Cabo Verde’s relatively high level of economic development and associated rates of fossil fuel consumption, due to the country’s insularity and the need for inter-island transport of people and goods in the archipelago as compared to other West African countries. However, it can be seen that the country’s per capita emissions are well below the world average, reflecting the country’s status as a developing economy with no national energy- or emissions-intensive industry. A comparison with other SIDS is shown in Figure 4-3 indicating that Cabo Verde is a comparatively low emitter, both in absolute terms and per capita, compared to other SIDS countries.



Source: EC, 2022

11 Net emissions correspond to total emissions from sources minus total emission removals from forestry
12 Global greenhouse gas emissions in 2019 are estimated at around 55 billion tCO₂e.

Figure 4-2: Regional comparison of Cabo Verde's total and per capita emissions

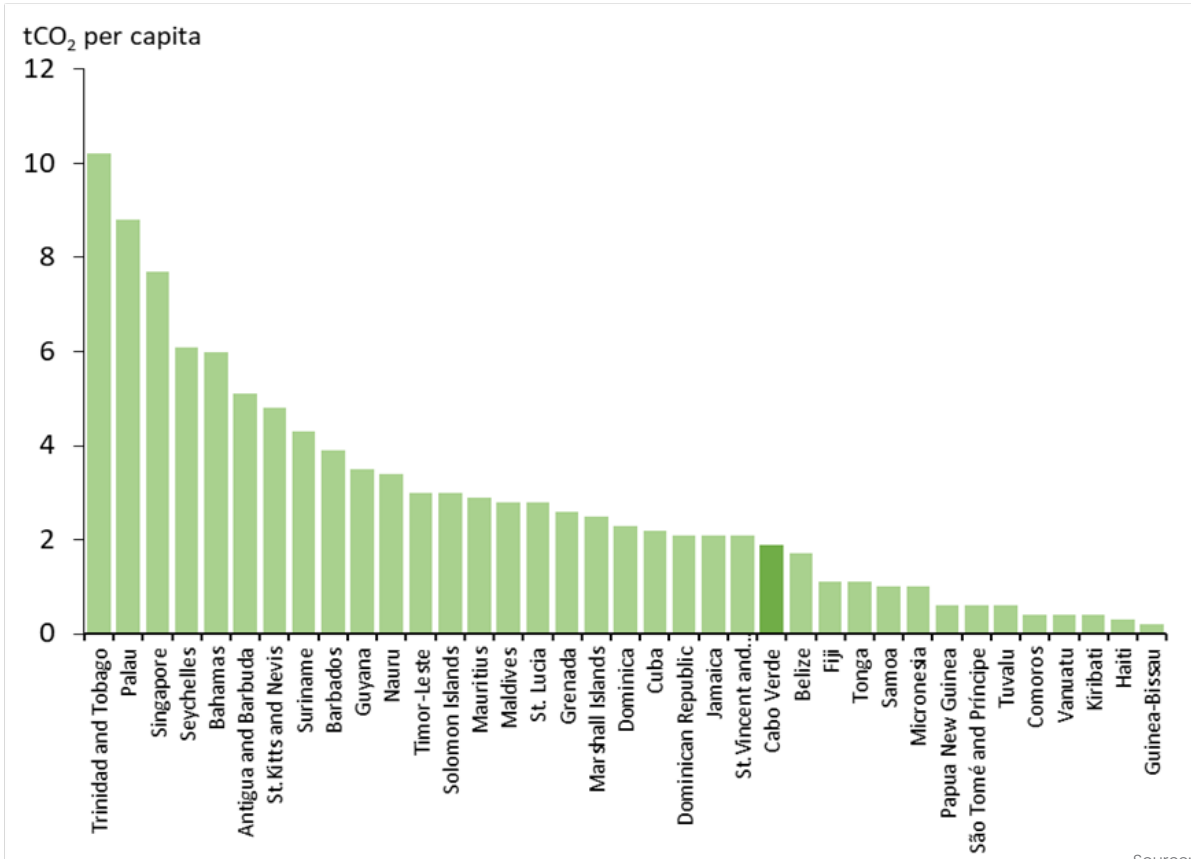
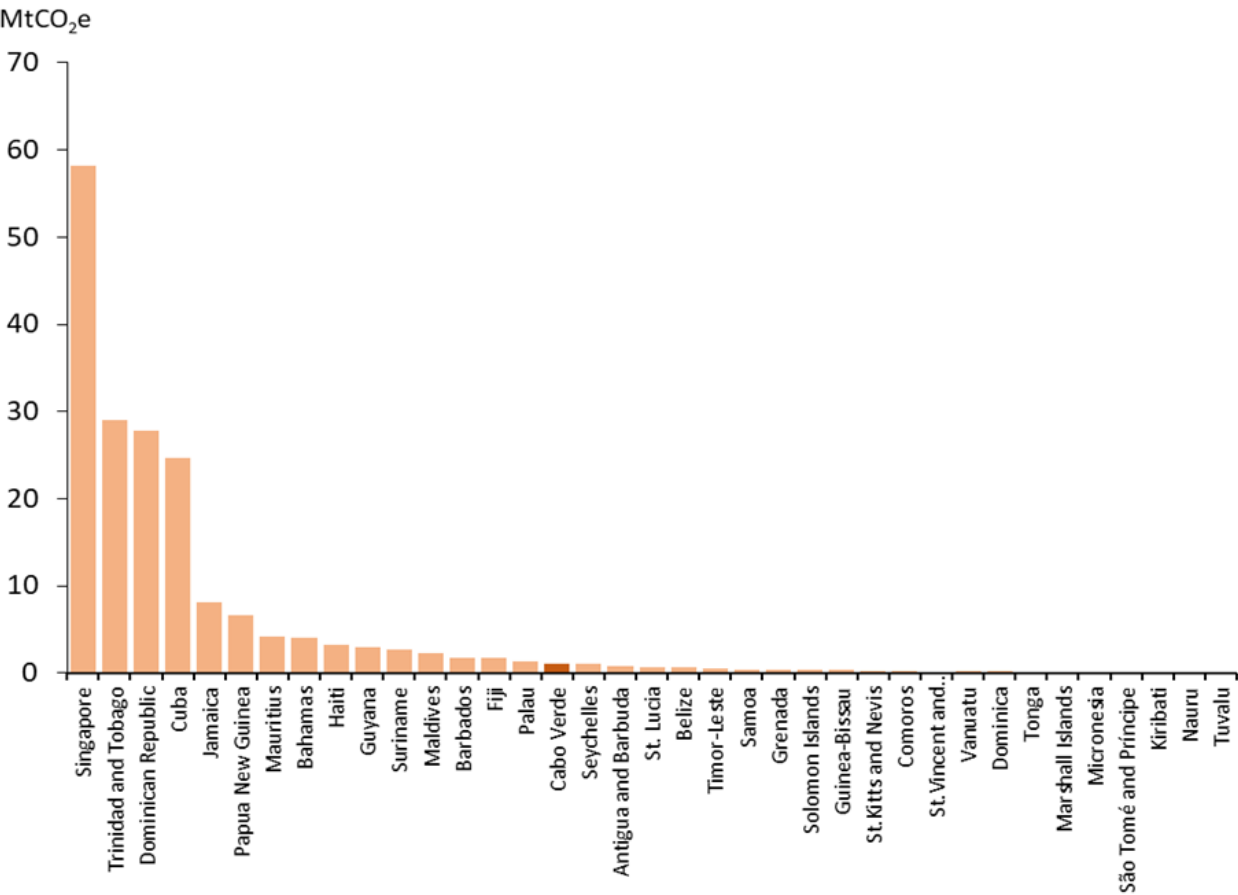


Figure 4-3: Comparison of Cabo Verde’s total and per capita emissions with other SIDS

The following sections describe the development of a BAU projection according to each sector, followed by a summary of total GHG emissions up to 2050.

4.2 Energy

In 2019, emissions from energy use were estimated at around 0.662 million MtCO₂e. The burning of fuels (diesel and fuel oil) to produce electricity accounted for around 43% of the total, closely followed by the use of fossil fuels in transport, with around 40% of the total. Of the remaining emissions, the use of diesel in manufacturing, construction and light industry accounted for the largest share.

Figure 4-4 and Table 4-2 show the projected GHG emissions for 2050 from energy use in the BAU baseline scenario. Based on data on energy use made available by the National Directorate of Industry, Commerce and Energy (DNICE), emissions are estimated to have decreased in 2020 and 2021 compared to 2019 levels. This can be attributed to the impacts of the COVID-19 pandemic on economic production, especially in the tourism sector, which has led to a reduction in electricity production, transport demand and other energy-consuming activities.

As the graph shows, emissions are expected to increase significantly, recovering to pre-COVID19 levels by 2025 and reaching 1.5 million tCO₂e by 2050. Increased demand for energy-using services such as electricity generation and road transport drives the forecast growth rate, more than doubling emissions over the period to 2050. Although all activities are expected to see an increase in emissions over the next decade, construction is expected to see a particularly strong increase to meet the growing demand from the tourism and commercial sector.

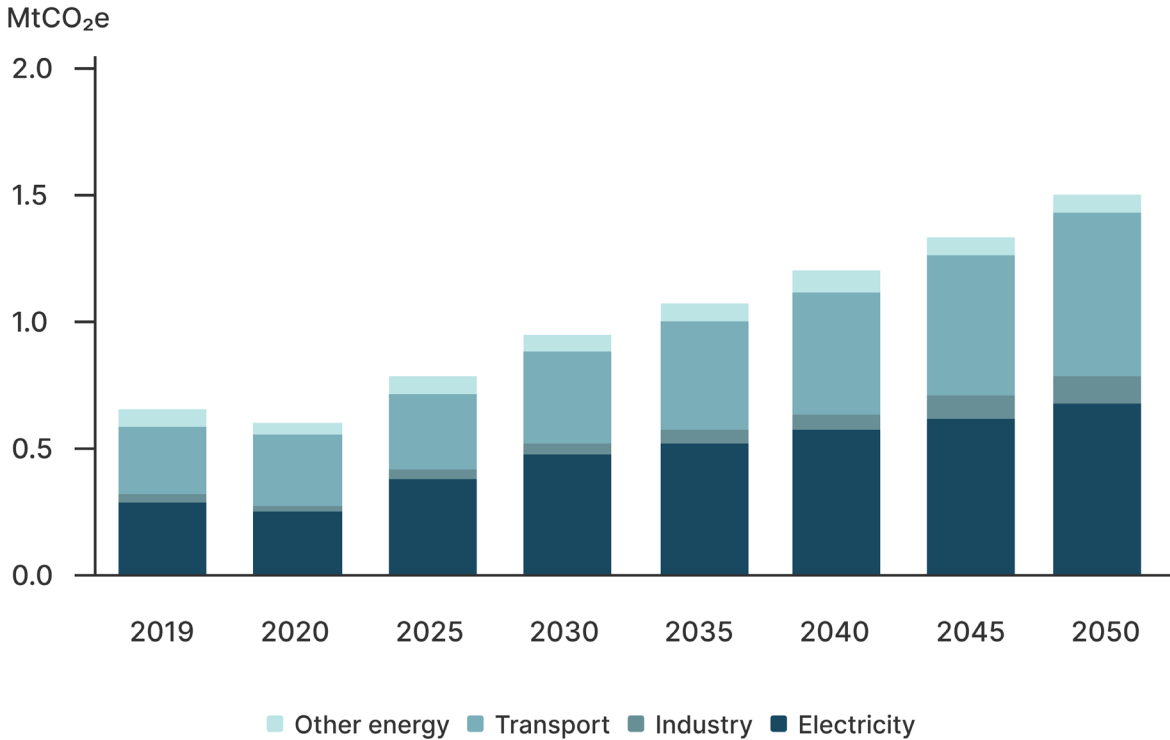


Figure 4-4: BAU emissions projection, Energy

Table 4-2: BAU emissions projection, Energy

MtCO ₂ e	2019	2020	2030	2040	2050
Electricity production	0.286	0.251	0.474	0.567	0.676
Industry	0.031	0.023	0.044	0.070	0.112
Transport	0.266	0.276	0.361	0.488	0.641
Other energy use	0.078	0.051	0.068	0.073	0.078
TOTAL	0.662	0.601	0.946	1.198	1.506

4.3 Industrial waste and processes

In 2019, emissions from waste were estimated at 0.17 million tCO₂e. More than half of these emissions came from the discharge of wastewater, predominantly from households, but also from economically important sectors such as fish processing and the drinks industry. This was followed by open burning, with a small contribution from the disposal of solid waste in landfills.

Figure 4-5 and Table 4-3 show the projected GHG emissions for 2050 from waste production in the BAU scenario. As can be seen in the graph, emissions are expected to more than double over the period, reaching 0.37 million tCO₂e in 2050. This trend is mainly driven by expectations of population growth and increasing levels of waste production per capita, accompanied by rising living standards and a continued shift towards urbanisation.

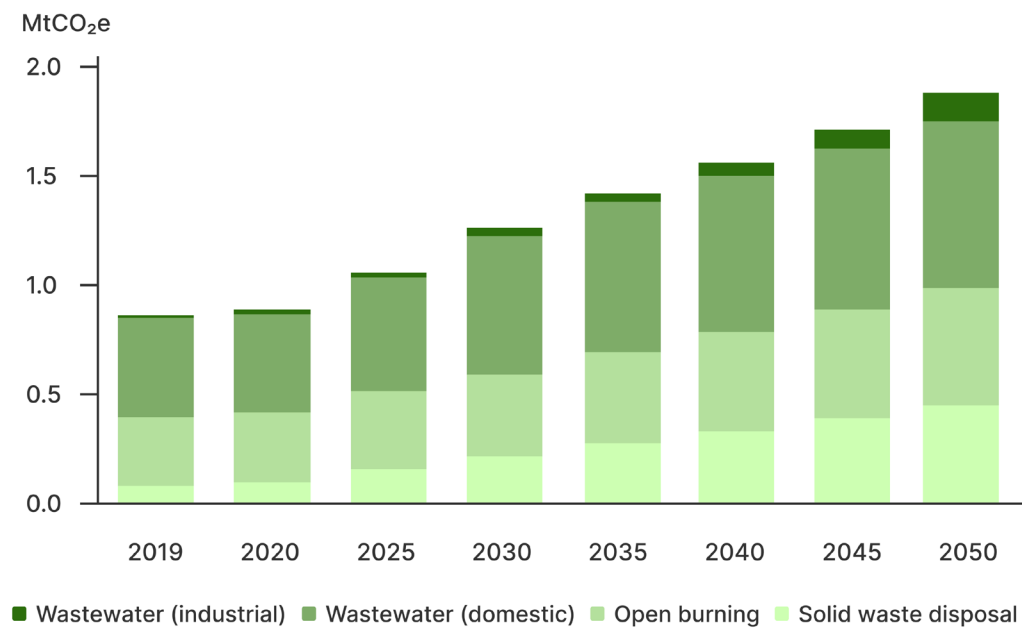


Figure 4-5: BAU emissions projection, Waste

Table 4-3: Projected BAU emissions, Waste

MtCO ₂ e	2019	2020	2030	2040	2050
Solid waste	0.017	0.019	0.043	0.067	0.090
Burning under the open sky	0.063	0.064	0.075	0.090	0.107
Domestic effluents	0.087	0.090	0.126	0.142	0.151
Industrial effluents	0.003	0.004	0.006	0.012	0.027
TOTAL	0.170	0.177	0.250	0.310	0.374

In 2019, emissions from industrial processes and other products (IPPU) were estimated at just 26,108 tCO₂e (0.026 million tCO₂e), most of which came from the use of HFCs as substitutes for ozone-depleting substances (ODS) for refrigeration and air conditioning in buildings, accounting for around 96% of the total. This was followed by a very small contribution from the use of non-energy products, such as lubricants and paraffin wax.

Figure 4-6 and Table 4-4 show projected GHG emissions for 2050 from IPPU sources in the BAU baseline scenario. As the graph shows, emissions are expected to increase to around 0.053 million tCO₂e by 2050, driven largely by the expected demand for HFCs for air conditioning in existing and new buildings. In the absence of known specific plans, the development of new industrial sectors located in Cabo Verde leading to additional sources of IPPU emissions is not included in the outlook.

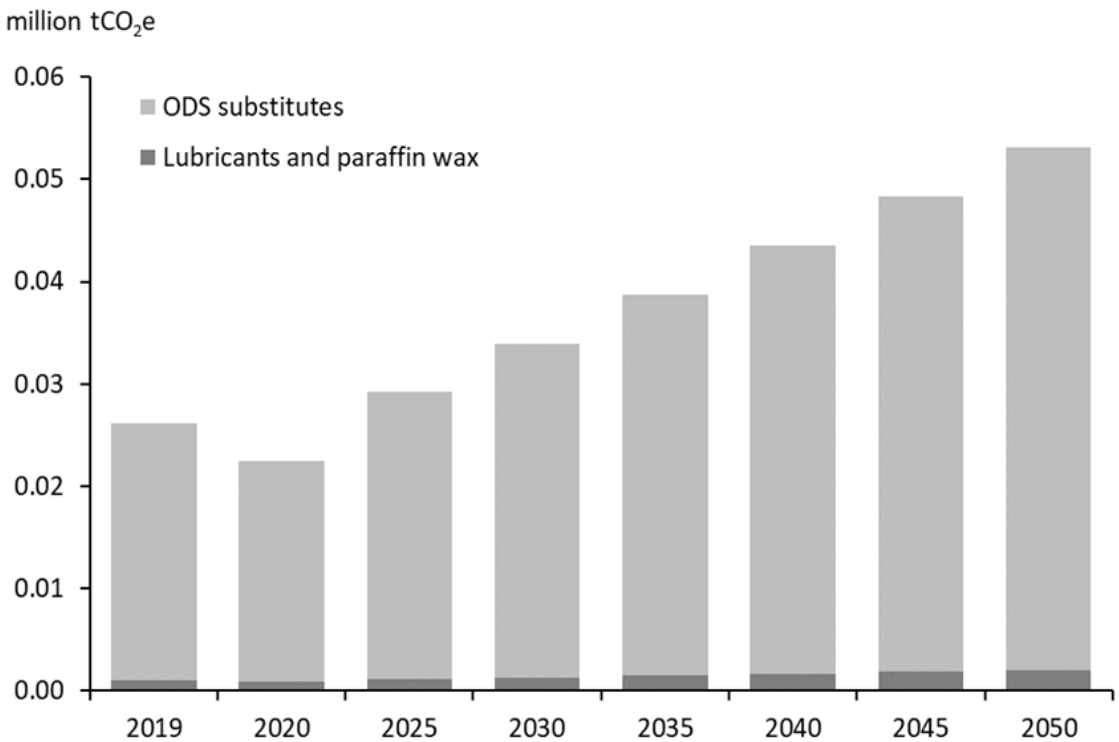


Figure 4-6: BAU emissions projection, IPPU

Table 4-4: BAU emissions projection, IPPU					
MtCO ₂ e	2019	2020	2030	2040	2050
Lubricants and paraffin wax	0.00101	0.00087	0.00132	0.00169	0.00206
SDO substitutes	0.02509	0.02155	0.03259	0.04184	0.05109
TOTAL IPPU	0.02611	0.02242	0.03390	0.04353	0.05315

4.4 Agriculture and LULUCF

Emissions from the agricultural sector were estimated at 0.112 MtCO₂e in 2019. Within LULUCF, emissions for the same year were estimated at 0.055 MtCO₂e, with forestry removals of 0.115 MtCO₂e, resulting in net LULUCF removals of around 0.058 MtCO₂e. Livestock emissions from enteric fermentation and manure management accounted for the majority of agricultural emissions, with pasture land accounting for most LULUCF emissions.

Figure 4-7, Figure 4-8 and Table 4-5 show the projected GHG emissions and removals for 2050 from the agriculture and LULUCF sectors, with total and net emissions expected to remain relatively stable through 2050. The agricultural sector sees only a modest increase in production and emissions, due to the limited availability of suitable areas, while emissions from land use conversion (mainly forestry on agricultural land and urban land) are expected to decrease. The increased expansion of plantation forestry and the protection of existing native forest areas, in line with government policy, predict a slight increase in the national carbon sink (i.e. carbon removals) from forestry.

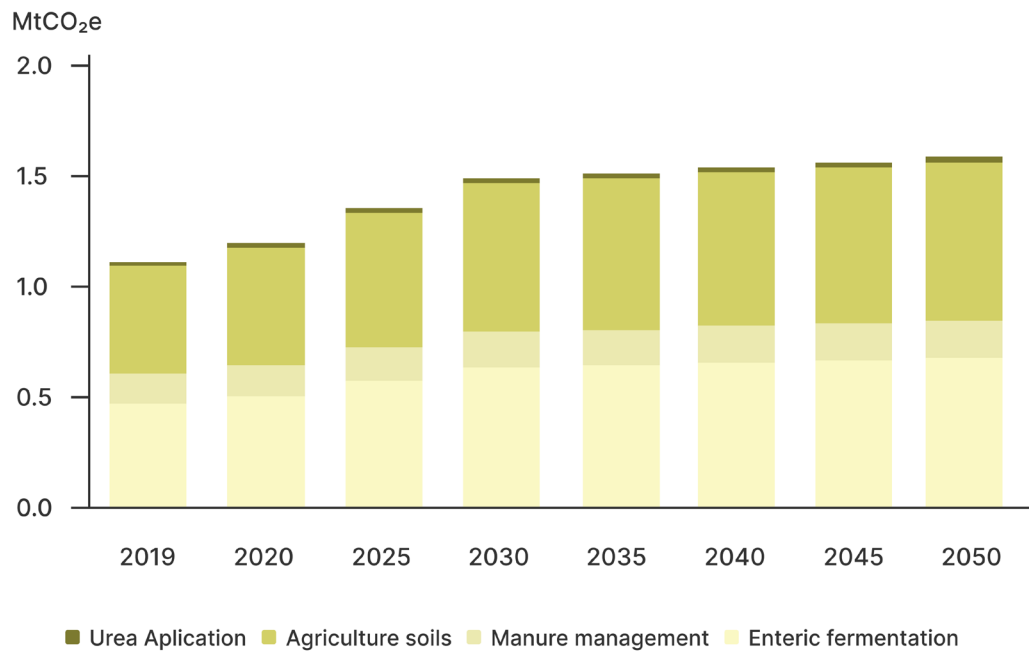


Figure 4-7: Projected BAU emissions, Agriculture

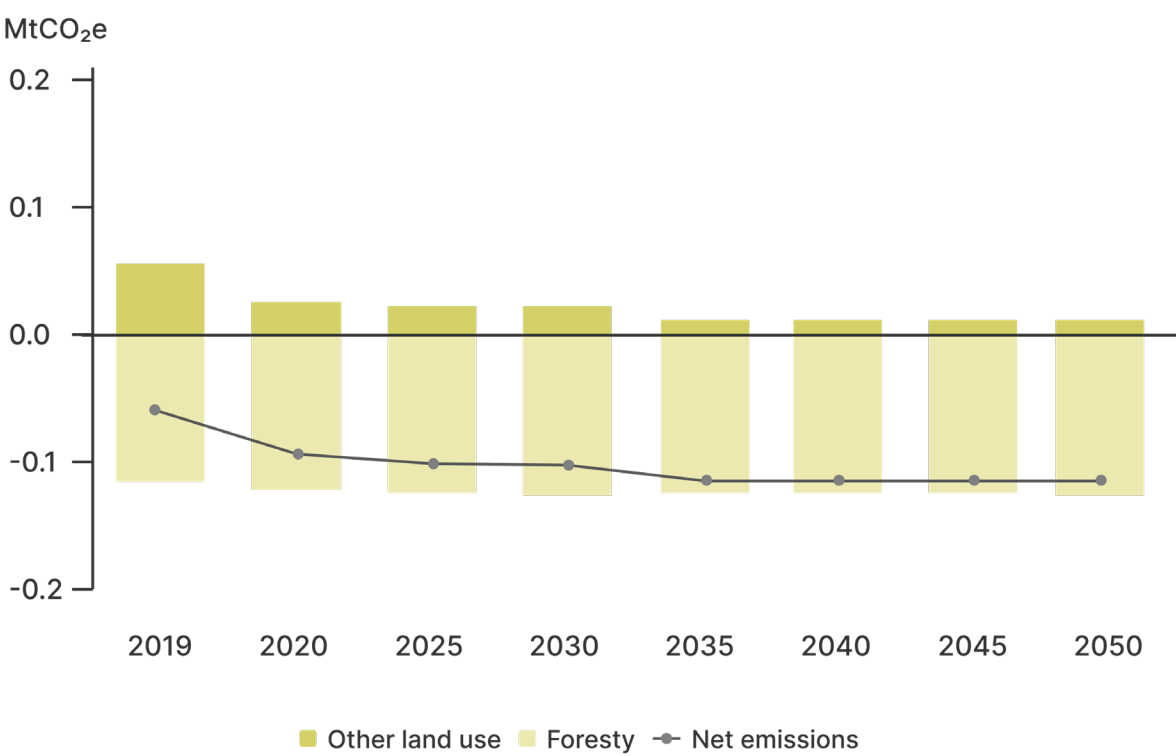


Figure 4-8: BAU emissions projection, LULUCF

Table 4-5: BAU emissions projection, Agriculture and LULUCF					
MtCO ₂ e	2019	2020	2030	2040	2050
Agriculture	0.112	0.119	0.149	0.153	0.158
Enteric fermentation	0.048	0.051	0.064	0.066	0.068
Manure management	0.013	0.014	0.016	0.016	0.017
Agricultural soils	0.048	0.052	0.067	0.069	0.072
Application of urea	0.002	0.002	0.002	0.002	0.002
LULUCF (net)	-0.059	-0.095	-0.102	-0.113	-0.113
Forests	-0.115	-0.121	-0.125	-0.124	-0.124
Other land use	0.056	0.026	0.023	0.011	0.011
Total emissions	0.167	0.146	0.171	0.165	0.170
Total removals	-0.115	-0.121	-0.125	-0.124	-0.124
Total net emissions	0.053	0.025	0.047	0.041	0.045

Note: The negative sign (-) indicates a removal; net emissions are calculated as total emissions from sources minus removals.

4.5 Economy-wide projection

The sectoral projections described above are aggregated below to produce a forecast of BAU emissions for the entire economy by 2050 (Figure 4-9, Figure 4-10 and Table 4-6). This represents the BAU baseline projection of all emitting sectors, against which the contribution of Cabo Verde’s mitigation measures can be quantified.

At an aggregate level, total emissions are expected to more than double in the 2019-2050 period, from around 1.03 million tonnes of CO2e (total emissions before removals) in the reference year to 2.1 million tonnes of CO2e in 2050. Taking forestry removals into account, annual net emissions increase from **0.91 MtCO2e** to **1.97 MtCO2e** over the same period. The main points are as follows:

- **Energy** use is by far the largest current source of national emissions and is also expected to grow the fastest, increasing its contribution to total emissions from 65% in 2019 to 68% in 2030 and 72% in 2050. Most energy-consuming sectors will see substantial growth, although the increase in demand for electricity produced from fossil fuels and road vehicles over the coming decades will contribute the most to the total projected increase.
- **Waste** and **IPPU** emissions are expected to increase roughly in line with the overall growth in total emissions, as rising urban population rates boost waste production and expectations of new post-COVID19 growth lead to an increase in IPPU emissions.
- In contrast, emissions from **agriculture** show only a small increase over the forecast period, resulting in a decrease in the percentage of global emissions from 11% in 2019 to 8% in 2050. Despite the expected increases in emissions from livestock and crop management, this trend reflects the limited potential for increasing domestic production due to land restrictions.
- The **LULUCF** registers a modest increase in expected removals, largely reflecting the assumptions regarding the conservation of Cabo Verde’s existing forest areas and the gradual decrease in carbon emissions resulting from changes in land use.

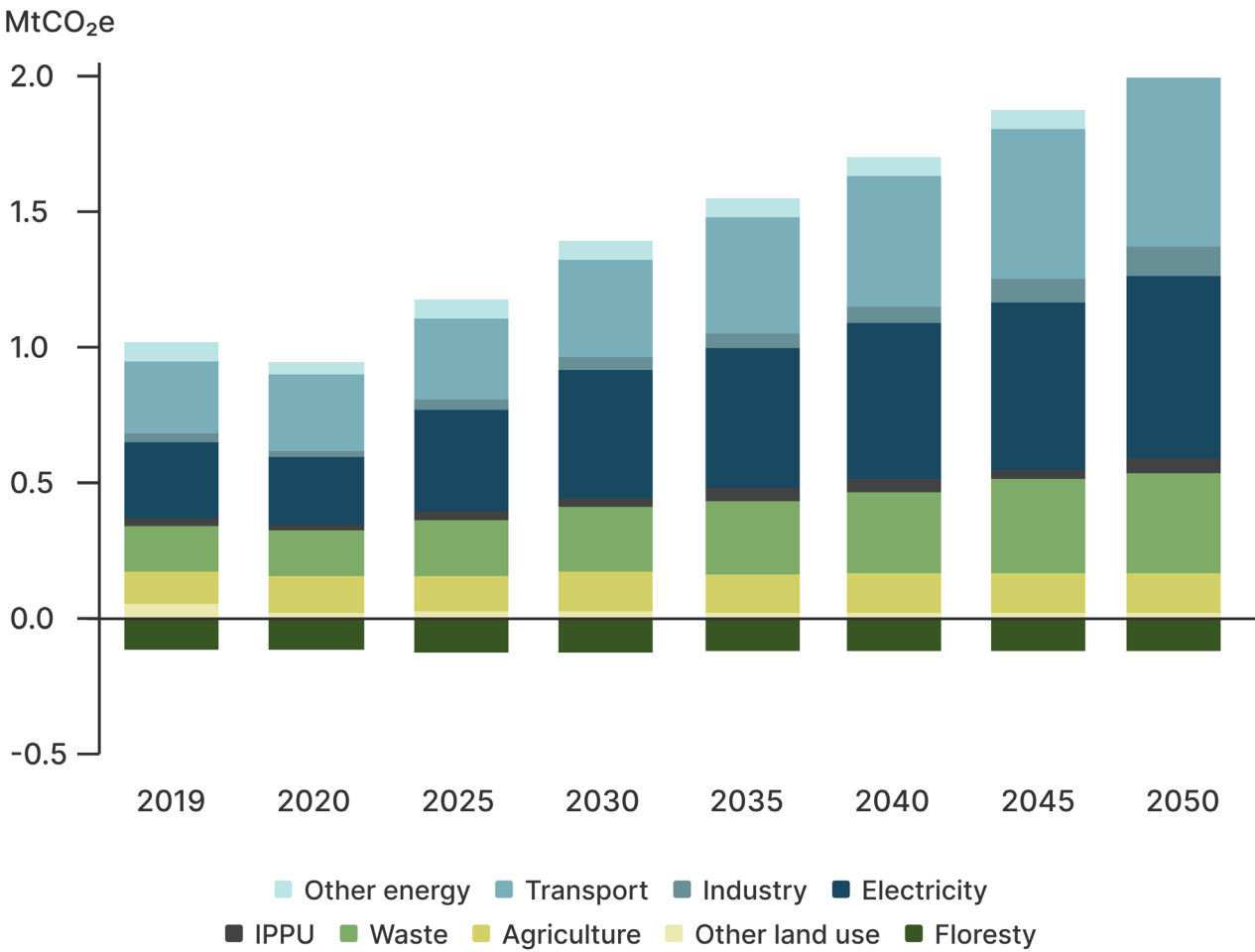


Figure 4-9: BAU reference case: GHG emissions and removals 2019-2050

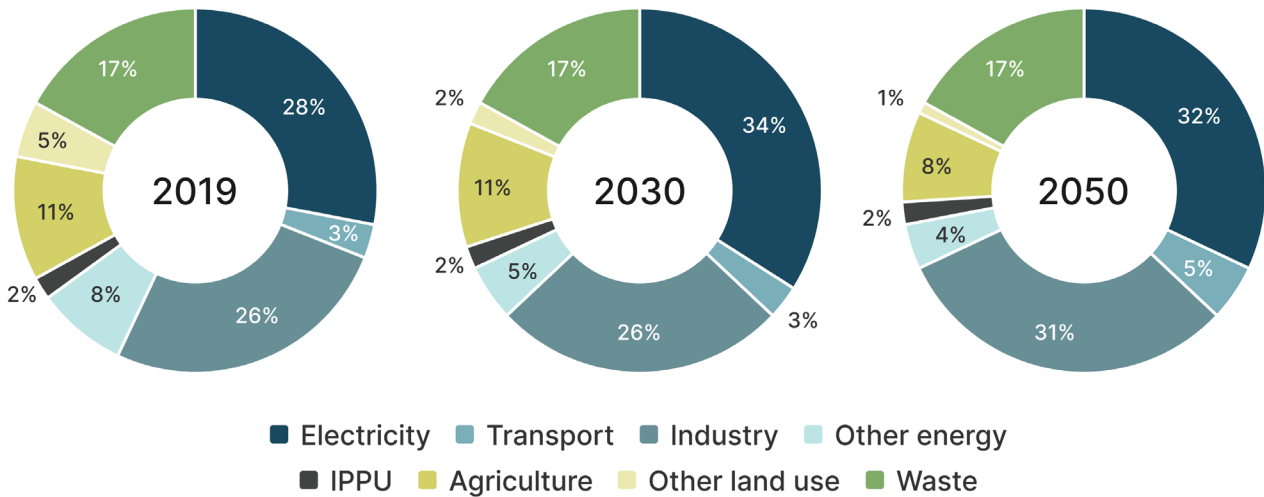


Figure 4-10: BAU GHG emissions 2019, 2030 and 2050 (all sectors)

Table 4-6: BAU reference case: GHG emissions and removals 2019-2050					
MtCO ₂ e	2019	2020	2030	2040	2050
Energy	0.662	0.594	0.943	1.212	1.562
Electricity production	0.286	0.251	0.472	0.565	0.674
Industry	0.032	0.023	0.044	0.078	0.139
Transport	0.263	0.273	0.361	0.488	0.640
Other energy use	0.081	0.047	0.067	0.082	0.109
IPPU	0.026	0.022	0.034	0.044	0.053
Agriculture	0.112	0.119	0.149	0.153	0.158
LULUCF (net)	-0.059	-0.095	-0.102	-0.113	-0.113
Forestry (within LULUCF)	-0.115	-0.121	-0.125	-0.124	-0.124
Other land uses	0.056	0.026	0.023	0.011	0.011
Waste	0.170	0.176	0.250	0.310	0.374
Total net emissions	0.911	0.824	1.269	1.585	1.972

Note: The negative sign (-) indicates a removal; net emissions are calculated as total emissions from sources minus removals.

The expected increase in national GHG emissions forecast over the period, combined with changes in sectoral contributions, can be understood primarily in terms of the assumptions made around economic and population growth. Together with the assumption of a continued post-COVID-19 recovery, gradually increasing urbanisation rates and the growth of the tourism sector, these factors are expected to create an ever-increasing demand for services such as transport and reliable energy supply as Cabo Verde continues to develop.

These trends have also been observed in several emerging economies in recent decades, resulting in economic growth and rising living standards, but also resulting in significant increases in GHG emissions globally. The central challenge underlying the development of an LT-LEDS for Cabo Verde is therefore how to sustain long-term economic growth along a low-carbon pathway.



05.

Mitigation Assessment

This section describes an assessment of GHG mitigation options for Cabo Verde, serving to quantify potential emission reductions and associated investment needs. The mitigation assessment was carried out according to the following steps:

- 1. Identification of mitigation measures.** A comprehensive list of potential emission reduction projects and measures was first developed through a thorough analysis of national documents and mitigation studies, and discussions and consultations with government officials, sector experts and other partners in Cabo Verde.
- 2. Assessment of mitigation potential.** The measures identified were then assessed in terms of their potential for technically feasible adoption, and consequent mitigation, by 2050, compared to the BAU reference scenario described in Chapter 4.
- 3. Evaluation of costs and benefits.** The measures were then assessed in terms of their socio-economic costs and benefits through a cost-benefit analysis (CBA). The quantitative analysis was complemented by a broader evaluation in order to assess their complementary co-benefits.

The results of the assessment were used to develop an alternative low-emissions or “decarbonisation” pathway for the country, as will be described in Chapter 6.

5.1 Identification of mitigation measures

The first step of the assessment involved identifying a series of mitigation measures from each of the emitting sectors described in Chapter 2 for further consideration and quantitative analysis. Information was gathered mainly through discussions with agreed focal points in relevant ministries, departments and other organisations. Other important partners such as co-operation partners and renewable energy promoters were also consulted where necessary. The list of measures presented in this chapter is therefore based on an exhaustive process of gathering national information, together with in-country and external expertise.

Over the short and medium term, the list mainly reflects a set of real projects and programmes that are being implemented, planned or under study by sector experts and partners and donors, but which have not yet been implemented or financed. These include measures identified under the NDC and the first BUR. In the long term, significant attention was paid to “scaling up” NDC measures, as well as other additional measures considered applicable only in the long term, for example between 2030 and 2050. Some measures were considered more suitable as longer-term options due to various factors, including their relatively high costs or present unavailability (e.g. sustainable aviation fuels, SAF) and/or likely high investment and infrastructure requirements (widespread electric vehicles, biogas production).

The following table lists the mitigation measures assessed in each of the emitting sectors. It gives a brief description of each of the measures, along with the intended mitigation effect. As mentioned above, along with the NDC and the BUR, many of the measures identified are defined within the framework of strategic low-carbon actions of national policies, sectoral plans and government studies.¹³

¹³ The measures presented in the table cover a wide range of projects, programmes, policies and strategies, as well as potential future technological applications. Due to the large number of options included in the analysis, the table is intended as a summary, with some of the measures representing a “package” made up of several different projects, actions or programmes.



Table 5-1: Mitigation measures identified				
SECTOR	AREA	MITIGATION MEASURES	SHORT DESCRIPTION	MITIGATION EFFECT
Energy	Decarbonised electricity supply	Wind energy	240 MW of new wind capacity additions, as provided for in the Electricity Sector Master Plan, including through large-scale IPP wind farms and small-scale distributed generation.	Replacing electricity production from fossil fuels
		Photovoltaic (PV) solar energy	315 MW of new solar photovoltaic capacity additions, as provided for in the Electricity Sector Master Plan, namely through large-scale IPP solar photovoltaic projects accompanied by battery and pumped storage and small-scale distributed generation.	
		Reducing transport and distribution losses (T&D)	Investment in a series of cost-effective measures to improve the efficiency of the national electricity transmission system, reducing losses from around 20% to 10%.	Reducing electricity production from fossil fuels
	Low-carbon transport	Electric mobility	Increase the share of the national road vehicle fleet from electric vehicles (EVs) to replace conventional internal combustion engine (ICE) vehicles, aiming for 100% of all vehicle registrations by 2050. Accompanied by a range of on-grid and off-grid solar photovoltaic charging infrastructure.	Replacement of ICE vehicles in all types of vehicles, reducing the use of fossil fuels in transport (diesel and petrol); accompanied by an increase in the use of electricity from the grid.
			Transition to vessels powered by renewable energy in artisanal fishing.	Transition to vessels powered by renewable energy in artisanal fishing.
			Transition to electric mobility in artisanal fishing	Diversification of energy sources, making fishermen less vulnerable to fluctuations in fossil fuel prices.
		Modal shift	Modal shift from private vehicles to non-motorised transport (NMT) and public transport through new investments in urban infrastructure and public campaigns.	Switching from journeys with higher emissions to journeys with lower greenhouse gas emissions (per km)
		Sustainable aviation fuels (SAF)	Increasing the mix of imported SAF with conventional aviation paraffin, in line with the European Union's objectives, from 5% in 2030 to 63% in 2050.	Gradual reduction in paraffin for jet engines used in domestic aviation.
	Energy efficiency measures	Measures in the residential sector	Range of measures, including the Code for Energy Efficiency in Buildings (CEEE), the Minimum Energy Performance Standards (MEPS) and the creation of energy service companies (ESCOs).	Reducing electricity production from fossil fuels
		Measures in the tourism sector	Programme for Energy Efficiency in Industry and Tourism, together with the implementation of CEEE, MEPS and ESCOs.	
		Energy-efficient street lighting	Energy Efficiency in Public Lighting Programme (replacement of public lighting with LEDs); Energy Efficiency in Public Administration and Sustainable Schools Project.	
		Efficient water use and supply	Improving energy efficiency in water use and supply, including energy-efficient renewable pumping and desalination units.	

Waste	Sustainable waste management	Recycling and reusing waste	Waste reduction, recycling and reuse in line with the National Strategic Waste Management Plan (PENGeR), resulting in a reduction in the disposal and burning of plastics, paper and glass.	Avoided emissions from solid waste disposal and open burning of waste
		Sustainable composting	Diversion of organic waste to community composting in order to reduce the use of imported chemical fertilisers such as urea.	Emissions avoided due to the use of chemical fertilisers
		Biogas for energy	Introduction of small-scale biogas plants on livestock farms, waste disposal sites and wastewater treatment facilities with the potential to produce electricity, in accordance with the National Strategic Plan for Waste Management (PENGeR).	Avoided methane emissions and grid-based electricity generation
IPPU	Reduction of high GWP gases	Replacing fluorinated gases with low-GWP alternatives	Replacement of imported fluorinated gases with alternative substances with lower global warming potential (GWP), in accordance with the Kigali amendment to the Montreal Protocol.	Reduction of fluorinated gas emissions (industrial process).
Agriculture and LULUCF	Forestry and land use	Reforestation and restoration	Long-term afforestation of 7,500 hectares and reforestation of 3,250 hectares using diversified, resistant and adapted tree and shrub species, namely through REFLOR-CV and other initiatives.	Increased carbon removal (C-stock) by planting trees and shrubs.
		Agroforestry	Establishment of 3,250 ha of new agroforestry systems using fruit tree species adapted to arid and semi-arid zones.	

5.2 Mitigation potential

This section presents the results of the technical assessment for each of the mitigation measures identified. The mitigation measures and their estimated long-term reduction potential are first described for each of the sectors, followed by an aggregate total for the entire economy.

5.2.1 Energy

As described in Chapter 4, a significant increase in the use of fossil fuels is expected in Cabo Verde in the coming decades. Despite providing important benefits in terms of economic growth, modern access to energy and improved living standards, this prospect is expected to lead to significant growth in emissions without major mitigation efforts. In addition, the country imports all of its fuel needs, thus making the economy particularly vulnerable to disruptions in international energy markets. Increasing the use of Cabo Verde’s abundant domestic renewable energy resources is therefore a key strategic priority for the country, both through centralised grid electricity supply and smaller-scale distributed generation. Implementing low-carbon measures in the largest growing energy-using sector, transport, will also be necessary to decouple economic growth from rising emissions, while increasing the uptake of energy-efficient equipment and practices will help reduce energy use and emissions leading to major cost savings for consumers and businesses.

Low-carbon electricity supply

Expanding the use of renewable energy sources has been identified in both national energy planning and national climate change policy as a key strategic priority. This is reflected in the Strategic Plans for Sustainable Development (PEDS I and PEDS II) and the Master Plan for the Electricity Sector 2018–2040 (GoCV, 2019).

Cabo Verde has abundant large-scale renewable energy resources available to meet the growing demand for electricity as an alternative to imported oil. The Cabo Verde Renewable Energy Atlas (Gesto Energy Solutions, 2011) identifies a nationwide solar photovoltaic potential of more than 2,000 MW and a wind potential of 300 MW – a combined amount more than 10 times greater than the country’s current installed production. The Electricity Sector Master Plan foresees a rapid expansion in the use of renewable energies, identifying 315 MW of solar photovoltaic and 240 MW of wind capacity. In order to guarantee the reliability of grid supply to meet changes in demand, new battery storage capacity and pumped storage plants (PSP) will also be needed to successfully replace fossil fuel production.

The LT-LEDS mitigation scenario assumes that near-total decarbonisation of electricity supply can be achieved by 2050 through an expansion of solar photovoltaic, wind and energy storage technology on the nine islands, through a combination of on-grid and off-grid electricity generation. These include new large-scale multi-MW solar photovoltaic projects and wind farms developed by independent power producers (IPPs), investment in the Santiago PSP and a series of lithium battery storage projects, distributed generation and key integrated renewable energy projects, such as the Sustainable Island of Brava (GoCV, 2023), supported by investments in grid reinforcement and consolidation. The planned expansion of renewable energies increases in order to achieve the investments foreseen in the Electricity Sector Master Plan of 315 MW of photovoltaic solar energy and 240 MW of wind capacity by 2050.

Reducing transmission and distribution (T&D) losses is also identified as important for mitigation in the energy sector, a key action that can also result in major electricity and cost savings. Currently, Cabo Verde has relatively high rates of energy losses, of up to 20% of supply, partly due to the country’s island geography and the wide prevalence of non-technical losses. With improvements to the T&D system, more produced electricity reaches the end consumer, reducing capacity requirements and resulting in lower production levels to satisfy the same demand. The LT-LEDS mitigation scenario assumes investment in a series of cost-effective mitigation measures aimed at improving the efficiency of the national electricity transmission system to reduce losses to around 10%.

The resulting outlook for low-carbon electricity generation is shown in Figure 5-2 below. The figure shows a significant increase in solar photovoltaic and wind energy production, replacing current and future fossil-fuelled capacity, which is accompanied by a large reduction in energy losses. This scenario can be compared with the electricity production prospects of the current situation, which shows only a modest contribution from renewable energy sources and no investment in reducing energy losses. The associated GHG mitigation impacts are shown in Figure 5 2 according to which almost all emissions from electricity production will be avoided by 2050. It can be seen how the reduction in electricity losses has the greatest impact over the next decade, decreasing until 2050; this is because the mitigation benefits are highest when the grid is still dominated by oil-fired generation (until around 2030–35 in the LT-LEDS mitigation scenario).

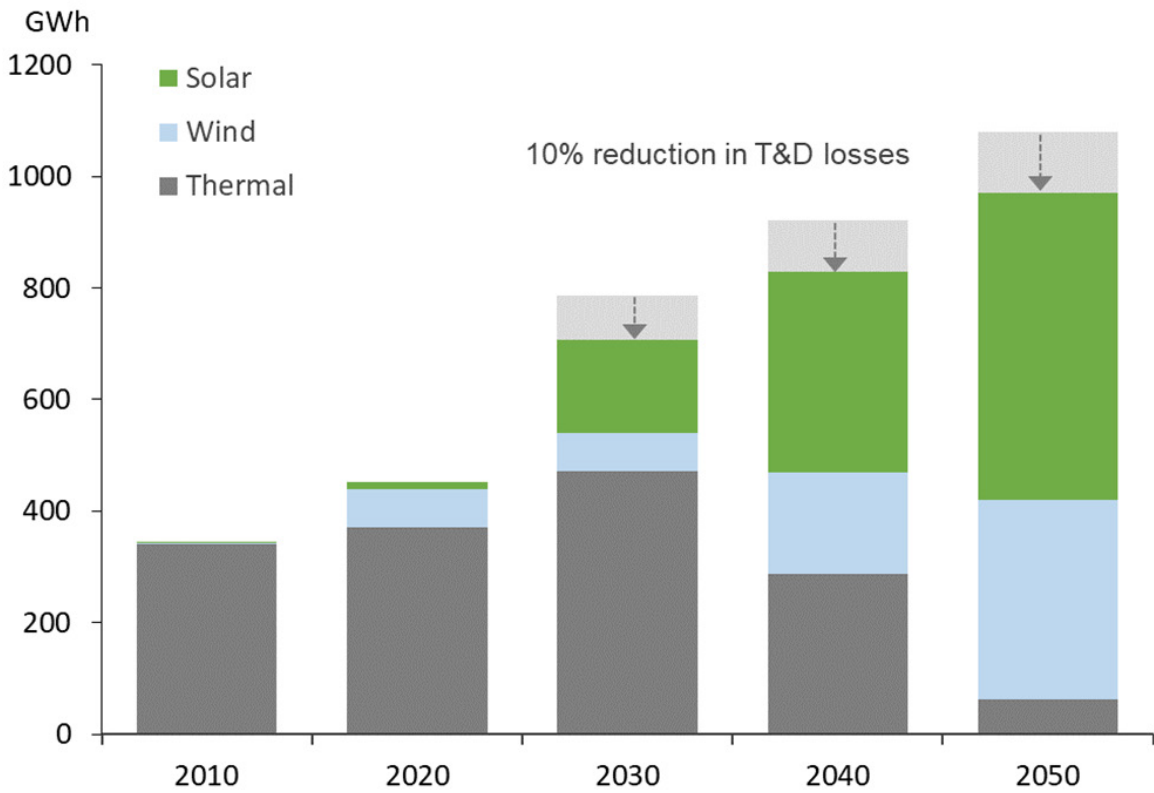


Figure 5-1: Prospects for low-carbon electricity generation by 2050

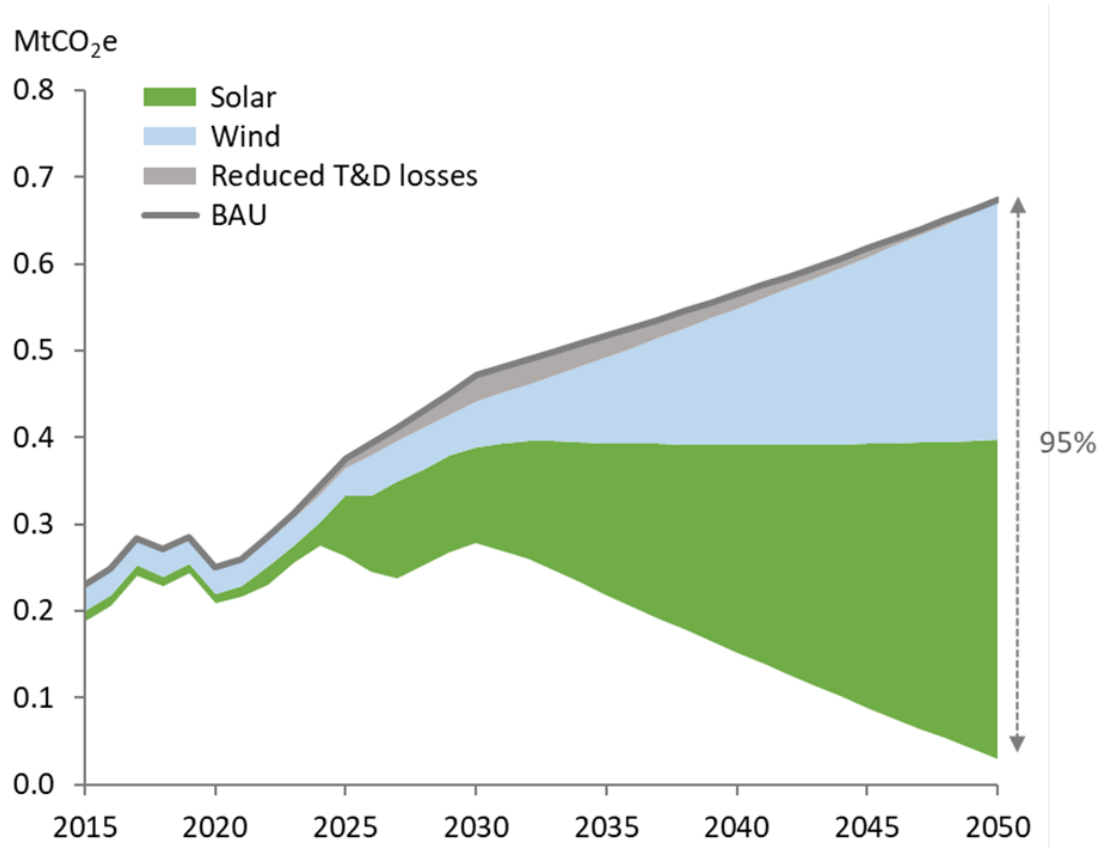


Figure 5-2: GHG emissions mitigation potential in electricity supply

Low-carbon transport

After electricity generation, the transport sector is responsible for the biggest increase in emissions predicted over the coming decades, as growing demand for private passenger road vehicles in particular leads to the increasing use of diesel and petrol. As well as contributing to climate change, this current trend could lead to increasing levels of local pollution, urban congestion and imports of foreign fossil fuels. Therefore, the promotion of low-carbon transport as part of national mitigation efforts is recognised in the NDC and is also reflected in a series of national and regional strategies and plans.

Electric mobility is the most significant measure identified to reduce road transport emissions in Cabo Verde. Electric mobility programmes include a series of policy incentives and support packages designed to increase the use of electric vehicles (EVs), thus avoiding the purchase of imported conventional internal combustion engine (ICE) vehicles, resulting in avoided fossil fuel emissions¹⁴.

Due to the additional costs compared to ICE vehicles and the country’s high electricity tariffs, Cabo Verde currently has low levels of EVs, mainly limited to passenger cars and minibuses in the public sector. The country’s Electric Mobility Action Plan (DNICE, 2018) envisages a 100% electric vehicle fleet by 2050 for all types of road vehicles. The rates assumed in the LT-LEDS scenario are shown in Figure 5 3 below. These have been adjusted from the rates originally forecast for the national fleet, as set out in the Electric Mobility Action Plan, to reflect slower progress than expected. According to the rates shown, electric motorbikes will become the fastest-growing market sector, as is already the case in some countries around the world, followed by passenger cars and buses. Heavy goods vehicles (HGVs) are expected to be the last type of vehicle to see a significant replacement of ICE models with EVs.

The widespread use of electric vehicles will require a very considerable expansion of the supply of low-carbon electricity for vehicle charging. There are a range of different charging technologies and potential configurations. Consumers and businesses can, for example, charge their personal vehicles or vehicle fleets directly from the grid, or they can instead invest in their own off-grid renewable supply – typically via a solar photovoltaic system with battery storage to enable daytime charging (for example, at a workplace during working hours) or domestic charging at night. Charging can also be carried out with “normal” chargers for several hours or via “level 2” fast charging.

The relative mix of charging solutions used in the coming decades will depend on a wide range of factors, most of which are highly uncertain, assuming a mix of charging models in the LT-LEDS scenario that is equal on- and off-grid, as well as home and workplace charging. For off-grid charging, an equal combination of solar PV systems only and solar PV systems with battery storage is assumed:

- **Charging model 1:** On-demand network charging, including charging stations and charging at the workplace/fleet and at home (50% of the total);
- **Charging model 2:** Off-grid solar photovoltaic charging for daytime charging (25% of the total); and

14 This is possible because, in most cases, the reduction in emissions from diesel and petrol significantly offsets the increase in emissions from the use of grid electricity associated with EV energy demand

- **Charging model 3:** Off-grid solar photovoltaic charging with lithium battery storage to enable night-time charging (25% of the total).

The overall mitigation impacts are closely associated with the combination of charging models. Grid-based charging will lead to an increase in electricity production from the grid, which even in the LT-LEDS scenario is assumed to include a significant share of oil-fuelled production in the short to medium term, while charging from a solar PV system will not create additional emissions in Cabo Verde. The LT-LEDS scenario assumes that the international EV market continues to grow, along with the increasing introduction of national policies and incentives aimed at changing consumer and business preferences in order to achieve a 100% share of EVs in vehicle imports by 2050. This penetration rate would allow around 230,000 EVs to circulate in 2050.

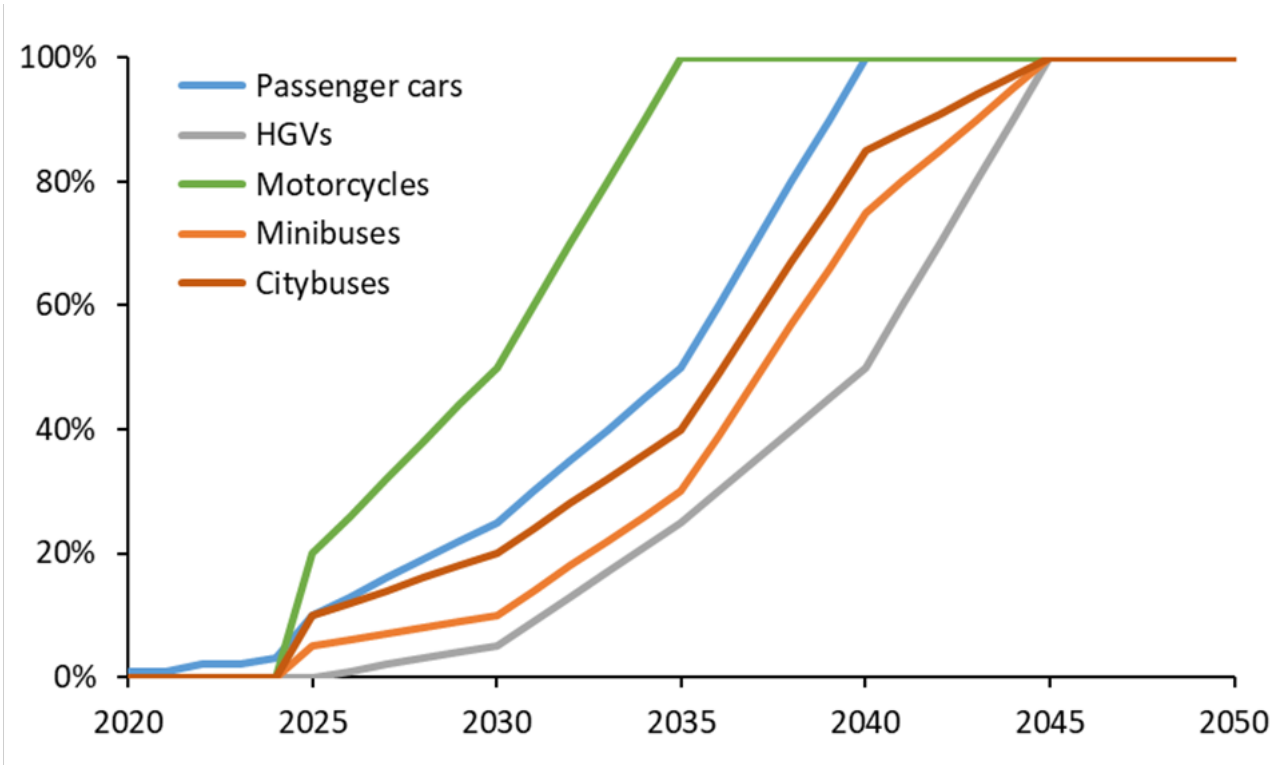


Figura 5-3: Projected EV penetration rates in the national road vehicle fleet

The impact of electric mobility in maritime transport and fishing has not yet been estimated. However, there is an ongoing GEF-funded project at DNICE on electric mobility in artisanal fisheries.

The modal shift from private vehicles to non-motorised transport (NMT) and public transport is also recognised as an important strategy for reducing fuel consumption and emissions from the transport sector, while providing other benefits such as improving health and productivity and reducing traffic congestion and accident rates. Like most African cities, Cabo Verde’s urban centres, such as Praia, were not designed to accommodate NMT. As a result, levels of walking and cycling have been declining as active travel is slowly replaced by motorised modes. Public transport systems are often inefficient, with buses and minibuses stuck in traffic. Increasing the use of NMT and public transport through the use of measures such as cycle lanes and buses is therefore included as a key mitigation measure in both the NDC and the LT-LEDS mitigation scenario.

The mitigation scenario envisages the gradual introduction of a series of measures, including the construction of new pedestrian and cycle routes, traffic calming measures and bus rapid transit (BRT) in Praia and Mindelo, accompanied by public awareness campaigns. As in other cases observed around the world, these measures are expected to result in a modal shift from low-occupancy passenger car journeys to higher-occupancy bus and NMT journeys, resulting in a reduction in fuel consumption and associated GHG emissions. Although higher modal shift rates are technically possible, it is more realistically assumed that a maximum modal shift rate of 30% from private vehicles to buses and NMTs can be achieved by 2040.

The resulting GHG mitigation potential in the road transport sector is shown in Figure 5 4 below. Two cases are shown to demonstrate the importance and relationship between the carbon intensity of the electricity grid and the overall emissions reduction impact of the widespread use of EVs. In the BAU grid scenario, which sees continued generation mainly from oil-fired power stations, a global emissions reduction of around 52% is achieved by 2050. However, in the “greening the grid” scenario, with expanded renewable generation, the level of reduction is much higher, reaching 82% compared to the BAU scenario by 2050. Provided the grid decarbonisation scenario is realised, electric mobility has the potential to reduce the predicted increase in transport emissions very significantly. The modal shift from private vehicles to NMT and public transport also plays an important role, albeit a minor one, whose associated mitigation benefits diminish over time, since the vehicle fleet is assumed to be increasingly dominated by low-carbon EVs in the mitigation scenario.

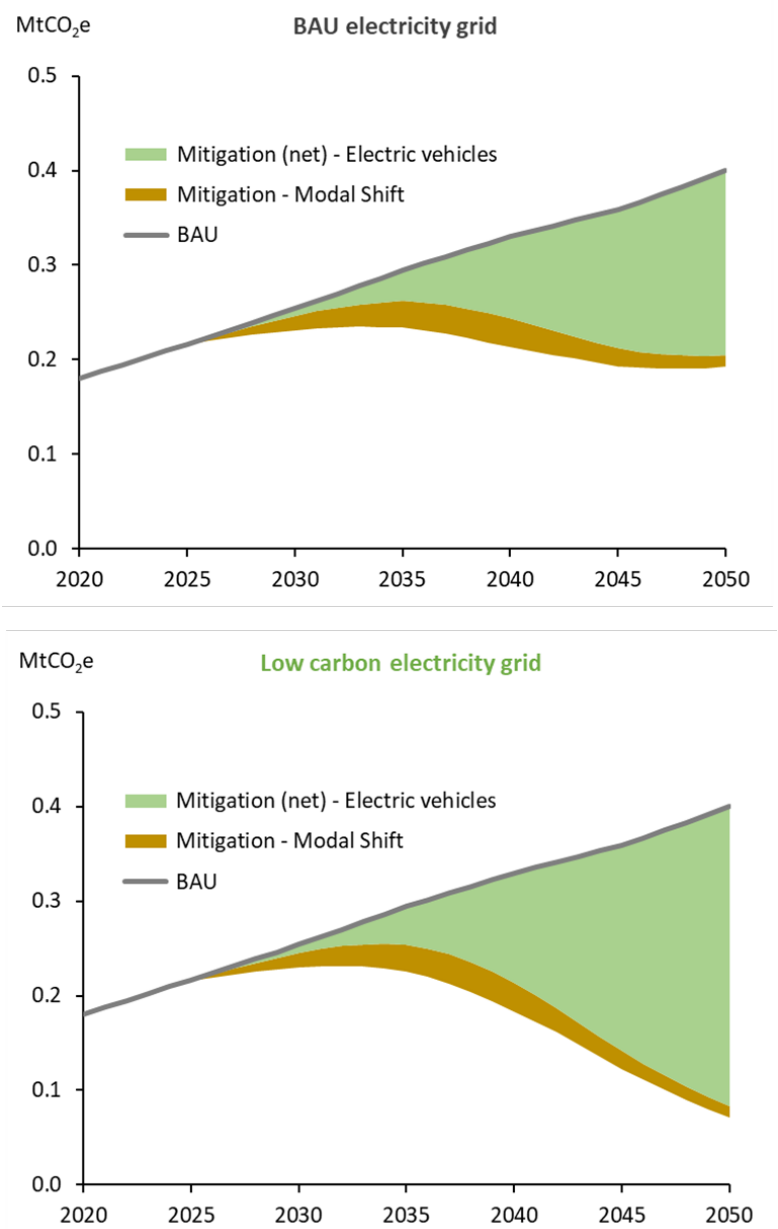


Figura 5-4: GHG emissions mitigation potential in the road transport sector

Sustainable aviation fuels (SAF) are considered a fundamental pillar in efforts to create a more sustainable aviation sector. Currently blended with conventional aviation paraffin, the SAF component of the blend allows for a reduction in CO₂ emissions, depending on the raw material and the SAF conversion route. The three families of raw materials/conversion routes envisaged for this growing market are Hydro-processed Esters and Fatty Acids (HEFA), liquid fuels produced from biomass (ABtL) and Power to Liquids (PtL). Currently, less than 1% of the aviation fuels used in Europe are SAF. However, the European Union (EU) has developed ambitious targets for the use of SAF as part of its Fit-for-55 climate policy package. The LT-LEDS mitigation scenario assumed that the EU targets for SAF could also be applied to domestic aviation in Cabo Verde between 2030-2035, as the international SAF market develops. This would result in a gradual increase in the SAF mix from 5% by 2035 at the latest to 32% in 2040 and 63% in 2050. It is assumed that, as with existing aviation fuel, all SAF is produced outside Cabo Verde. The resulting mitigation impact sees an estimated annual reduction in the use of conventional aviation fuel and emissions of around 63% by 2050, equivalent to 0.13 MtCO₂e per year.

Energy efficiency

Reducing national energy consumption is a mitigation priority for most countries, but especially for countries like Cabo Verde which rely on expensive fossil fuel imports for almost all of their energy needs. The country has introduced a series of measures and policies to increase energy efficiency in all sectors of the economy which will have a growing impact over the coming decades, resulting in avoided energy imports and cost savings for businesses and consumers, as well as public sector organisations such as schools, hospitals and government offices.

The measures include the planned introduction of a Code for Energy Efficiency in Buildings (CEEE), Minimum Energy Performance Standards (MEPS), labelling of high-efficiency appliances, and a certification and testing mechanism for energy-efficient appliances. The government also approved a regulation to promote energy efficiency in energy-intensive consumers and promote energy service companies (ESCOs). The introduction of several demonstration programmes is currently underway, including the following:

- Energy efficiency in public lighting (replacement of public lighting with LEDs)
- Promoting energy efficiency in the replacement of equipment and buildings
- Energy efficiency in public administration
- Sustainable Schools Project
- Energy efficiency in industry and tourism
- Mass introduction of solar thermal systems; and
- Incremental growth in access to clean cooking technologies

The expected savings in energy and GHG emissions resulting from these measures are shown in the figures below up to 2050.

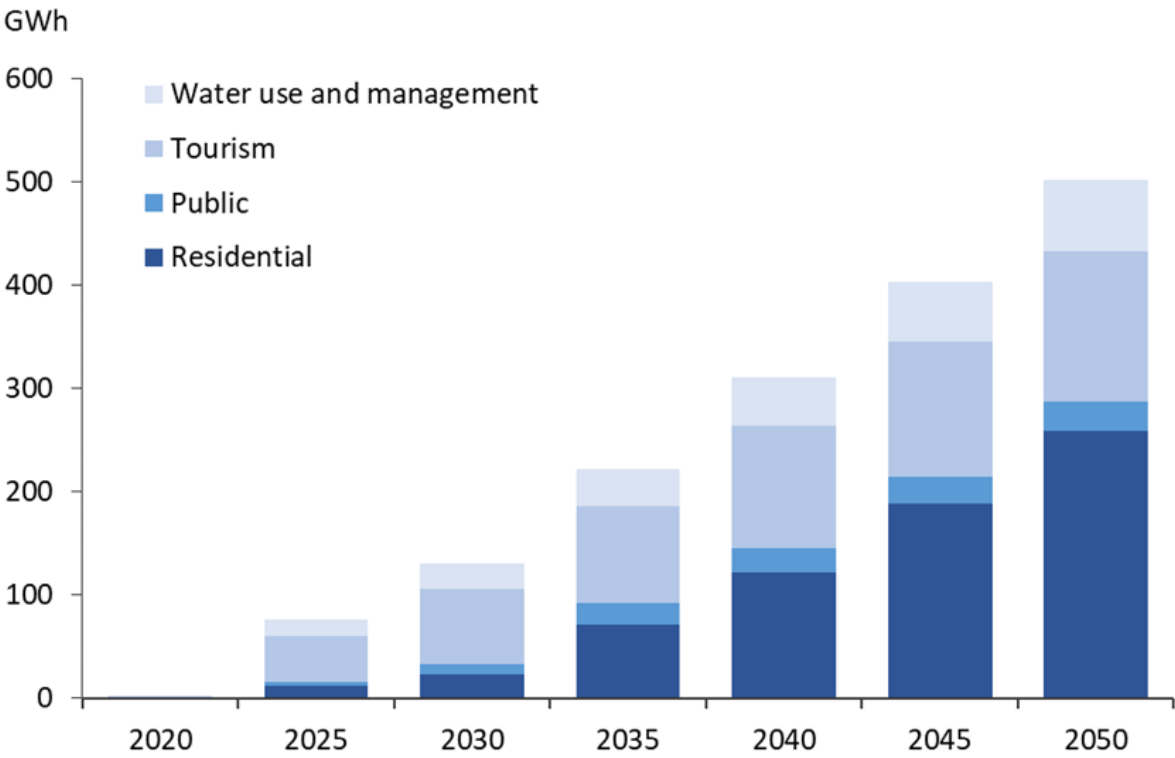


Figura 5-5: Projected energy savings from energy efficiency measures

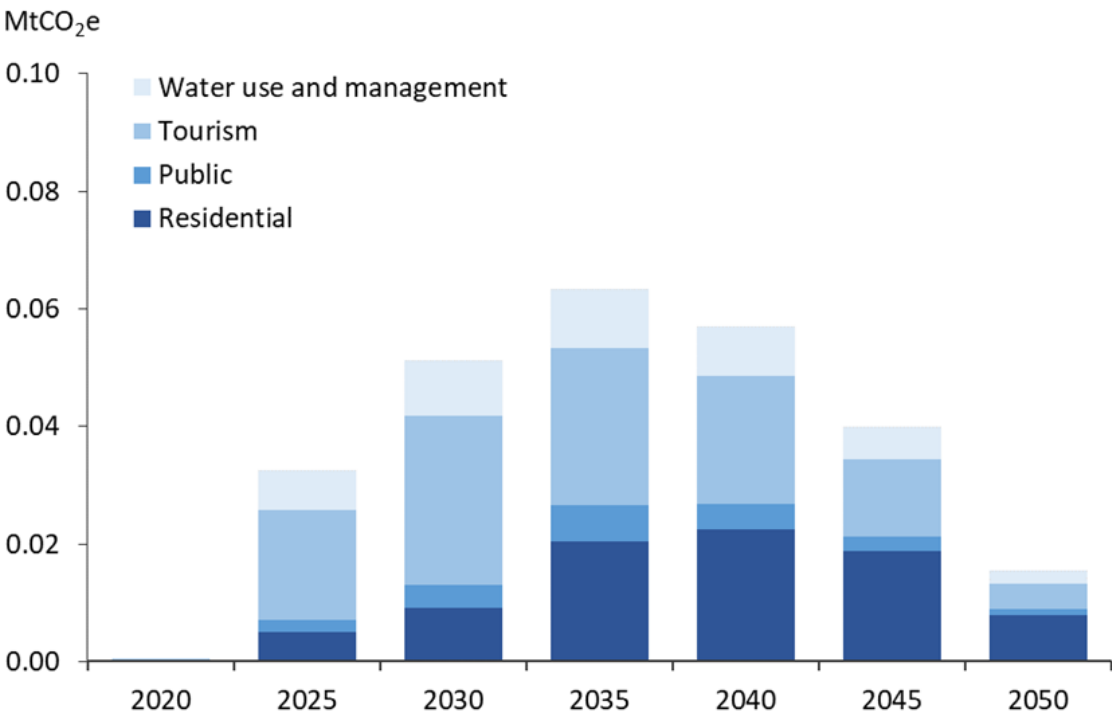


Figura 5-6: GHG emissions mitigation through energy efficiency measures

Although energy savings continue to increase compared to the BAU scenario, the benefits of mitigation are reduced over time. This is because most of the savings are related to reducing the use of electricity from the grid which, in the mitigation scenario, becomes increasingly “green” with increasing rates of renewables replacing oil-based production. In other words, as the electricity supply becomes cleaner and cleaner, each unit of energy saved results in a smaller reduction in GHG emissions. It is important to note, however, that even with these modest GHG reductions, most energy efficiency measures are generally cost-effective, unless the electricity supply from the grid is low-cost (this is not a situation pertaining to the planned investment into new solar PV, wind and energy storage projects in Cabo Verde).

Summary

The estimated mitigation potential of the energy sector measures described above is summarised in Figure 5 7 and Figure 5 8 below. The analysis indicates a large and growing reduction potential compared to the BAU scenario, equivalent to a reduction of 29% in 2030 and 74% by 2050. Measures taken in the electricity production sector show the greatest reduction potential by 2050 (57% of the annual total), dominated by the expansion of new solar photovoltaic and wind projects. Low-carbon transport measures (electric mobility, sustainable aviation fuels and modal shift) account for around 41% of the total, with energy efficiency measures in the residential, tourism and water sectors accounting for the remainder.

The projections clearly show how the relative contribution of the different measures is expected to change over time. For example, “demand-side” measures that save electricity production, such as energy efficiency programmes and investment in reducing energy T&D losses, are considered to have a large benefit over the next decade, as long as the electricity grid remains predominantly fossil fuel-based. In contrast, long-term gradual change measures such as converting the country’s vehicle fleet to electric vehicles have greater long-term benefits. As mentioned above, this measure will depend on the success of “greening the grid” to ensure the large-scale mitigation impacts presented below. This demonstrates how mitigation efforts must be centred on early interventions, low-carbon policies and investments that avoid “carbon lock-in”.¹⁵

¹⁵ This is particularly important in electricity supply, where oil-fired generation plants can have an economic life of 40 years or more. To achieve significant reductions in emissions at national level, it will therefore be necessary to decarbonise the energy sector, meeting the growth in demand through renewable sources while maintaining the reliability of supply.

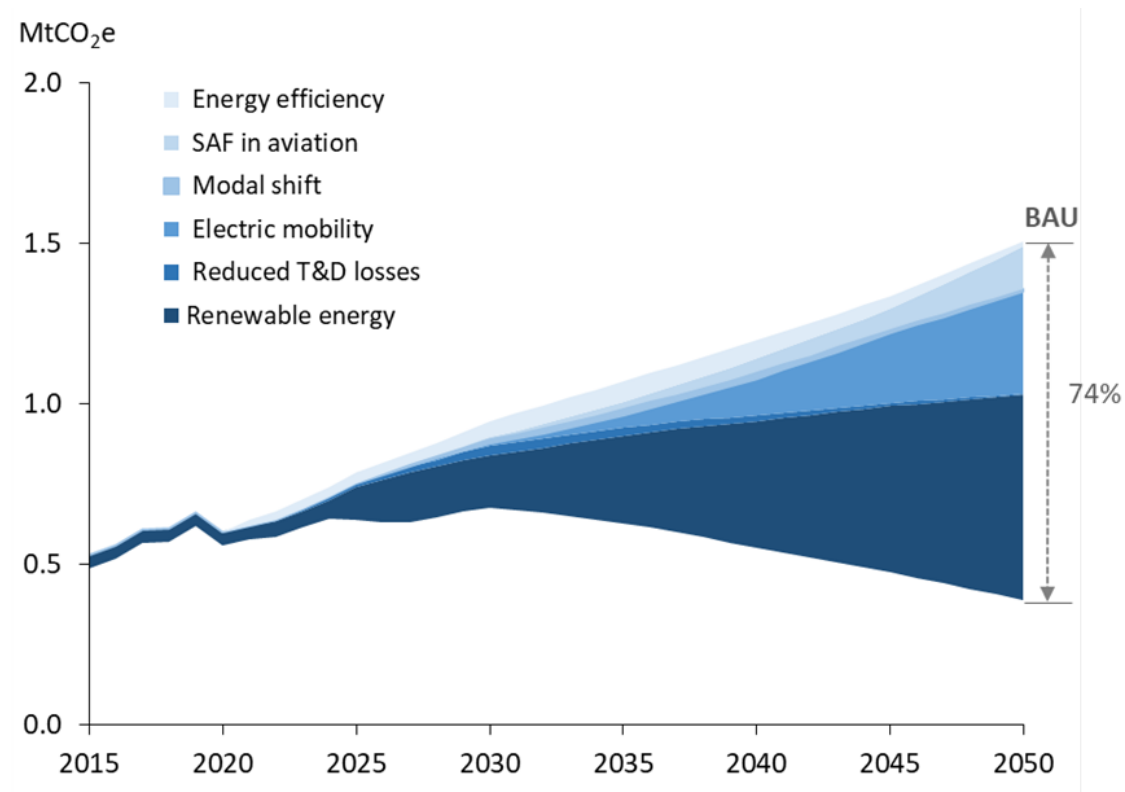


Figura 5-7: GHG mitigation potential 2015-2050, Energy

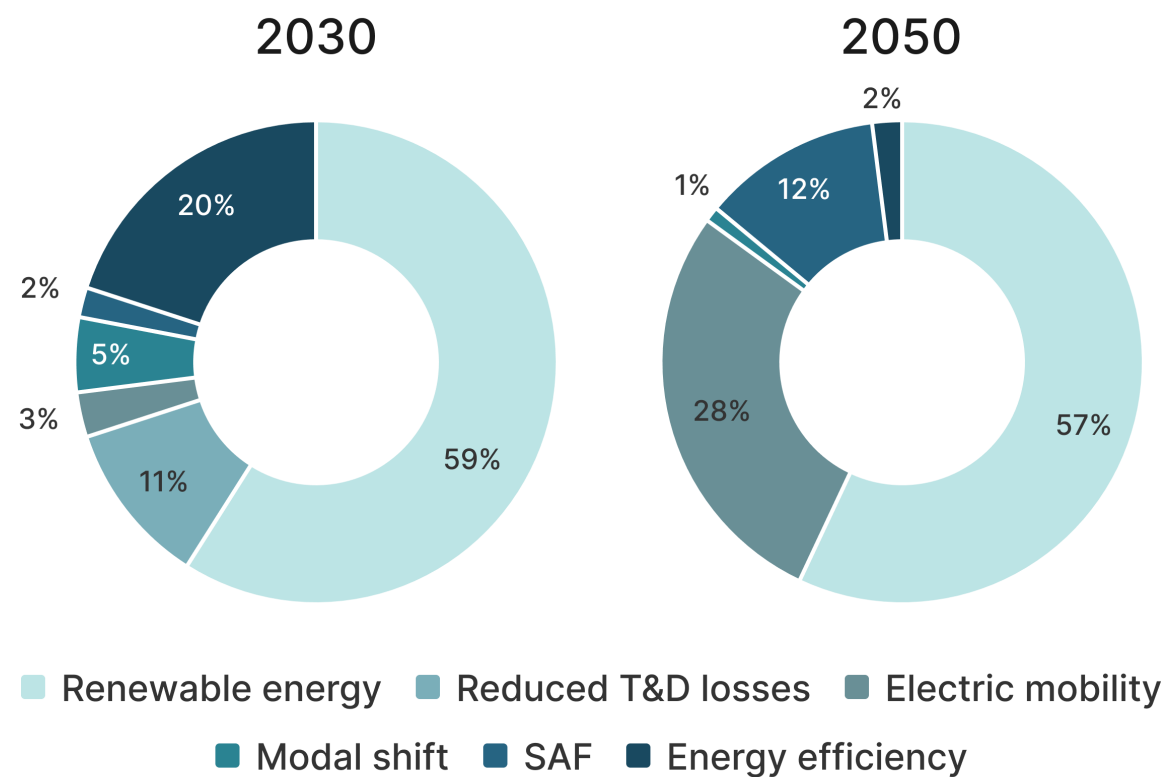


Figura 5-8: GHG mitigation potential in 2030 and 2050, Energy

Table 5-2: GHG emissions mitigation potential, Energy

GREENHOUSE GAS EMISSIONS (MtCO ₂ e)	2020	2030	2040	2050
BAU Energy	0.59	0.94	1.21	1.51
GHG reduction potential	0.04	0.28	0.69	1.12
Renewable electricity	0.04	0.16	0.40	0.64
Reducing losses in T&D	0.00	0.03	0.02	0.003
Electric mobility	0.00	0.01	0.12	0.32
Modal shift	0.00	0.01	0.02	0.01
SAF in aviation	0.00	0.00	0.04	0.13
Energy efficiency	0.00	0.06	0.10	0.02
GHG reduction versus BAU	7%	29%	53%	74%

Note: Mitigation in the energy sector (from the use of renewable energies) shows a reduction in the year 2020 compared to the current situation, because the first NDC uses a reference year of 2013. Therefore, mitigation efforts have been accounted for since 2013.

5.2.2 Waste and industrial processes

Sustainable waste management

As described in the previous section, unsustainable waste management practices are responsible for a growing source of GHG emissions in Cabo Verde, associated with the discharge of wastewater, the disposal of solid waste in managed and unmanaged dumps and the open burning of various types of materials.

The need to better manage and recover waste is recognised in Cabo Verde’s environmental and waste policy. The National Strategic Plan for Waste Management (PENGeR) outlines the sector’s plans for the period 2015-2030, drawn up on the basis of the best techniques and technologies aimed at minimising GHG emissions, and is particularly focused on the production, management and prevention of municipal waste, including through the use of biogas for energy production. The Plan constitutes a strategic document for the waste sector, providing clear guidelines for all areas of waste production (i.e. municipalities, industries, services, hospitals).

The PISCCA Project (Sustainable Waste Management in Cabo Verde) represents a significant step forward in tackling the problem of solid waste in the archipelago. By offering support to civil society organisations (CSOs), the project aims to strengthen local waste management capacity and promote the adoption of more sustainable practices. In 2023, the country introduced a new legal framework to reduce the disposal of plastics in landfills and open dumps, as well as their burning, namely through the prevention of single-use plastic, and to increase recycling and re-use, with the creation of plastic collection and recycling stations and the promotion of the reuse

of plastic products. These actions also serve as the basis for the current preparation of a responsible tourism and circular economy roadmap for the country which will include plastic recycling and reuse objectives.

A project to build a sorting plant on the island of Santiago is being implemented and plastics are already being recycled, albeit on a small scale, in partnership with the private sector, which has installed a recycling plant with the capacity to process 500kg of plastics per hour from the categories described above. A project to collect and prepare electronic waste is also being implemented with the support of Expertise France.

Based on these plans and programmes, the LT-LEDS mitigation scenario describes a series of sustainable waste management measures based on the so-called “waste hierarchy”.¹⁶ These include the construction, operation and maintenance of small-scale **biogas** plants on livestock farms, waste disposal sites and wastewater treatment plants (WWTPs) with potential electricity production, the diversion of organic matter, such as animal waste, to further **composting**, and the **reduction, reuse and recycling of waste**, including plastic, paper and glass.

Mitigation impacts stem from the reduction of emissions from farms, waste disposal sites and wastewater facilities (due to methane capture, the diversion of organic waste to composting and the potential prevention of electricity emissions from the grid) and the reduction of emissions from the production of virgin materials for plastics, glass and metals. Increased use of organic composting can also lead to a reduction in the use of chemical fertilisers, such as urea, and the associated GHG emissions. In addition to sales of recycled materials, compost and electricity, other related benefits would include reduced operating costs for local councils in managing waste management systems, including rubbish dumps, sanitation and health benefits, improved air, water and soil quality, reduced leachate and the creation of green jobs.

Replacing fluorinated gases

Fluorinated gases (or F-gases) are currently imported into Cabo Verde for refrigeration, fixed air conditioning and mobile air conditioning. These gases include a range of gases such as HFC-134a, HFC-125, HFC-143a and HFC-32 which have a very high global warming potential (GWP). The use of alternatives with lower or no GWP makes it possible to significantly reduce the main source of emissions from national industrial processes. For example, the main fluorinated gas used in Cabo Verde, HFC-134a, has a GWP of 1,300, while its substitute, HFO-1234yf, has a GWP of less than 1. Recognising the need to phase out the use of HFCs, Cabo Verde signed the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (UN, 2016) in 2021. The LT-LEDS mitigation scenario therefore includes a gradual reduction in HFC imports to comply with the Kigali amendment and their replacement with alternative substances with a much lower GWP. It is assumed that, similar to the commitments made by European countries under the Kigali amendment, HFC imports can be reduced by up to 80% by 2030.

¹⁶ The “waste hierarchy” categorises waste management options according to what is best for the environment. It prioritises waste prevention first. When waste is created, it prioritises preparing it for reuse, then recycling, recovery and finally disposal.

Summary

The estimated mitigation potential of the measures relating to the waste and IPPU sectors mentioned above is summarised in Figure 5 9 and Figure 5 10 below. Compared to the BAU scenario, the LT-LEDS mitigation scenario achieves a GHG reduction of around 54% by 2050. Implementing sustainable waste management practices has the greatest mitigation potential by 2050, with around 82% of the total, with biogas collection and composting accounting for the largest percentages. Replacing fluorinated gases with alternative climate-friendly substances accounts for the remaining 18%.

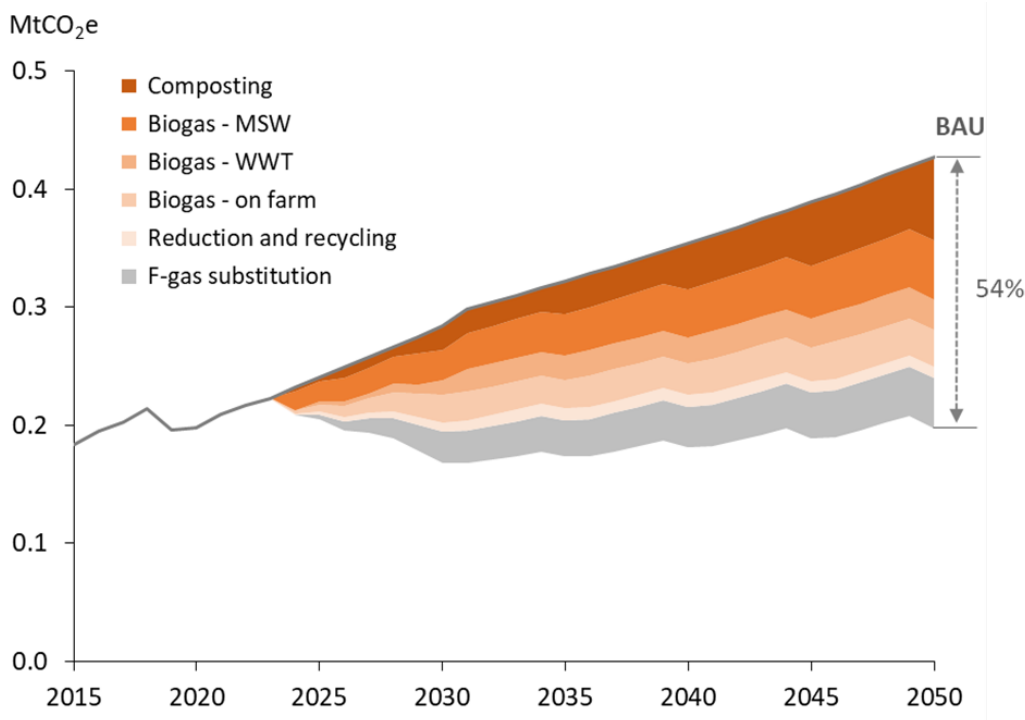


Figure 5-9: GHG emissions mitigation potential 2015-2050, Waste and IPPU

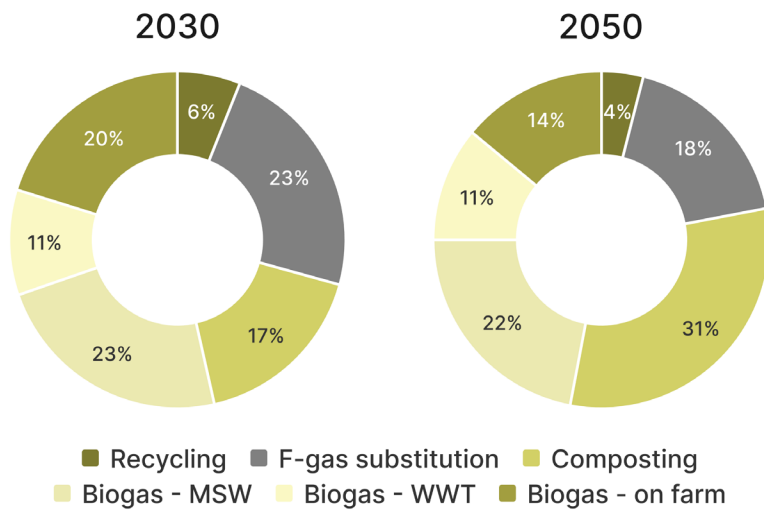


Figure 5-10: GHG emissions mitigation potential in 2030 and 2050, Waste and IPPU

Table 5-3: Mitigation Potential for GHG Emissions, Waste and IPPU				
GREENHOUSE GAS EMISSIONS (MtCO ₂ e)	2020	2030	2040	2050
BAU Waste and IPPU (combined)	0.20	0.28	0.35	0.43
GHG reduction potential	0.00	0.12	0.17	0.23
F-gas replacement	0.00	0.03	0.03	0.04
Composting	0.00	0.02	0.04	0.07
Biogas - RSM	0.00	0.03	0.04	0.05
Biogas - Wastewater Treatment Plant	0.00	0.01	0.02	0.03
Biogas - on farm	0.00	0.02	0.03	0.03
Reduction and recycling	0.00	0.01	0.01	0.01
GHG reduction versus BAU	0%	41%	49%	54%

5.2.3 Agriculture and LULUCF

Afforestation and reforestation

With afforestation and reforestation measures implemented since the 1920s, forest cover in Cabo Verde has gone from zero to around 85,000 ha or 21% of the national territory (MAA, 2021a). The generally adverse environmental conditions have a negative impact on the density and growth of planted trees, largely affecting the productivity and quality of the forest. However, forests fulfil essential environmental functions in Cabo Verde, namely through soil protection and water regeneration. Woody and non-timber forest products also play a significant role in local economies. Given the country’s climatic conditions, tree and shrub cover also plays an essential role in combating desertification. Cabo Verde was the first African country to sign and ratify the Convention to Combat Desertification, and the second worldwide, having drawn up its National Action Programme to Combat Desertification in 1998 and approved it in 2000. As described in Chapter 2, Cabo Verde’s forest cover acts as a national carbon sink, ‘offsetting’¹⁷ around 10-15% of national GHG emissions every year. Actions to protect and improve the national forest stock therefore have multiple and important benefits for the country.

Recognising the crucial role that forests play for the environment and the economy in general, Cabo Verde has set targets to increase forest areas by 2030 with resilient and preferably endemic and native species through reforestation and afforestation. These include a commitment to afforest a total of 7,000 hectares (ha) and reforest 3,000 ha using diverse, resilient and adapted tree

17 In climate policy, an offset is a unit of CO2 that is reduced, avoided or sequestered to compensate for emissions occurring elsewhere (UNEP, 2023).

and shrub species (MAA, 2021a). Cabo Verde’s Reforestation Policy produced in 2021 indicates that potential species could include *Prosopis juliflora*, *Parkinsonia aculeata* and various species of the *Acacia* genus. *Prosopis juliflora* is the species most typically used to combat desertification and currently occupies around 83% of the national forest area. The Cabo Verde Reforestation Project (REFLOR-CV), funded by the Global Environment Facility (GEF), is contributing to the realisation of Cabo Verde’s forestry goals by planting around 1,000 ha to help achieve the reforestation targets.

Cabo Verde has only limited capacity to expand its forest cover beyond the targets set for 2030. Limited land availability and climatic conditions are barriers to significantly increasing the natural carbon stock through vegetation. The LT-LEDS mitigation scenario considers that in the long term, from 2030 to 2050, and with adequate support, the total area of forested land could be extended to 7,500 ha and reforested land to 3,250 ha.

Agroforestry

Agroforestry offers a sustainable approach to increasing carbon reserves while generating new revenue streams for small farmers and local communities. Agroforestry can also help prevent deforestation resulting from the non-utilisation of natural forests for the production of charcoal and wooden poles. REFLOR-CV includes the promotion of agroforestry systems as one of its main objectives, in order to improve the sustainability of agricultural systems, as well as stimulate and diversify local economies and gender equality. The LT-LEDS mitigation scenario includes the establishment of 3,250 ha of new agroforestry systems using fruit species adapted to arid and semi-arid areas, such as carambola (star fruit), cashew, banana, tamarind, papaya, avocado and mango.

Summary

The estimated carbon removal potential of the Agriculture and LULUCF sector measures described above is summarised in the figures below. Taken together, these measures represent an emission reduction of around 0.015 MtCO₂e by 2050. This is a relatively modest amount that reflects the limited potential for expanding the country’s forest cover. The volume of carbon removals can be seen to decrease over time due to the sustainable harvesting of timber, fruit and wood products. Without logging, the overall reduction by 2050 could be increased from 32% to 47%, compared to the BAU reference scenario.

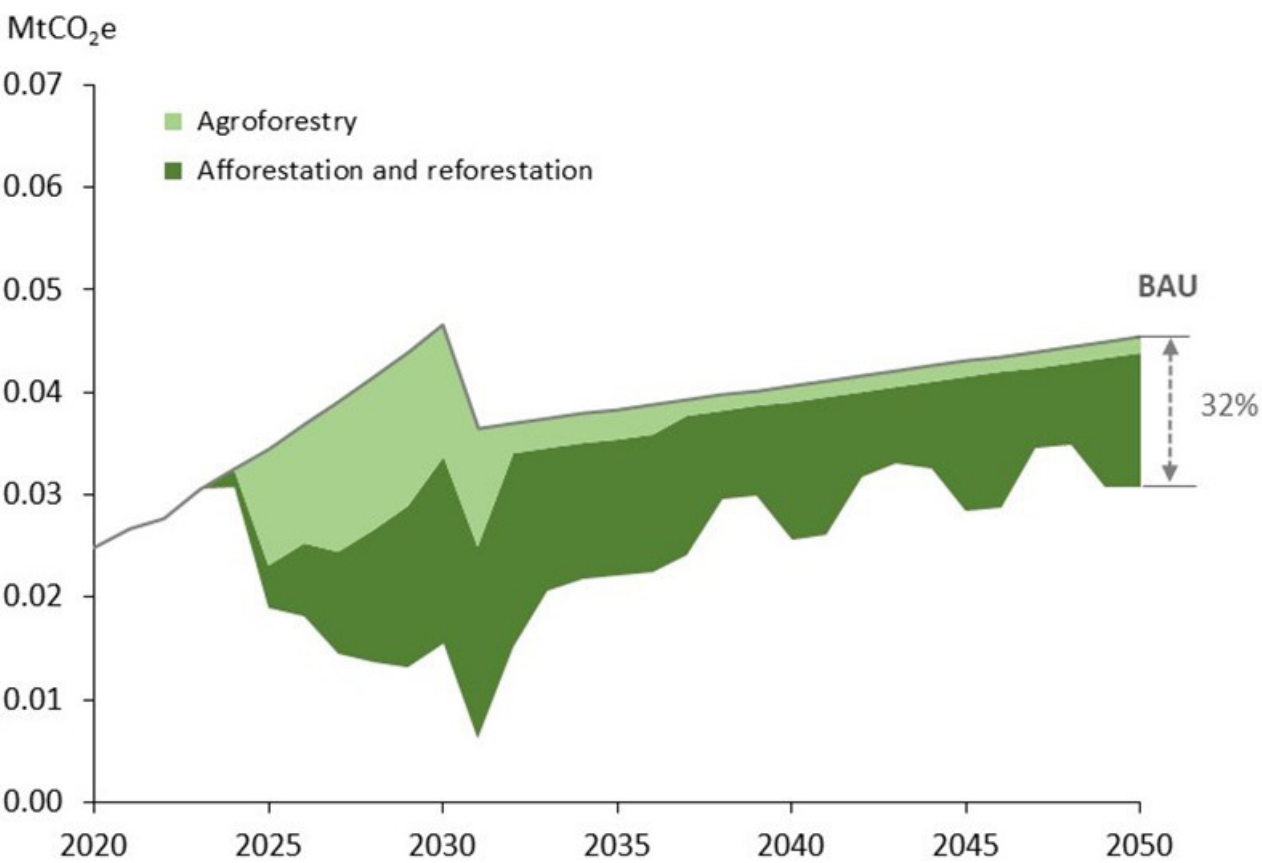


Figura 5-11: GHG emissions mitigation potential 2015–2050, Agriculture and LULUCF

Table 5-4: GHG emissions mitigation potential, Agriculture and LULUCF				
GREENHOUSE GAS EMISSIONS (MtCO ₂ e)	2020	2030	2040	2050
BAU Agriculture and LULUCF (net)	0.025	0.047	0.041	0.045
GHG reduction potential	0.000	0.031	0.015	0.015
Agroforestry	0.000	0.013	0.002	0.002
Afforestation and reforestation	0.000	0.018	0.014	0.013
GHG reduction versus BAU	0%	67%	37%	19%

5.3 Socio-economic potential

5.3.1 Cost-benefit analysis

Economic cost-benefit analysis (CBA) was carried out for each of the mitigation options identified, in order to assess not only the direct costs of each option (e.g. investment and running costs), but also the wider socio-economic benefits of implementing them.

Most mitigation options give rise to a series of costs and benefits, the scope of which is usually determined by carrying out an economic or financial analysis. The CBA is carried out from a socio-economic perspective, thus seeking to reflect the costs and benefits of the entire economy for each of the options, unlike a financial analysis which usually involves evaluating projects from the perspective of a private company or an individual. The inclusion of wider benefits for the economy, such as the effects of job creation or additional revenue streams, allows for an assessment of the relative economic performance of mitigation options that is better suited to policy-making and the provision of international support.

The economic costs and benefits associated with each of the mitigation measures are summarised in the table below. Some measures have potential benefits that are highly uncertain, specific to certain sites or projects and/or cannot be quantified with an adequate level of robustness. In order to avoid overestimating these benefits, they are not included in the analysis. For example, some measures such as the development and operation of renewable energy projects will entail the creation of new jobs – but not necessarily additional jobs when compared to the alternative baseline of new thermal power stations. Similarly, some potential benefits, such as reduced air pollution, which are reasonably well established in large ‘megacities’, are less easily applicable to Cabo Verde’s largest urban areas, such as Praia and Mindelo, and have little or no basis for quantification. The benefits identified but not quantified are also indicated in the table.

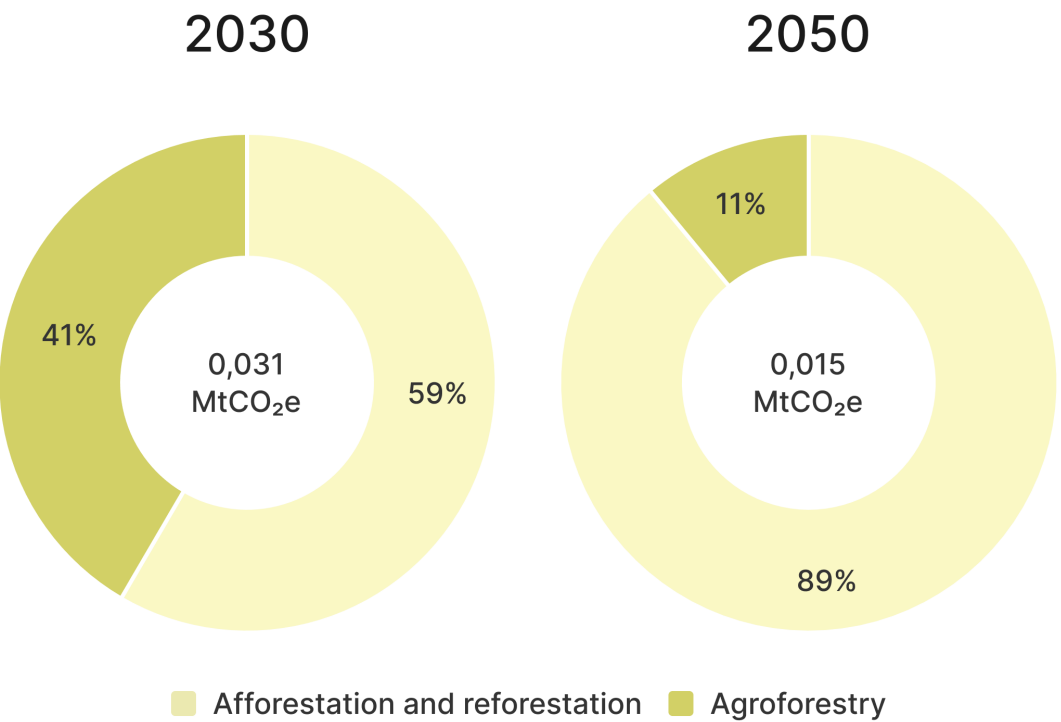


Figura 5-12: GHG emissions mitigation potential in 2030 and 2050, Agriculture and LULUCF

Table 5-5: Costs and benefits of mitigation measures						
SECTOR	AREA	MITIGATION MEASURES	COSTS	BENEFITS		
Energy	Decarbonised electricity supply	Increased production of wind and solar photovoltaic electricity	Capital costs of wind and solar photovoltaic plants, including lithium batteries and pumped storage plants (PSP) Operating and maintenance costs (O&M)	Avoided capital costs of new oil-fired capacity Avoided costs of diesel and HFO imports Potential local benefits for air quality (not quantified)		
		Reduction of Transport and Distribution (T&D) losses	Capital costs of network upgrades and investments in transmission and distribution, including network reinforcement	Avoided costs of thermal and renewable energy production, including avoided imports of diesel and HFO for avoided production from oil		
		Low-carbon transport	Electric mobility	Additional cost of imported electric vehicles compared to equivalent ICE models Replacement of electric vehicle batteries and charging units Grid or off-grid electricity supply	Avoided diesel and petrol costs Potential local benefits for air quality, depending on location (not quantified)	
	Modal shift		Capital costs for footpaths, cycle lanes, bus lanes, traffic calming measures, etc. Operating and maintenance costs (O&M) Unearned revenue from fuel tax	Avoided diesel and petrol costs for consumers Reduction in road accidents and road deaths Productivity gains (not quantified) Benefits for air quality (not quantified) Avoiding the construction of new roads (not quantified)		
				Sustainable aviation fuels (SAF)	Additional cost of imported SAF, whether pure SAF or mixed with aviation paraffin	Avoided costs of conventional aviation paraffin
				Energy efficiency	Energy efficiency in buildings and public lighting	Capital costs for new energy-efficient equipment and appliances and LED lighting Energy saving programme and training costs
	Efficient water use and supply	Capital costs for new energy-efficient equipment (new pumping stations and equipment) Costs of additional new energy efficiency practices	Avoided energy costs for water utilities and consumers, when savings are passed on Job creation (ESCOs, energy audits, etc.)			

Waste	Sustainable waste management	Recycling and reusing waste	Installation and capital costs of recycling plants Operating and maintenance costs (O&M) Costs of training and awareness programmes	Revenues from the sale of recycled materials, including paper, plastics, glass and steel Avoided landfill or rubbish costs (not quantified)
		Sustainable composting	Installation costs for composting plants Operating and maintenance costs (O&M) Costs of training and awareness programmes	Revenues from the sale of organic compost, or implicit value of own use Avoided N-fertiliser costs (not quantified)
		Biogas for energy	Installation and capital costs of biogas plants Operating and maintenance costs (O&M) Costs of training and awareness programmes	Revenues from the sale of biogas energy and/or avoided electricity costs Diesel and HFO imports avoided
IPPU	Reduction of high GWP gases	Replacing fluorinated gases with low-GWP alternatives	Incremental costs of imported low-GWP fluorinated gas substitutes in air conditioning and refrigeration use	No benefits were identified
Agriculture and LULUCF	Forestry and land use	Reforestation and restoration	Establishing forest plantations Plantation maintenance Training and supervision costs	Revenues from the production of firewood, timber and sustainable poles
		Agroforestry	Establishment of agroforestry plantations Plantation maintenance Training and supervision costs	Income from fruit production

A net project value (NPV) was calculated for each of the mitigation options identified, based on the expected annual flows of costs and benefits over the economic assessment period.

A wide range of data and assumptions were used to carry out the economic analysis. Information on costs and benefits, as well as project details and supporting technical data, was requested from government services and relevant stakeholders. Wherever possible, this information was used in the analysis, although significant information gaps and the need to ensure consistent values for common assumptions meant that national data was often supplemented by a range of assumptions and inputs drawn from international literature and from case studies and analogous/regional project schemes.

5.3.2 Marginal abatement costs

Figure 5-13 below shows a marginal abatement cost curve (MACC) in which each of the identified mitigation measures is ranked in ascending order of its unit cost, measured in USD per tCO2e emissions mitigated. The measures add up to show the total estimated annual GHG reduction compared to the BAU scenario in 2050. The costs shown are taken from the net present values (NPV) generated by the CBA and therefore represent the socio-economic costs of GHG reductions, reflecting both the costs and benefits to the economy as a whole. The MACC presents a useful way of assessing the relative costs and contribution of the mitigation potential for each of the measures assessed.

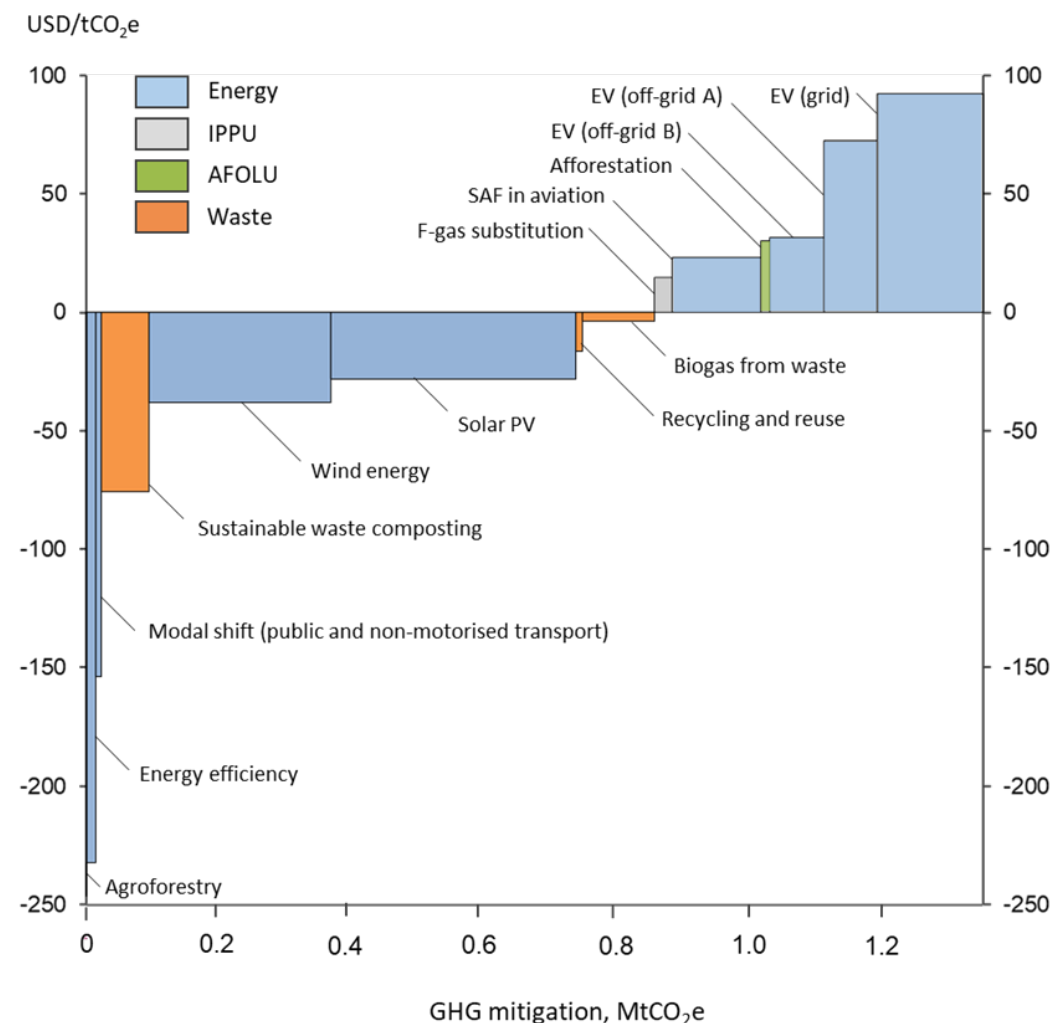


Figura 5-13: Marginal abatement cost curve for all mitigation measures

The figure highlights the large mitigation potential within the scope of mitigation measures available at a low to medium cost, i.e. less than 100 USD/tCO₂e. It is important to note that many of the measures are considered cost-effective overall, with net benefits outweighing the costs, presented here as having negative abatement costs. It is considered that around 0.85 MtCO₂e, or 63% of the total, are available with negative socio-economic costs. This situation can be seen in a series of measures in all sectors that make it possible to improve efficiency, reduce imports of high-cost fuels and generate additional revenue streams. These include major plans to expand the use of renewable energy sources, such as solar photovoltaics and wind power, which, despite the large investment needs, would avoid large volumes of expensive oil imports. This pattern is consistent with many other abatement cost curves produced on the basis of socio-economic cost-benefit analyses.

The MACC also shows that several measures have positive costs, whose costs outweigh the benefits. These measures include afforestation and reforestation, the substitution of fluorinated gas and the use of SAF in domestic aviation. More significantly, these measures include electric mobility, shown in the graphs divided according to three different charging models (on-grid and off-grid).

This is because, despite the great uncertainties surrounding the future costs of vehicle batteries and off-grid renewable-based energy production, electric mobility is expected to continue to have higher costs than conventional vehicles (ICEs) in the reference scenario until 2050, reflecting the incremental costs of EVs and the need for battery replacement and the large capital expenditure required to develop the charging infrastructure. Off-grid charging methods are considered more economical, based on expectations that even with increased investment and sector reform, grid tariffs will continue to be higher than the consumer's lifetime cost for home or workplace charging based on solar energy.



Poilão Dam Santiago Island

06.

Decarbonisation Pathway

This chapter presents an alternative low-carbon pathway for Cabo Verde up to 2050, based on the technical analysis described in the sections above. The expected reduction in GHG emissions compared to the BAU scenario of implementing all identified mitigation measures is presented first, followed by an estimate of the associated financing requirements.

The analysis shows how it is possible to make deep and ambitious cuts in the country’s emissions over the coming decades. However, it also shows how additional actions are likely to be needed to reach net zero. Like many other countries that have adopted net-zero emissions targets as part of global climate policy efforts, Cabo Verde will have to make difficult choices about how any remaining or “hard to abate” emissions can be offset by carbon removals. The potential scale and feasibility of many of these removal options remain highly uncertain at present, both globally and for Cabo Verde. The chapter concludes with a discussion of the potential applicability of carbon removal options for the country to achieve its goal of net zero emissions by 2050.

6.1 GHG reduction potential

The figures below illustrate the emissions projections for the BAU reference scenario and the long-term mitigation scenario, including a sectoral breakdown of the mitigation expected in 2030 and 2050. The associated figures are presented in Table 6-1.

The projection shows that in the BAU scenario, emissions are expected to more than double in the long term, from around 0.82 million tonnes of CO2e in 2020 to 1.97 million tonnes of CO2e in 2050. According to the alternative low emissions trajectory, with the application of the mitigation measures identified, it is estimated that emissions would increase to around 0.61 million tonnes of CO2e in 2050. This is a much lower level than today and represents a very significant reduction of around two thirds compared to the current situation.

The analysis shows how the vast majority of emission reductions are expected to come from changes in energy use. By 2030, around two-thirds of the mitigation potential is attributed to low-carbon energy interventions, of which low-carbon transport and electricity production from renewable sources represent the largest percentages. The importance of these actions increases even more in the long term, accounting for more than 80% of the total mitigation potential by 2050. The projections clearly show how the relative contributions are expected to change over time, with energy efficiency actions having the greatest benefits over the next decade and low-carbon transport sector measures playing an increasing role in the longer term, with the gradual expansion of electric vehicles, modal shift and the use of sustainable aviation fuel.

Although low-carbon energy measures dominate the predicted mitigation potential, actions taken to increase the sustainability of the waste sector also contribute an important part of the total effort. Sustainable waste management, including reuse and recycling, composting and biogas energy, accounts for 22% of reductions in 2030 and 14% in 2050. The reduction of fluorinated gases and forestry measures account for the remainder.

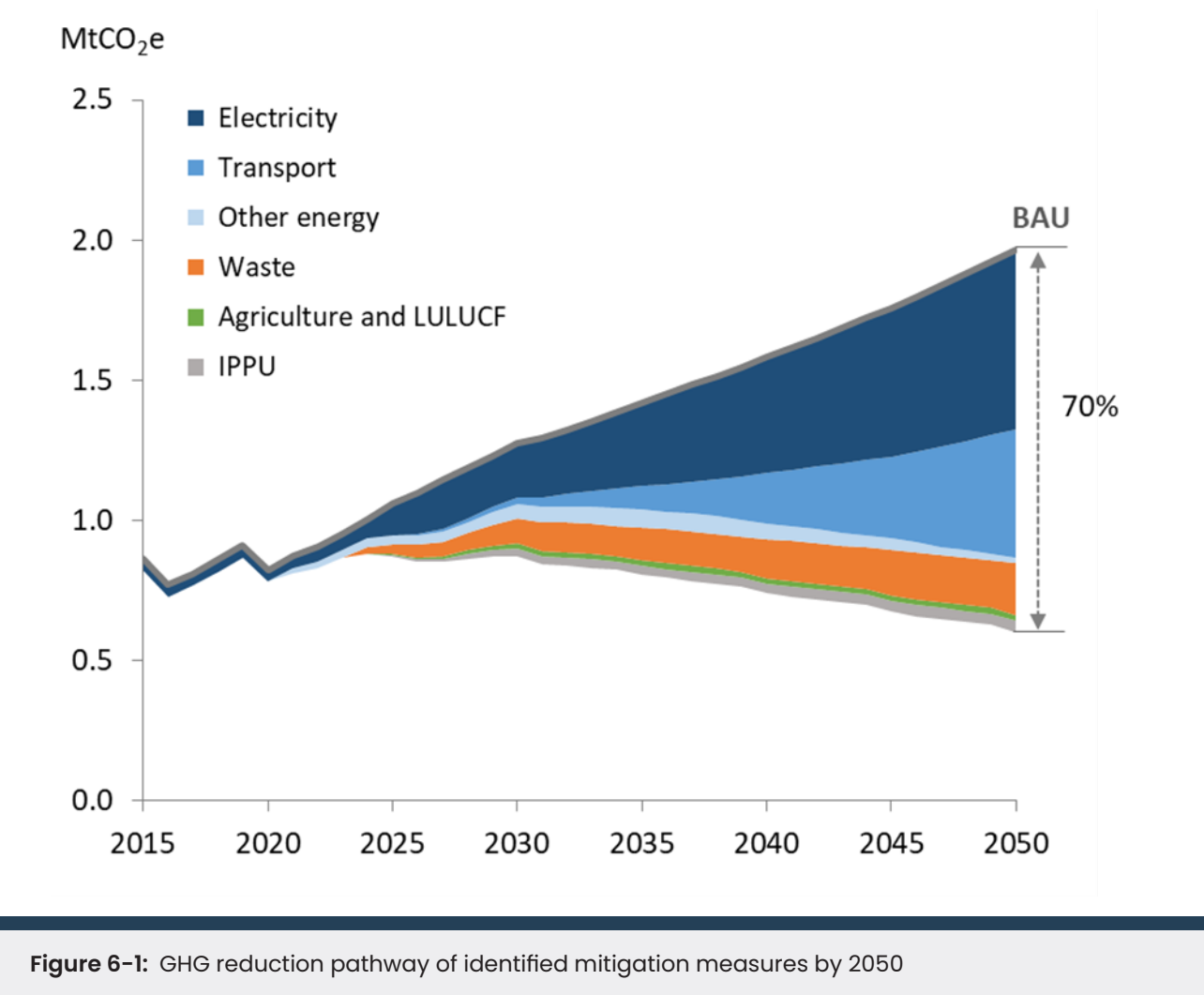


Figure 6-1: GHG reduction pathway of identified mitigation measures by 2050

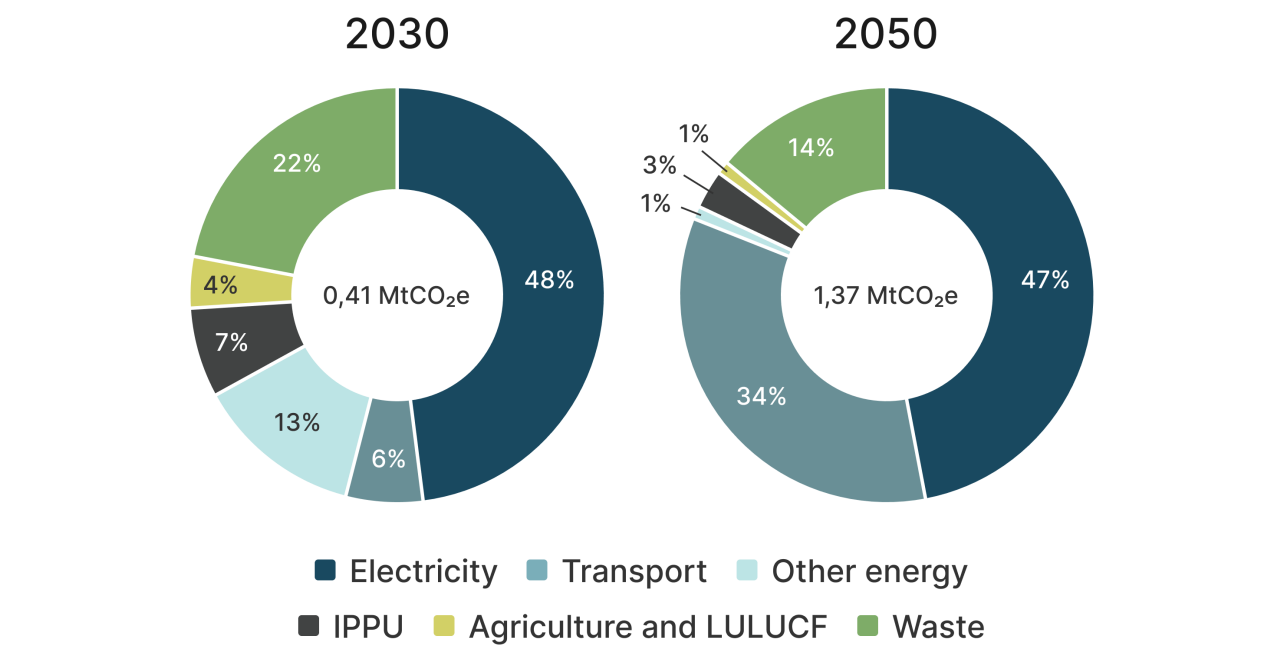


Figure 6-2: Greenhouse gas mitigation potential in 2030 and 2050

Table 6-1: Greenhouse gas emissions scenarios up to 2050				
GREENHOUSE GAS EMISSIONS (MtCO ₂ e)	2020	2030	2040	2050
BAU scenario	0.82	1.27	1.56	1.97
Total mitigation	0.04	0.41	0.84	1.37
Energy	0.04	0.27	0.65	1.12
IPPU	0.00	0.03	0.03	0.04
Agriculture and LULUCF	0.00	0.02	0.02	0.02
Waste	0.00	0.09	0.14	0.19
Mitigation scenario	0.78	0.87	0.75	0.60
Reduction compared to BAU (%)	5%	32%	53%	70%

Although they offer important and multiple co-benefits to Cabo Verde, the measures identified in the forestry sector, such as afforestation, reforestation and agroforestry, are relatively limited in their scale and associated carbon storage potential. Due to the limited availability of suitable land to expand the national forest area, as well as the country's semi-arid climate which restricts the carbon stock, it is estimated that these 'nature-based' carbon removal options can offset only a very small part of Cabo Verde's anthropogenic GHG emissions.

Projections show that, by 2050, around a third of predicted emissions will not be mitigated. These residual or "hard to abate" emission sources reflect the fact that, even with vigorous efforts to implement gradual changes in energy supply and use and new waste use and management practices involving major investments, coordinated political action and lifestyle changes, emission reductions alone are unlikely to achieve a net zero result. Many sources of emissions, particularly in the waste and agriculture sectors which are characterised by multiple small sources, prove almost impossible to eradicate completely. Similarly, it is probably not feasible to completely avoid all emissions in some industrial and energy use sectors. Since Cabo Verde's potential to expand its natural carbon stock through new forest plantations is not considered sufficient to offset these remaining sources, it will be necessary to consider alternative approaches to achieving net zero by 2050. This is discussed below.

6.2 Financing requirements

Under Article 13 of the Paris Agreement, developed countries reaffirmed their previous commitments to channel at least 100 billion dollars in annual climate finance to developing countries by 2020. They also agreed to set a more ambitious climate finance target from 2025. Cabo Verde's ability to implement the full range of mitigation measures described in this document will depend on whether these ambitions are fulfilled by the international community in the coming years.

Figure 6-3, Figure 6-4 and Table 6-2 show the estimated financing needs associated with all the mitigation options identified and described in this report, which are estimated to amount to around 3.4 billion dollars by 2050.¹⁸ These represent the additional investment costs in the mitigation scenario compared to the BAU scenario required for new plants, facilities, equipment and assets, as well as additional ongoing costs such as training, maintenance and support needs.

Estimates show that mitigation measures in the energy sector are expected to dominate funding needs, accounting for more than 95% of the total. Measures implemented in the other emitting sectors of waste, forestry and industrial processes account for only 5% of the total. This breakdown partly reflects the predominance of energy supply and use in Cabo Verde's emissions profile and its estimated mitigation potential, but also the fact that interventions in the energy sector are typically more capital-intensive. For example, the expansion of new renewable energy production, accompanied by battery and pumped storage and new grid infrastructure, will require very large investments (around a third of the estimated total), while a shift to low-carbon transport will also involve significant additional costs and investments for imported electric vehicles, chargers and non-motorised transport infrastructure (more than half of the total requirement). Although the waste, industry and forestry sectors will also require significant amounts of funding to realise the expected mitigation benefits, for example through new investments in recycling, biogas plants and plantations and agroforestry schemes, interventions in these sectors are typically less capital-intensive, relying more on introducing changes in practices and providing ongoing support.

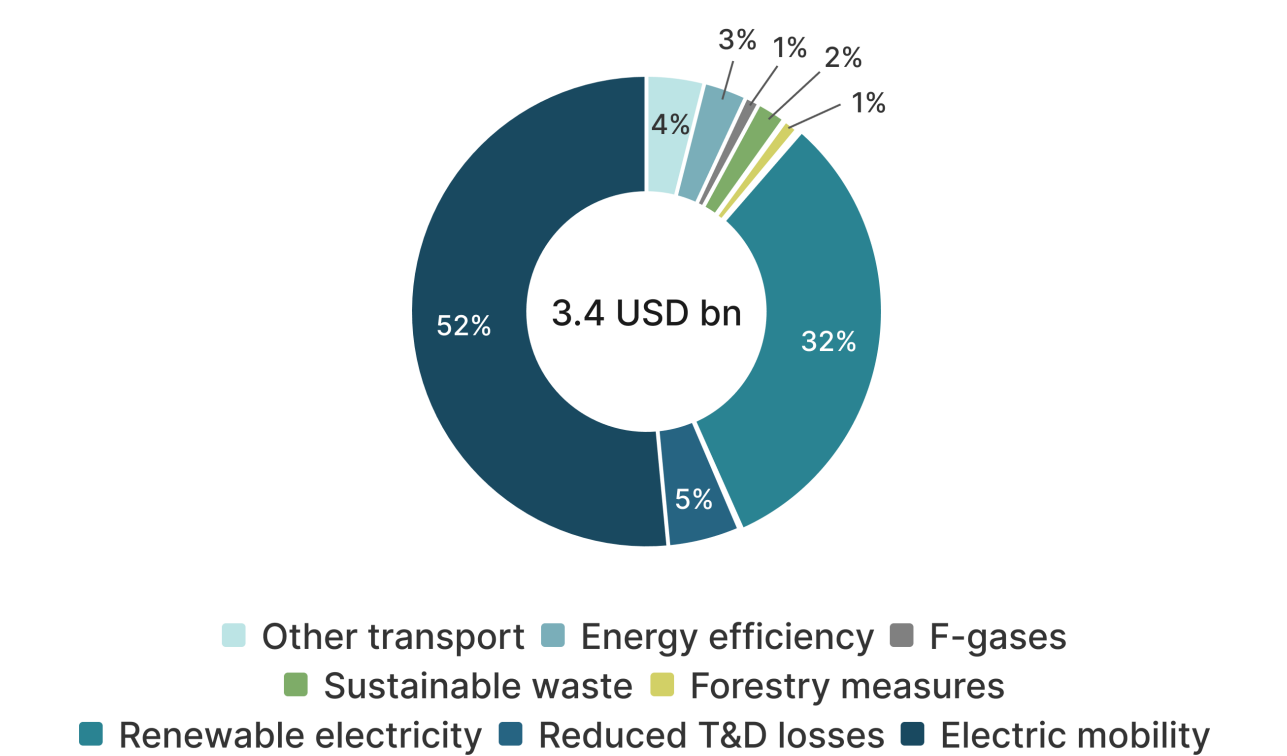


Figure 6-3: Investment needs for all identified measures up to 2050

¹⁸ Financing needs are estimated in real terms (i.e. 2023 USD) and represent initial investments and running costs additional to the BAU baseline scenario

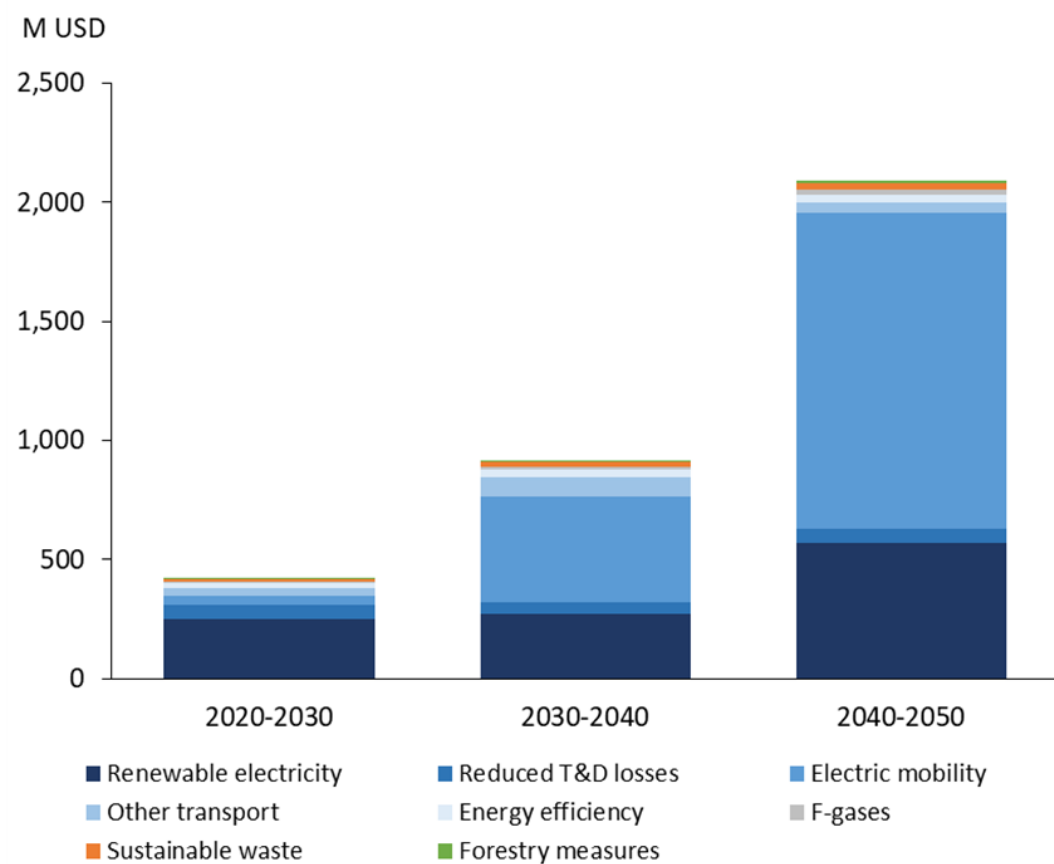


Figure 6-4: Investment needs for all identified measures, by period

Table 6-2: Investment needs for all identified measures up to 2050

MILLIONS OF DOLLARS	2020–2030	2030–2040	2040–2050	TOTAL
Renewable electricity	252	271	572	1,095
Reducing losses in T&D	60	51	57	168
Electric mobility	35	440	1,330	1,805
Other low-carbon transport	31	82	40	153
Energy efficiency	23	33	36	92
F-gas replacement	4	12	16	32
Sustainable waste management	11	22	32	65
Forestry and agroforestry	6	8	8	22
Total	422	918	2,092	3,432

The estimates show how the transition to a low-carbon economy envisaged by the implementation of all the measures identified will require a significant increase in financing needs over each decade until 2050. This pattern can be observed in most measures and sectors, as investment and support levels are increased to achieve increasingly ambitious mitigation results over time. However, this pattern is most striking in the electric mobility measure. This reflects the assumptions and expectations around timescales and market penetration rates for the entry of EVs into the national fleet in each of the vehicle classes, accompanied by sufficient charging and energy supply infrastructure. As the costs of EVs and batteries are expected to fall over the next 1-2 decades worldwide, along with the gradual greening of the Cabo Verdean electricity grid, the share of EVs entering the national vehicle fleet is expected to accelerate during the decade 2030-2040. By the first half of the 2040-2050 period, it is expected that in order to electrify the entire fleet all new vehicle registrations will be EVs.

6.3 Moving towards net zero

6.3.1 Balancing GHG emissions and removals

The Paris Agreement’s collective goal of achieving “a [global] balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century” (Article 4(1)) places the goal of net-zero emissions at the centre of global climate action. Instead of seeking to mitigate climate change by simply reducing or completely eliminating all sources of anthropogenic GHG emissions (“absolute zero”), net zero means that any residual anthropogenic GHG emissions occurring after 2050 must be offset by an equivalent level of carbon dioxide removals (CDR).¹⁹

The emergence of net zero has led to a growing number of net zero commitments from countries, organisations and companies. Net zero has led to a shift in emphasis in climate policy discourse. The need to cut greenhouse gas emissions more deeply remains on the agenda, but increasingly the debate centres on how to achieve parallel growth in CDR by strengthening terrestrial carbon sinks and reservoirs. For example, in the EU, which has committed itself (together with its member states) to achieving the goal of net-zero emissions of all greenhouse gases by 2050, studies suggest that even with ambitious targets for reducing emissions through energy efficiency and the use of renewable energies, there will still be considerable residual greenhouse gas emissions in 2050. In scenarios compatible with the objective of limiting the temperature increase to 1.5°C, to achieve net GHG neutrality it will be necessary to balance 500 to 600 MtCO₂e of anthropogenic emissions with an equivalent level of removals (European Commission, 2018).

Other studies at global and national level also indicate a huge role for carbon removals in the coming decades. The long-term scenario projections presented above for Cabo Verde also indicate that, by 2050, a large proportion of residual emissions will remain, equivalent to around a third of BAU’s projected emissions. Cabo Verde is therefore one of a growing number of countries that, having committed to net zero, has begun to consider which CDR options are best suited to help it achieve net zero.

¹⁹ The problems of cumulative stocks of long-lived climate pollutants, such as CO₂, mean that net zero is often considered only for CO₂, although broader interpretations also include net zero for all GHGs.

6.3.2 Carbon dioxide removal methods (CDR)

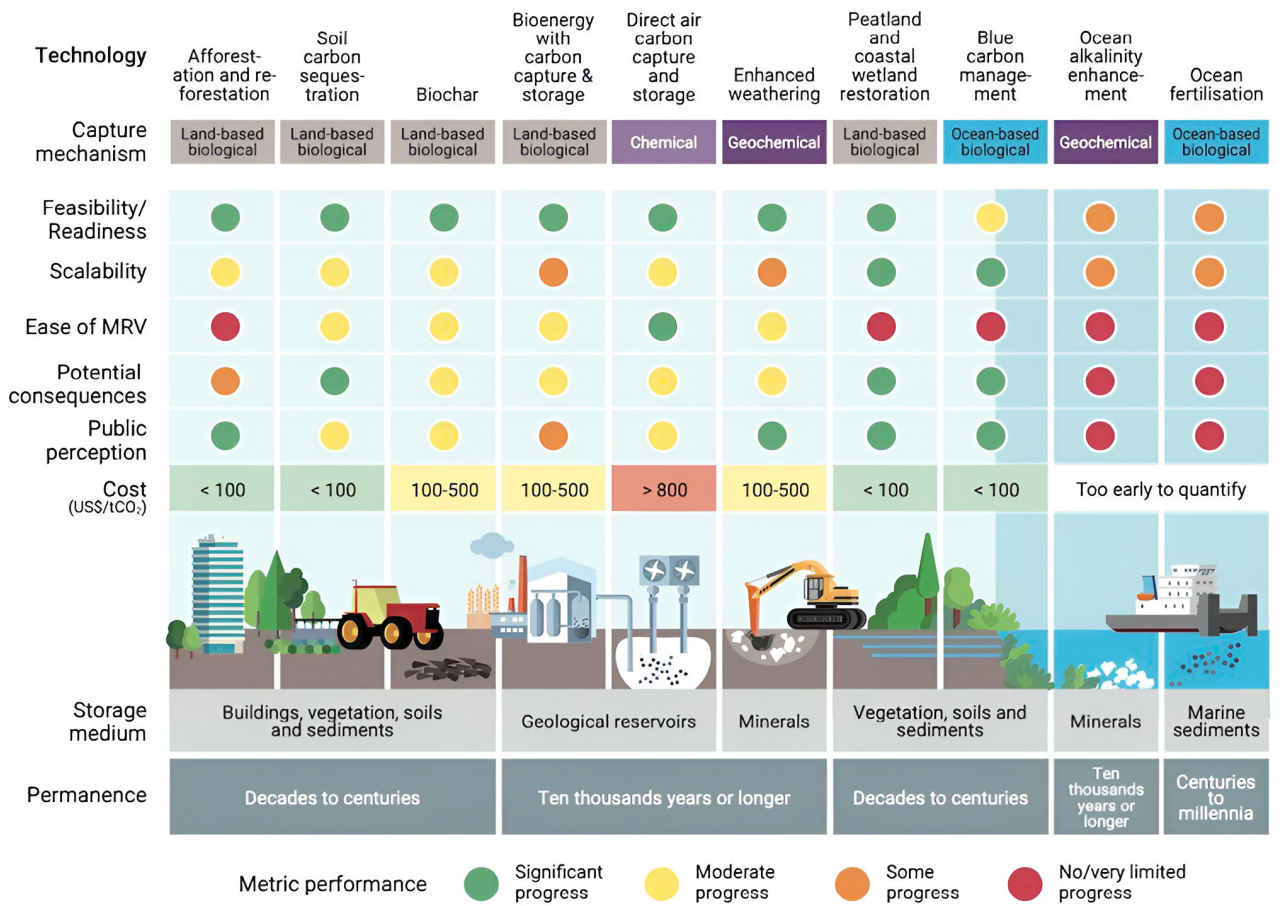
As part of current or planned efforts to reduce emissions, the widespread use of CDRs is inevitable if the long-term temperature objective of the Paris Agreement is to continue to be achieved (UNEP, 2023). In this context, the attention given to carbon removals has grown at an unprecedented rate in recent years, with an increasing number of new initiatives, new research, new position papers, new platforms and new companies being launched, dedicated to CDR and so-called negative emissions technologies (NET).

CDR involves the direct removal of CO2 from the atmosphere and its long-term storage in geological, terrestrial or oceanic reservoirs, or in products (UNEP, 2023)..²⁰ CDR methods include afforestation, reforestation, coastal blue carbon management, enhanced weathering, biochar, soil carbon sequestration, direct air carbon capture and storage (DACCS), bioenergy with carbon capture and storage (BECCS), ocean alkalinity enhancement and ocean fertilisation.

Figure 6-5 summarises the main characteristics of CDR methods. While conventional approaches such as afforestation and reforestation have been practised for centuries, others are in the early stages of development, or have reached the pilot, demonstration and commercialisation phases (UNEP, 2023).

The graph shows how CDR methods vary according to a number of different characteristics, including their current level of feasibility/readiness, their scalability, susceptibility to Monitoring, Reporting and Verification (MRV), unit costs and degree of permanence. The time scale of the different CDR approaches is a particularly important factor to consider in terms of the possible speed at which global warming is reduced. For example, while forest carbon sinks can take decades to centuries to establish, CCD removes CO2 on much more immediate timescales (Chiquier et al., 2022). The different CDR approaches also have different co-benefits (e.g. soil improvements), risks and adverse consequences (e.g. competition for land for food production) (UNEP, 2023).

²⁰ It should be noted that although carbon capture and storage (CCS) and carbon capture and utilisation (CCU) share components with some DRR methods, their application to CO2 emissions from fossil fuels can never result in the removal of CO2 from the atmosphere (UNEP, 2023).



Note: The coloured circles indicate the level of progress for different metrics based on the current development of the technology. Green corresponds to progress close to the target levels needed for more widespread adoption, while red indicates no or limited progress towards the goal (UNEP, 2022).

Figure 6-5: Summary of carbon dioxide removal (CDR) options

6.3.3 What CDR options could apply to Cabo Verde?

The suitability of CDR options within countries’ net zero strategies will be determined by a number of factors. The availability of inputs/resources/materials containing the carbon or CO2 and suitable storage media will determine the technical potential for removal. These factors vary according to the geography, geology and specific biosystems of each country. As described above, CDR methods also vary in terms of costs, stage of commercialisation, public acceptance and “MRV ability” and other key aspects that affect their viability. Although the costs of certain CDR methods are expected to decrease over time and MRV techniques are expected to improve, as has been the case with other GHG mitigation technologies, these factors are likely to pose major challenges to their expansion in the short and medium term. All of these factors need to be considered when assessing which CDR options might be most applicable/viable for Cabo Verde to help achieve net zero.

To date, there have been few assessments of the potential for CDR in Cabo Verde. However, various studies and research initiatives provide a useful basis for making an initial assessment of CDR options that could be applied within the framework of the country’s long-term strategy.

In 2015, a study was carried out to assess carbon capture and storage (CCS) opportunities in the Community of Portuguese Speaking Countries (CPLP), including Cabo Verde (Carneiro et al., 2015). The study concluded that there was very little CCS potential due to the relatively small size of the country's point emission sources; due to Cabo Verde's island geography, its oil-fired power stations are not large single sources and there are no large industrial sources of CO₂, such as cement factories or refineries. The study indicated, however, that the extensive basalt outcrops on several islands could provide suitable conditions for storing CO₂ through in **situ mineral carbonation**, as has been done in Iceland and in the Columbia River basalts in the USA.²¹

In fact, much of Cabo Verde's geology is mainly composed of igneous rocks, with basalt comprising a large part of the total volume. These include extensive basalt outcrops on Santiago, the archipelago's largest island (Figure 6 6). Existing projects show that injection into basalts demonstrably mineralises CO₂, allowing for the permanent geological storage of carbon. The basalt material extracted from the mines can also potentially be used for **coastal enhanced weathering (CEW)**, in which the crushed minerals are scattered in coastal areas to be naturally weathered by waves and tidal currents, releasing alkalinity and removing atmospheric CO₂. Both geomechanical CDR methods shown in Figure 6 5 – increased weathering and increased ocean alkalinity – could have potential application in Cabo Verde. Further study is needed to assess the suitability of basalts for these methods and the technical and economic viability of their use as CDR options.

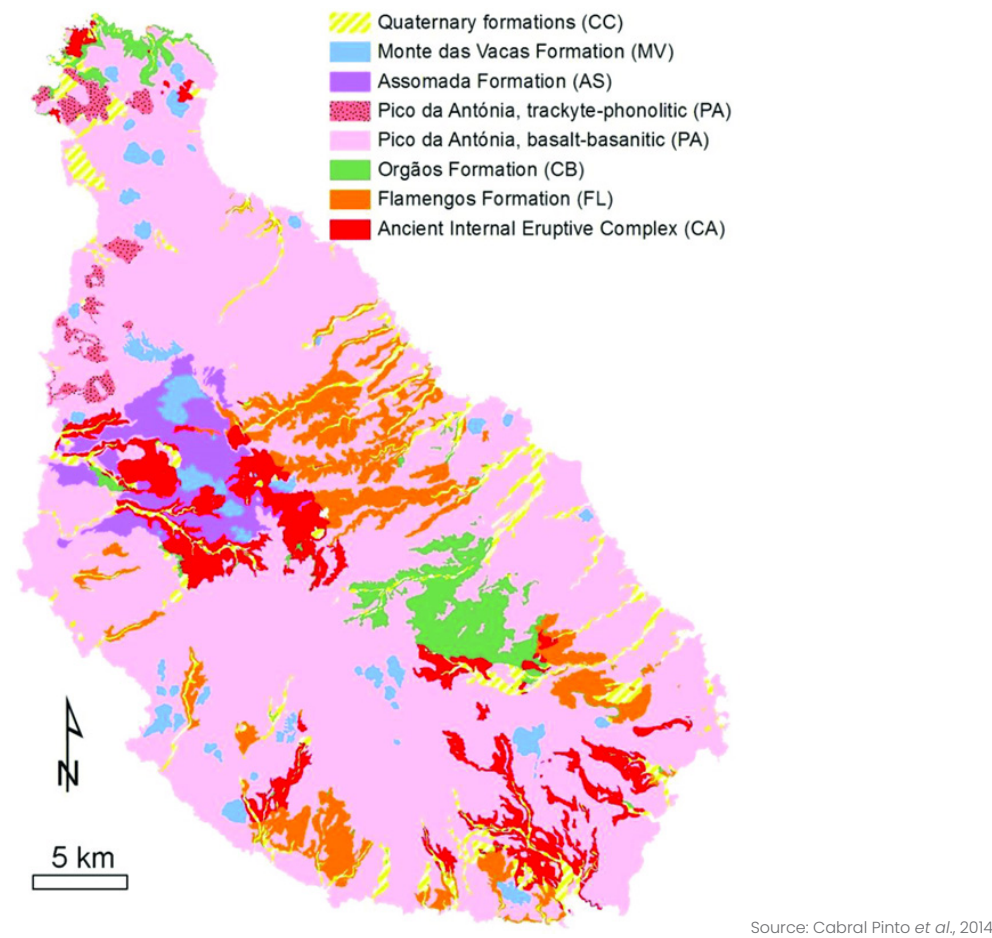


Figure 6-6: Geological map of the island of Santiago.

²¹ The study also highlighted several potential areas for R&D projects, namely through the use of CO₂ as a fluid to improve geothermal systems (EGS) on the island of Fogo.

The potential for storing CO₂ in basaltic formations on one or more islands also indicates the possible application of **direct air capture**. DACCS uses chemical processes to capture and separate CO₂ directly from the atmosphere. The CO₂ is then separated from the chemicals and captured so that it can be injected into suitable geological reservoirs. The technology is currently at an early stage of development and faces high costs, although it is receiving significant attention and public and private funding, particularly in the USA (IEA, 2023). One of the main challenges facing DACCS is the large energy requirements, which means that the technology needs a low-carbon energy source to provide significant mitigation benefits. Although several large technology companies and philanthropic funds are actively investing in DACCS projects, high costs are likely to pose a major challenge to their rapid expansion in the short and medium term. However, the presence of very significant renewable energy resources in Cabo Verde as a potential source of low-carbon energy, together with the potential for basaltic storage of CO₂, suggest that the potential of DACCS should be evaluated further.

Blue carbon management has been identified as an important priority for Cabo Verde, linked to the protection of its exceptional coastal ecosystems and biodiversity. The protection of the country's seagrass meadows in particular is recognised as a key area for environmental protection and is included in the NDC. Seagrasses play a key role in regulating the climate through carbon sequestration, chemical regulation and seawater quality, providing habitats for various marine species for feeding, breeding and refuge.

Following the discovery of the first seagrass beds in Cabo Verde in 2015, according to research carried out on Santiago Island (Creed et al., 2016), there have been efforts to map seagrass meadows and promote their protection, including through the ResilienSEA (resilient seagrass) project. This project, implemented by DNA and supported by the MAVA foundation since 2018, has carried out research and capacity-building activities to map and monitor seagrasses in seven pilot countries in West Africa, including Cabo Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone. The research made initial estimates of carbon removals in the seagrass meadows identified in Praia Gamboa, Santiago and Pedra Badejo. These indicate that these sites, which total around 14 hectares, could be sequestering up to around 12 tCO₂ per hectare per year, which could be released into the atmosphere if the seagrass meadows were degraded (Touron-Gardic, G. et al., 2022). Another seagrass meadow has since been discovered in Porto Lobo, São Domingos, Santiago. At 3.2 hectares, this is the largest seagrass meadow in the country confirmed to date (ECOCV, 2023).

However, despite this new discovery and the mapping of several other meadows expected in the coming years, it seems unlikely that Cabo Verde's seagrass meadows are storing more than a few thousand tCO₂ per year at most. Although their protection is extremely important, with multiple ecosystem, economic and tourism benefits, their carbon removal volume appears to be small in relation to the size of Cabo Verde's expected residual emissions.

Table 6-3 provides a high-level initial assessment of the potential applicability of different CDR methods to Cabo Verde. Land-based biological options are considered to have low potential. The most well-established of these, afforestation and reforestation, which is being implemented through national forest sector targets, is estimated to have only limited additional removal potential, as described in Chapter 3. Other nature-based options, such as biochar and BECCS, are not considered applicable, largely due to the limited availability of domestic biomass material and/or sufficient soil volumes. Wetland restoration may have a role to play, given that Cabo Verde has

several important wetlands, including four Ramsar sites²². However, the limited area suggests only modest removal potential. Blue carbon management is also unlikely to offer significant removals based on existing studies.

Table 6-3: Applicability of CDR in Cabo Verde					
CDR METHOD		CDR AVAILABILITY		COST AND FEASIBILITY	COMMENTS
		INPUT MATERIAL	STORAGE MEDIA		
Land-based biological	Afforestation and reforestation	●	●	●	Very limited potential for further expansion due to limited availability of suitable land and semi-arid climatic conditions
	Soil carbon sequestration	●	●	●	Highly uncertain applicability, but expansion potential considered very limited due to the small agricultural sector and soil availability
	Biochar	●	●	●	The applicability is highly uncertain, but the potential for expansion is considered very limited due to the availability of land, biomass and soils
	Bioenergy with carbon capture and storage (BECCS)	●	●	●	Challenges in the domestic supply of biomass due to climatic growing conditions and competing demands for land and biomass
	Recovery of peatlands and wetlands	●	●	●	Cabo Verde has four Ramsar wetlands, but the potential volume of carbon removal is probably relatively small given the area.
Chemical and geochemical	Direct air capture carbon and storage (DACCS)	●	●	●	High technical potential (national renewable energy resource and potential basalt storage capacity), although unit costs remain high
	Enhanced rock weathering	●	●	●	High technical potential due to the availability of basaltic rock material. Potential use as coastal enhanced weathering (CEW).
	Ocean alkalinity enhancement	●	●	●	At a very early stage of development, with a large MRV, implementation challenges and uncertainties at present
Ocean-based	Blue carbon management	●	●	●	Existing studies on seagrass meadows in Cabo Verde indicate that the potential volume of removals is small (<1,000 tCO ₂ per year)
	Ocean fertilisation	●	●	●	At a very early stage of development, with major challenges and uncertainties in terms of MRV and implementation

Note: Red circles indicate low availability/performance, amber circles indicate moderate or uncertain availability and green circles indicate high availability/performance. Source: authors

22 The Ramsar Convention, also known as the “Convention on Wetlands”, is an international environmental treaty signed on 2 February 1971 in Ramsar, Iran, under the auspices of UNESCO.

Chemical and geochemical CDR options, such as enhanced weathering, mineralisation and DACCS, are likely to have greater technical potential due to the country’s extensive basalt geology and (in the case of DACCS) the abundant renewable energy resources that could meet low-carbon energy needs. If it turns out that a suitable storage site is co-located in an area suitable for large-scale solar photovoltaic or wind energy development, a medium to large-scale DACCS facility could prove viable. Although current DAC installations are only removing a few thousand tonnes of CO₂ per year, a very significant increase is expected over the next decade with much larger installations capable of capturing several hundred thousand tCO₂ per year.²³

For Cabo Verde to achieve net zero, whereby its remaining emission sources are offset by an equal amount of carbon removals, more efforts will be needed to assess the CDR potential in greater detail. This would help identify potential projects and provide the basis for a CDR roadmap of actions designed to help the country achieve its long-term goal.

23 The largest operating DAC plant in the world, the Orca plant in Iceland, developed by Climeworks, can remove 4,000 tonnes of CO₂ per year. Carbon Engineering, another DAC developer, is planning to install a plant in Texas, USA, which it claims will remove and store up to 1 million tCO₂ per year when it starts operating in 2024. This development includes a multi-million dollar investment by United Airlines to offset emissions from its flights, as well as to purchase synthetic fuels.



Mosteiros, Fogo Island

07.

Climate Impacts and Adaptation

In the context of Small Island Developing States (SIDS), such as Cabo Verde, adaptation is a key consideration for the development of the LT-LEDS, arising from the need to address the impacts of climate change and increase the resilience of communities and ecosystems. Therefore, the LT-LEDS includes not only long-term measures for climate change mitigation but also a broader global national strategy to combat climate change, namely through adaptation and resilience to climate impacts for sustainable development.

Cabo Verde’s overall adaptation strategy is outlined in the National Adaptation Plan (NAP; MAA, 2021b) and the updated NDCs (MAA, 2021a). The most vulnerable and priority sectors for climate adaptation and resilience in Cabo Verde are identified as: (1) ecosystems and biodiversity, (2) water resources, (3) agriculture and food and nutrition security, (4) fisheries and coastal zones, (5) forestry, (6) infrastructure, housing and transport, (7) tourism and (8) human health (MAA, 2021b).

7.1 Country profile of climate risks and impacts

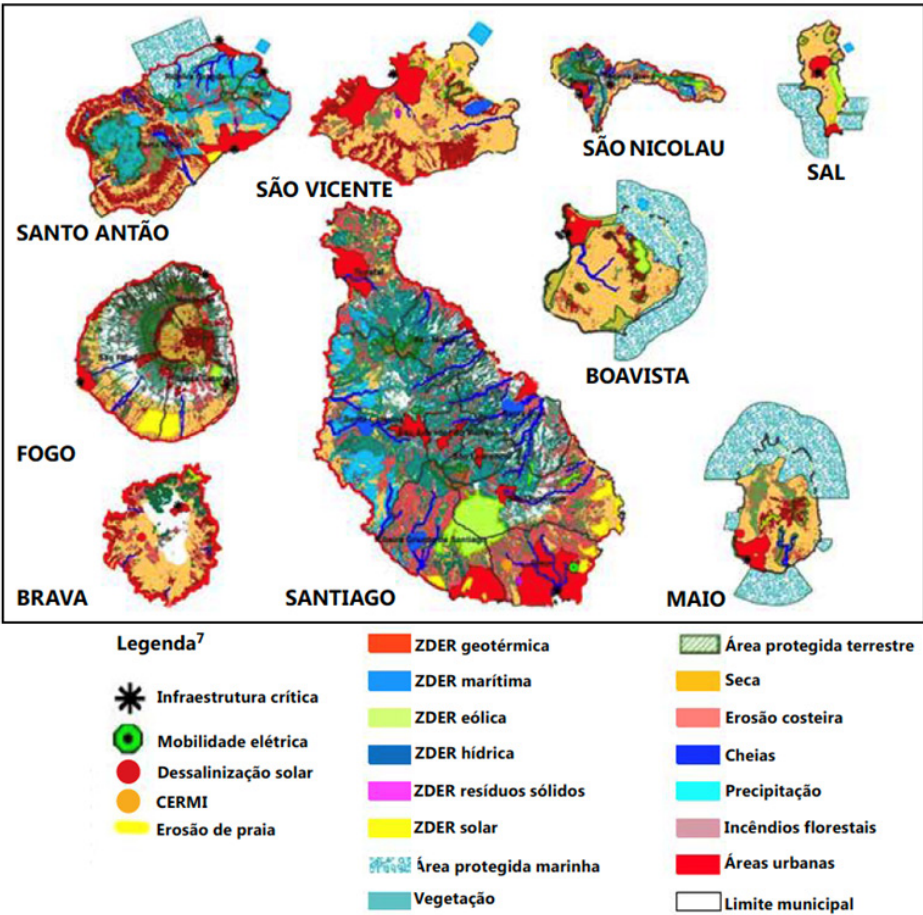
Cabo Verde, an island country located in the Atlantic Ocean off the west coast of Africa, is vulnerable to climate change due to its geographical location. As a Sahelian Small Island Developing State (SIDS), the country has long dealt with a hostile climate, but climate change has made weather phenomena such as droughts or coastal storms more frequent and intense (MAA, 2021b).

Cabo Verde is ranked as the 98th most vulnerable country in the world to climate change and 76th out of 192 countries prepared to face the threat according to the Notre Dame Global Adaptation Initiative (ND-GAIN, 2021).

Some of the specific concerns related to climate change in Cabo Verde include:

- **Sea Level Rise:** As an island country, Cabo Verde is particularly exposed to rising sea levels. This can result in coastal erosion, saltwater intrusion into aquifers, and threats to coastal infrastructure. While most projections conclude a progressive rise in sea level, with unpredictable consequences for marine and coastal ecosystems, including the livelihoods of coastal communities, this concern is the most worrying for a SIDS like Cabo Verde in the long term.
- **Extreme Weather Events:** Cabo Verde is increasingly impacted by extreme weather events such as tropical storms and hurricanes. These events cause flooding, landslides and damage to infrastructure.
- **Droughts and Water Scarcity:** Given its arid nature, Cabo Verde already faces challenges related to water scarcity. Changes in rainfall patterns and prolonged drought events could further aggravate this situation, affecting food security and the availability of water resources.
- **Higher temperatures:** Rising temperatures can have an impact on human health, agriculture and local ecosystems. More intense heatwaves may become more frequent.
- **Loss of Biodiversity:** Climate change could affect biodiversity in Cabo Verde, with changes in flora and fauna patterns. This could have implications for agriculture, fishing and natural ecosystems.

Studies carried out by the National Institute for Territorial Management (INGT) established the map summarising hazards by island, shown in the following figure.



Source: Adapted from INGT, 2021

Figure 7-1: Summary of hazard mapping, exposed elements and response capacity

This mapping of climate risks established that the most significant hazard in terms of area occupied is drought, followed by landslides and coastal erosion.

Table 7-1: Total hazardous area per island (km²).

DANGER	FOGO	SANTO ANTÃO	MAIO	SANTIAGO	BOA VISTA	BRAVA	SÃO NICOLAU	SAL	SÃO VICENTE
Beach erosion	IND	IND	IND	IND	IND	IND	IND	IND	IND
Coastal erosion	IND	120,0	0,5	256,6	5,1	41,3	32,4	4,8	34,5
Floods	3,8	8,6	6,5	19,0	12,9	0,1	2,2	0,2	1,2
Movement of slopes	52,3	144,4	0,0	189,2	0,0	4,3	28,7	0,0	0,0
Forest fires	49,8	36,8	7,8	145,7	3,3	7,8	17,2	0,0	5,7
Land movements	69,6	186,9	14,3	177,6	33,6	10,3	55,8	1,6	29,4
Droughts	446,8	628,4	273,4	556,2	631,4	52,5	304,7	219,7	225,2

Source: Adapted from INGT, 2021

The socio-economic sectors affected by the island are shown in the table below.

Table 7-2: Main socio-economic sectors affected by climate change by island

SECTOR AFFECTED	FOGO	SANTO ANTÃO	MAIO	SANTIAGO	BOA VISTA	BRAVA	SÃO NICOLAU	SAL	SÃO VICENTE	SANTA LUZIA
Ecosystems										
Water resources										
Agriculture										
Fishing										
Forestry										
Infrastructure										
Tourism										
Human health										

Extremely affected

Affected

Little affected

Source: Adapted from MAA, 2021b

7.2 Adaptation co-benefits of mitigation measures

The climate adaptation benefits of long-term mitigation measures are wide-ranging and extend beyond the immediate reduction of GHG emissions. Mitigation contributes significantly to adaptation by building resilience, protecting ecosystems and promoting sustainable practices. The following table presents some specific climate adaptation benefits from the measures selected for Cabo Verde in the long term.

Table 7-3: Adaptation benefits of LT-LEDS mitigation measures

SECTOR	AREA	MITIGATION MEASURES	ASPECTS/BENEFITS OF ADAPTATION
Energy	Decarbonised electricity supply	Wind energy	Harnessing local resources and reducing dependence on external energy sources, making it less susceptible to fluctuations in fossil fuel prices and supply interruptions. Mitigation of Climate Impact Risks, considering that wind energy is less vulnerable to certain climate impacts, such as droughts and rising temperatures, compared to energy sources that rely on water for cooling. This contributes to the energy sector's adaptation to climate change.
		Photovoltaic (PV) solar energy	Reducing dependence on non-renewable fossil fuels, contributing to the diversification of the energy matrix. Solar-powered water desalination plants generating water for agriculture, industry and consumption. In areas prone to heatwaves, solar photovoltaics can play a role in mitigating the impacts by providing electricity for cooling systems and reducing the demand on traditional electricity grids.
		Transport and Distribution (T&D) losses reduced	Efforts to reduce energy losses also raise awareness of the importance of energy efficiency. This can lead to behavioural changes and more sustainable practices in relation to energy consumption, contributing to long-term adaptation. Reducing energy losses can result in lower operating costs for utilities, which in turn can reduce costs for consumers. This can be particularly beneficial in vulnerable communities, helping to mitigate the adverse socio-economic impacts of climate change. Building and maintaining additional infrastructure to compensate for energy losses can result in significant environmental impacts. Reducing these losses minimises the need for constant infrastructure expansion, relieving pressure on sensitive ecosystems and natural habitats. Reducing energy losses implies more efficient use of natural resources such as fossil fuels and water.
	Low-carbon transport	Electric mobility	Improving air quality in urban areas. This is especially important for public health, as air pollution is linked to a number of respiratory and cardiovascular problems. Reduced dependence on imported fuels, reducing vulnerability to fluctuations in oil prices and other geopolitical factors. Investments in charging stations powered by renewable energies contribute to adaptation by promoting greener practices in the transport infrastructure.
		Modal shift	Design infrastructures that are accessible to all, including people with disabilities. Improving urban air quality to reduce diseases caused by atmospheric pollution. Reducing and decongesting traffic can help strengthen response capacities in urban areas. Increasing the resilience of public transport and its adaptability to predicted climatic events.
		Sustainable aviation fuels (SAF)	Reducing dependence on imported fuels Mitigation of environmental impacts in aviation / Environmental benefits, such as reducing local pollutant emissions and improving air quality in the vicinity of airports.
	Energy efficiency	Residential measures	Increased resilience to energy supply disruptions, such as blackouts caused by extreme weather events / Decentralised energy systems and alternative sources can increase resilience. Improved indoor air quality, contributing to the health and well-being of occupants. Raising awareness about energy consumption and fostering sustainable communities

Energy	Energy efficiency	Tourism sector measures	Energy efficiency measures in the tourism sector reduce the demand for natural resources such as electricity, water and fuels. This promotes a more sustainable use of these resources, in line with adaptation when considering the limited availability of natural resources. The implementation of more efficient and modern technologies, such as LED lighting systems, state-of-the-art air conditioning systems and intelligent energy management in tourist establishments, improves operational efficiency. Efficient waste management, including recycling and waste reduction, contributes to the overall sustainability of the tourism sector and helps adaptation by managing environmental impacts. Implementing education and awareness programmes for staff involved in the tourism industry can raise awareness of the importance of energy efficiency and sustainable practices.
		Energy-efficient street lighting	Low-energy street lighting infrastructures, especially those designed with resilience in mind, are better able to withstand extreme weather events such as storms and floods. The rapid recovery capacity of energy-efficient public lighting infrastructures contributes to urban adaptation. Efficient and well-distributed street lighting is essential for urban safety. Low-energy public lighting systems are often more flexible and adaptable to different lighting conditions. This allows for seasonal adjustments and responses to changing environmental conditions, contributing to long-term adaptation.
		Efficient water use and supply	Efficient water use practices contribute to conserving water resources. Reducing Water Stress Efficient water supply practices, such as diversifying water sources and implementing water reuse technologies, increase the resilience of urban and rural communities to periods of prolonged drought and water scarcity. Sustainable water management strategies, including the implementation of water conservation policies, effective monitoring and regulations to ensure the responsible use of water, are key to adaptation. The efficient use of water in the agricultural and industrial sectors, through practices such as smart irrigation and more efficient production technologies, contributes to adaptation by reducing vulnerability to changes in rainfall patterns. Effective monitoring and early warning systems for water scarcity and extreme weather events allow communities to prepare and respond appropriately, minimising negative impacts.
	Waste	Sustainable waste	Reuse and recycling help conserve natural resources, including trees, minerals, water and energy, and promote more sustainable practices. The extraction and processing of natural resources often involves significant environmental impacts. By recycling and reusing, the demand for these resources decreases, preserving ecosystems and reducing pressure on ecosystem services. Recycling and reuse are fundamental elements of the circular economy, in which products, materials and resources are kept in use for as long as possible. This contrasts with the traditional linear economy, where products are manufactured, used and discarded. The circular economy promotes sustainability by minimising waste and maximising the value of existing resources. Recycling and reuse help reduce the need to extract non-renewable resources such as minerals and precious metals. This preserves sensitive ecosystems and avoids the environmental degradation associated with the extraction of these resources.

Waste	Sustainable waste	Sustainable composting	The compost produced by composting is a natural, organic fertiliser that enriches the soil, improving its structure and fertility. Healthy, fertile soils are more resilient to climate change, helping plants adapt to changing conditions. Compost from composting has a significant water retention capacity. This is crucial for adaptation, as it helps to cope with extreme weather events such as droughts and floods by providing a more stable supply of water for plants. Composting promotes beneficial microbial activity in the soil, increasing biodiversity and the health of the underground ecosystem. Soils rich in biodiversity are more resilient to adverse climatic conditions. Reducing dependence on chemical inputs and fertilisers and promoting more sustainable agricultural practices. The improvement in soil structure resulting from sustainable composting contributes to the conservation of water resources. Healthy soils have a greater capacity to absorb water, reducing surface runoff and erosion. The application of organic compost encourages sustainable agricultural practices such as crop rotation, cover crops and integrated pest management. These practices contribute to more resilient agricultural ecosystems.
		Biogas for energy	Diversifying the energy matrix and reducing dependence on non-renewable sources such as fossil fuels. Support for sustainable agriculture through the use of agricultural waste and animal manure and the opportunity to provide an additional source of income for farmers. Biogas production often takes place on a local scale, allowing for decentralised energy generation. This can increase the resilience of communities, especially in areas prone to extreme weather events, by offering a more resilient and self-sustaining source of energy. Making the most of available organic waste to produce domestic renewable energy. Provision of a stable energy source, important to guarantee continuous supply in situations of unpredictable change.
IPPU	Reduction of high Global Warming Potential (GWP) gases	Replacing fluorinated gases with low-GWP alternatives	Reducing emissions of fluorinated gases has benefits for human health, as these gases are sometimes associated with health problems. Many of these gases are associated with respiratory and cardiovascular problems. Replacing them with safer alternatives helps protect the health of exposed populations. Reducing emissions of fluorinated gases contributes to the protection of sensitive ecosystems, such as corals and polar regions, which are particularly vulnerable to climate change. Preserving these ecosystems is crucial for maintaining biodiversity and ecosystem health.
Agriculture and LULUCF	Forestry and land use	Reforestation and restoration	Increased forest cover contributes to slope stability. Increasing forest cover reduces the risk of desertification. Trees play a crucial role in improving air quality by absorbing pollutants and releasing oxygen. Reforestation and restoration help to recover degraded areas, transforming places that have been deforested, degraded by human activity or impacted by fires into healthy ecosystems. Forests play a vital role in regulating the water cycle, helping to conserve water resources. They help control soil erosion, improve water quality and regulate the flow of rivers and streams. Reforestation projects often involve local communities, providing opportunities for environmental education and raising awareness about the importance of conservation and sustainable management of natural resources. Healthy forests and ecosystems act as natural barriers against natural disasters such as floods, landslides and storms, helping to protect neighbouring communities. Reforested areas often become attractive locations for outdoor recreation and sustainable tourism, generating economic opportunities for local communities. Reforestation and restoration create natural habitats, promoting biodiversity by providing shelter and food for a variety of species, including plants, animals and insects.

Agriculture and LULUCF	Forestry and land use	Agroforestry	Diversification of products, including food, wood, fruit, herbs and other forestry products. Trees in agroforestry systems can improve soil fertility. Their deep roots can access nutrients in deeper soil layers, and falling leaves contribute to organic matter, enriching the soil. Trees and shrubs help control soil erosion by reducing the loss of nutrients and sediment caused by rainwater and wind. The presence of trees in agroforestry systems can improve water sustainability. Trees help regulate water flow, reducing surface runoff and improving aquifer recharge. Product diversification can lead to additional sources of income for farmers. In addition to traditional agricultural crops, they can harvest wood, fruit, nuts and other forest products. Agroforestry systems provide habitat and ecological corridors for wildlife. This contributes to the conservation of biodiversity and helps maintain healthy ecosystems. Plant diversity in agroforestry systems can increase resistance to pests and diseases. The presence of trees can create a less favourable environment for the spread of certain pests. Vegetation in agroforestry systems can help conserve water by reducing soil evaporation, maintaining moisture and minimising the need for irrigation. As well as increasing fertility, the presence of trees can improve soil structure, increasing porosity and water retention capacity.

08.

Roadmap for Implementation

8.1 Overview

The Paris Agreement outlines an NDC cycle based on a five-year update and review period, in which Parties provide information centred on the next five years (e.g. until 2025 for the current NDC). The roadmap for LT-LEDS implementation in this section is based on existing plans and measures related to GHG mitigation in Cabo Verde, including those identified in the first NDC, but provides a long-term overview up to 2050. It is therefore aligned with the country’s short-term plans, while aiming to give a broader view of the path needed to achieve Cabo Verde’s ambition of net zero emissions by mid-century.

As with NDCs, the longer-term framework should be reviewed and amended for use in future LT-LEDS reporting cycles. This includes any changes to the proposed measures, including additional actions and improved goals and targets, in line with the requirements of the Paris Agreement. Cabo Verde’s LT-LEDS implementation framework includes a roadmap of actions, described further below in this section and summarised in the Implementation Plan. This is closely linked to the development of a financing and resource mobilisation strategy to deliver the plan (described in Section 9).

This section first presents the roles and responsibilities of the different stakeholders in Cabo Verde for carrying out the implementation plan. It then outlines a schedule of specific actions for each of the mitigation measures described by mitigation sector.

The sectoral tables, including sectoral activities and measures, are presented in the Annex.

8.2 Stakeholders’ roles and responsibilities

There are many stakeholders operating in all sectors of the economy who need to be involved in the implementation of LT-LEDS. The effective implementation of the long-term strategy will require the efforts and close co-operation of a wide range of actors and entities in Cabo Verde. Coordination and leadership between sectors and between stakeholder groups are fundamental to the realisation of the policies, projects and programmes identified. This needs to take place at all levels of governance, encompassing local levels of government, as well as seeking community-based involvement and action. Key stakeholders include government, the private sector, non-governmental organisations and civil society, academia, development partners and local communities. Climate change impacts everyone – we’re all in this together.

Government

Climate change has a significant impact on all sectors of the economy and is cross-cutting in nature. The integration and incorporation of climate change into national and sectoral plans, policies and programmes is therefore fundamental. For this reason, a wide range of government institutions – from municipal to national – will be involved in the sector-specific implementation of the mitigation actions included in the LT-LEDS. Coordination and leadership between sectors and between stakeholder groups are essential for the delivery of the policies, projects and programmes identified.

At a strategic level, the bodies responsible for defining and implementing climate policy in Cabo Verde are the Interministerial Council for Climate Action (CIAC), chaired by the Prime Minister, and the National Council for the Environment and Climate Action (CNAAC), chaired by the Minister responsible for the environment (GoCV, 2024).

- The **Interministerial Committee for Climate Action (CIAC)** is the decision-making body on climate policy and sectoral policies with an impact on national climate change objectives, chaired by the Prime Minister and made up of the members of the government responsible for the environment, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, education and science.
- The **National Council for the Environment and Climate Action (CNAAC)** is an advisory body on major policy options and cooperation between public and private entities in the field of the Environment and Climate Action, chaired by the member of the Government responsible for the area of the environment and climate action and made up of the government departments responsible for the areas of the environment, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, education and science, municipalities, civil society organisations, the private sector and academia.

At the operational level, the **National Secretariat for Climate Action (SNAC)** is the executive body that operates under the direct supervision of the member of the Government responsible for climate change, in close liaison with the CIAC and CNAAC, which is responsible for, among other things, proposing and evaluating policies, norms and initiatives and defining strategies relating to the National Policy on Climate Change, promoting coordination and cooperation on actions relating to climate change, coordinating the implementation of the NDC, the NAP and other national plans and instruments on climate change, including the LT-LEDS.

SNAC’s **Department of Transparency and Means of Implementation (DTMI)** is responsible for Cabo Verde’s Enhanced Transparency Framework (ETF). The DTMI will take responsibility for promoting transparency within the framework of the implementation of the LT-LEDS, ensuring effective accountability and reporting such as national communications and transparency reports, the department will have responsibility for attracting support for the LT-LEDS and supporting the mobilisation of funds and the transfer of technology and knowledge.

Implementing the actions identified requires the active participation of sectoral ministries, especially the **Ministry of Industry, Trade and Energy (MICE)**, which plays a crucial role in implementing Cabo Verde’s low-emission development strategy. As the government body responsible for defining and implementing national policies related to industry, trade and energy, this ministry has a range of responsibilities and strategic actions to achieve the country’s decarbonisation goals. MICE leads the development of policies and regulations that encourage the production and consumption of renewable energies, such as solar and wind, the establishment of energy efficiency standards for various sectors, such as industry, buildings and transport, and the promotion of public-private partnerships to accelerate the energy transition.

The **National Planning Directorate (DNP)** of the **Ministry of Finance and Business Development (MFFE)** is responsible for coordinating international climate finance. The DNP is the Designated National Authority for the Green Climate Fund (GCF), mobilises climate finance and negotiates specific bilateral financial transactions in line with the national climate strategy and planning, and manages the database of projects eligible for national and international climate finance. The role of climate finance in realising the LT-LEDS is described in more detail in Section 9 (Financing Strategy). DNP supports efforts to integrate climate planning into the Strategic Sustainable Development Plan (SSDP) in order to align the NDC and NAP with the SSDP.

At municipal level, the **National Association of Cabo Verde Municipalities (ANMCV)** participates in the CNAAC. The association also promotes the participation of all Cabo Verdean municipalities in the processes of planning and implementing local climate actions. On the island of Santiago, the Municipalities of Praia and Ribeira Grande de Santiago are pioneers in being part of the regional initiative Covenant of Mayors for Sub-Saharan Africa (CoM SSA) in the fight against climate change and access to renewable energies. They have voluntarily made a political commitment to act on climate change and since 2020. The two municipalities have developed a joint Sustainable Energy Access and Climate Action Plan (SEACAP) to promote the measures needed to make their territories more adapted, safer and more resilient to the effects of climate change. Several other municipalities in the country are in the same process of joining the Covenant of Mayors and promoting their SEACAP. This existing framework also serves to guarantee the participation of municipalities in defining and monitoring climate policy and long-term low-emission development up to 2050.

Private sector

The private sector is one of the main drivers of economic growth and job creation in Cabo Verde and will therefore play an active role in helping to realise the identified measures. Private companies and investors are key to achieving low-carbon development for the country through investment in cleaner technologies and the creation of green jobs. This is most critical in relation to promoting renewable energy production and increasing electric mobility, both important priorities for the long-term strategy, but the involvement of the private sector in other key sectors such as tourism and construction will also be fundamental.

The private sector should actively participate in decision-making on climate change initiatives. This can be achieved through representation in the Citizens' and Climate Forum and other government forums, as a platform for providing input and participating in climate change projects and programmes. Companies also have an important role to play in providing data for the NDC and LT-LEDS monitoring process.

Crucial roles for the private sector in realising the long-term strategy, in partnership with the government and development partners, include:

- Identification of opportunities, projects and management practices with low carbon emissions
- Mobilising funds and implementing mitigation and adaptation projects
- Providing technical support for the design and implementation of sectoral climate change policies and measures, in cooperation and coordination with the government

- Participate in the creation of national financing mechanisms for best practices in climate change, including incentives for low-carbon development and the adoption of clean technologies
- Integrate climate change risks into business plans and create greater resilience and security for investments
- Taking a leading role in introducing and disseminating best sector practices
- Monitoring and communicating the company's GHG emissions and reductions

Speaking of the private sector, the Cabo Verdean government signed a subsidy protocol with national commercial banks for microgeneration of electricity based on renewable energy, to facilitate investments and access to bank credit for the acquisition of self-production systems, at the level of the renewable energy microgeneration regime.

Non-governmental organisations and civil society

Non-governmental organisations (NGOs), civil society organisations (CSOs) and other civil groups have an important role to play because they work closely and directly with communities and can influence “on the ground” responses to climate change adaptation and mitigation. It is important for this group of stakeholders to help communities integrate climate change and disaster risk reduction into their development activities in order to increase community resilience. NGOs and CSOs can also provide useful information on monitoring the implementation and on-the-ground support for climate change projects and programmes.

NGOs and civil society have the following key roles to play:

- Implementation of projects and activities in the field of climate change at the community level
- Training local communities on climate change issues
- Mobilisation of funds for the implementation of projects in the field of climate change
- Monitoring the implementation of climate policy, including the LT-LEDS Strategy, as independent observers
- Dissemination of information on good practices
- Translate materials on climate change into material that is easy for the public to use and understand
- Facilitate interaction between scientific and local knowledge on climate change and
- Support and cooperate in the implementation of programmes and projects in the field of climate change

Cabo Verde is also committed to ensuring that Action for Climate Empowerment (ACE) becomes, in line with the Paris Agreement, a key horizontal instrument for involving all levels of society in climate action, in particular vulnerable groups (including children, youth, the elderly and people with disabilities) in support of all elements of mitigation and adaptation. Similarly, Cabo Verde places social gender equality at the centre of its political and planning processes and has implemented a series of measures designed to empower women in climate matters, with the particular aim of reducing their climate vulnerabilities.²⁴

²⁴ See the first updated NDC for more details (MAA, 2021a)

Academia, training and skills

Academic institutions have a key role to play in enhancing understanding of the impacts of climate change and in designing and implementing interventions. Training in climate change issues should be improved to strengthen the capacity of individuals and organisations to integrate climate change into their activities and to effectively adapt to and mitigate its impacts. Applied research in Cabo Verde that is adapted to the country’s circumstances should also be promoted. Scientific knowledge from research activities should be used to inform the choice of mitigation and adaptation measures and their successful implementation, adapted to the national context.

Cabo Verde is responding to these needs by planning a wide range of measures to develop climate literacy, skills and engagement. These will be key to helping realise the long-term vision and low-carbon development under LT-LEDS and include, for example:

- Creation of a network of youth associations (by island/municipality or city) as a focal point for youth participation in climate action
- Creation of a digital platform, open-access data and iterative teaching tools to involve all interested civic groups in climate talks
- Facilitate public access to climate information and include climate education in textbooks and schools for all age groups and train teaching staff accordingly
- Develop specific training programmes, create job opportunities and offer financial support to individuals and entrepreneurs interested in the fields of renewable energies, energy efficiency, water efficiency and other renewable resources, sustainable agriculture, nature-based solutions, responsible tourism, marine protection and technology and sustainable aquaculture
- Increase the number of jobs available for young adults in fields related to climate change and sustainability
- Encourage society in general and give incentives to consume low-carbon products, especially when there are local substitutes for imports.

Development partners and financing for climate action

Development partners provide resources to the government, NGOs and CSOs in Cabo Verde to carry out development activities. These include important climate interventions ranging from reforestation to low-carbon energy projects, as well as technical assistance and capacity building. Their technical and financial interventions must be aligned with the measures identified and prioritised in the country’s increasingly ambitious NDCs, so that all stakeholders work towards a common goal.

In addition to the climate finance resources provided by the financial mechanisms established by the UNFCCC, namely the Green Climate Fund (GCF), the Adaptation Fund (AF), the Global Environment Facility (GEF) and the Special Climate Change Fund (SCCF), there are also mechanisms to support climate action promoted by bilateral and cooperation partners in Cabo Verde (e.g. Luxembourg, Germany, Portugal, Spain, France, etc.), through international programmes at the United Nations level (e.g. FAO, UNDP/Climate Promise, UNIDO), but also through philanthropic funds and contributions from foundations for climate action.), through international programmes at United Nations level (e.g. FAO, UNDP/Climate Promise, UNIDO), but also through philanthropic funds and foundation contributions to climate action.

8.3 Energy

The Roadmap for implementation for the energy sector is shown in Figure 8 1 which illustrates the different mitigation measures grouped into three key mitigation areas, namely low-carbon electricity supply, low-carbon transport and energy efficiency. The measures are described below.

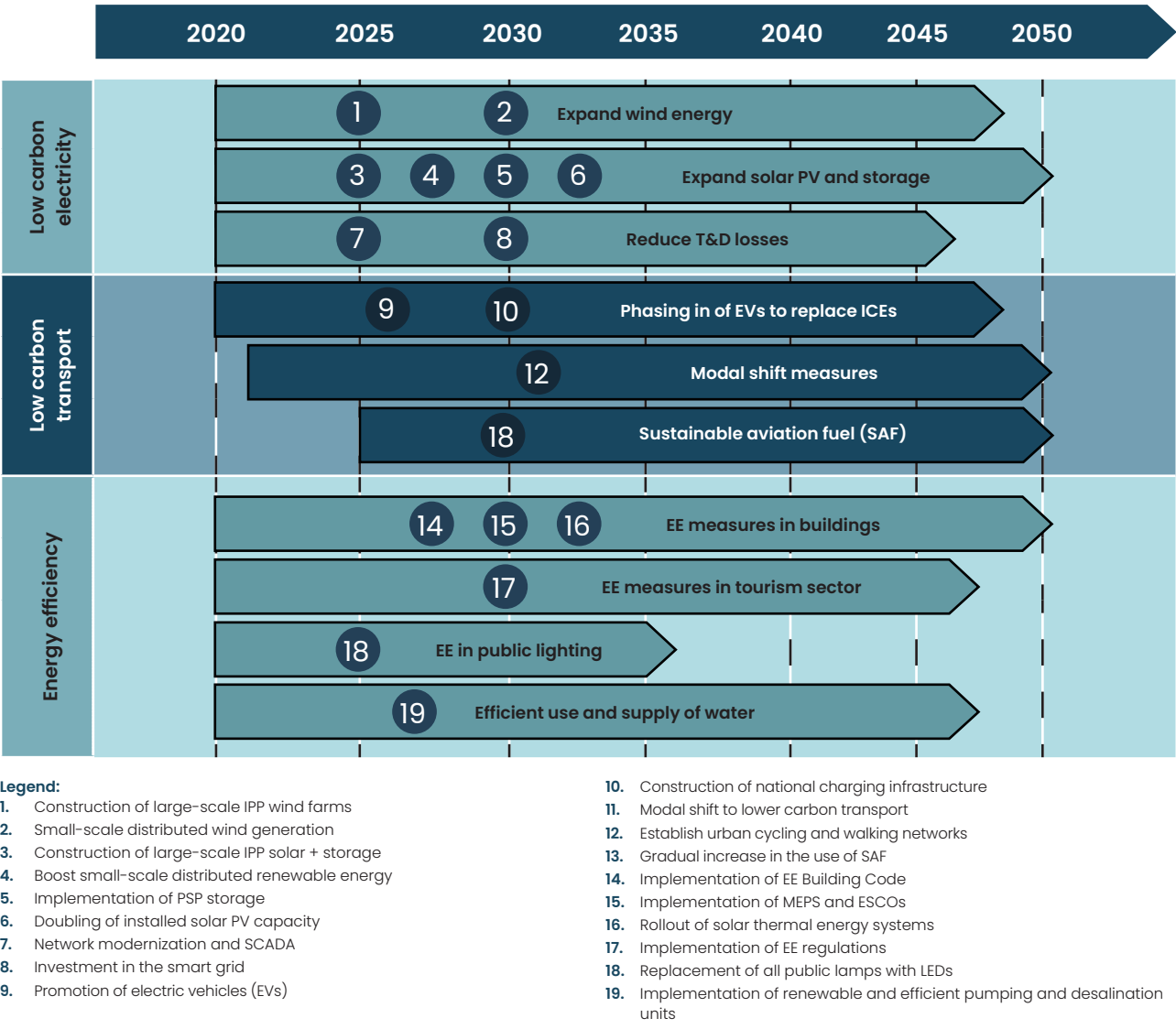


Figura 8-1: Roadmap for Energy

Expansion of wind energy

The focus on expanding renewable energy production is one of the main components of Cabo Verde’s strategy to reduce national GHG emissions, but also to reduce energy dependence and guarantee energy security, in line with the main documents that guide the country’s energy and environmental policy. Wind energy is one of the main alternatives to imported fossil fuels for achieving decarbonisation goals, taking advantage of the country’s enormous wind potential. The Electricity Sector Master Plan 2018–2040 (GoCV, 2019) estimates that around 90 MW of wind farms will be installed across the country by 2030, an investment that could amount to 125 million

euros. This investment will be made progressively, depending on consumption needs and the ability to mobilise resources. According to the National Directorate of Industry, Commerce and Energy (DNICE), around 13.5 MW of wind power will be installed on the island of Santiago in 2024, through an independent power producer (IPP). Several projects for different levels of use are expected to be implemented by 2050, with capacities ranging from 1 MW to 20 MW in different parts of the country. LT-LEDS foresees a continuous and growing commitment to investing in wind energy until 2050, making the most of the abundant wind resources available in the archipelago.

Expansion of photovoltaic (PV) solar energy

As part of the energy transition strategy, the Cabo Verdean government, through the National Programme for Energy Sustainability (PNSE), has made a commitment to ensure more efficient use of endogenous resources by significantly increasing the share of renewable energy production in the electricity system, both on a small scale and on the scale of photovoltaic (PV) units connected to the grid. The contribution of small-scale distributed generation has been very important in achieving this result, surpassing the objectives set by the Master Plan. Private residential, agricultural and hotel projects have greatly contributed to this success, taking advantage of the incentive measures made available to encourage and promote renewable energies. Another example is renewable solar photovoltaic installations in public institutions such as educational centres, health centres, hospitals, etc. Distributed energy production has thus proved to be an effective approach, and it is expected that by 2050 most public buildings will be supported by renewable energy for self-consumption and will increase their renewable penetration rates, namely through hybrid systems combining PV with wind, biomass and mini-hydro.

The national objectives of achieving 30% of energy production through renewable energies by 2025 and 50% by 2030, as set out in the Master Plan, has led to an accelerated commitment to electricity production based on solar photovoltaics, with plans to install around 160 MW in facilities by 2030. The Masterplan identified a long-term potential of 315 MW. In addition to the two installations currently in operation on Santiago and Sal, several solar power plants are already under construction on almost all the islands, with a total installed capacity of around 30 MW, which should come into operation by 2025, doubling by 2028. As is the case with wind production, it is expected that this trend of building solar photovoltaic power plants, either through public concessions or IPPs, will gradually continue beyond 2040.

Increasing energy storage through batteries and pumped storage plants (PSP)

In order to provide reliable and secure electricity production, in addition to renewable energy technologies such as wind and solar photovoltaic, the government is also investing in strengthening domestic energy storage, through batteries and pumped storage plants (PSP). In addition to the solar photovoltaic production projects on the islands of Santo Antão, São Nicolau, Maio and Fogo, battery storage systems will be implemented with an installed capacity of 4.4 MW. But the government's ambition is that, by 2027, battery storage capacity, together with solar and wind-based production, will be significantly extended to around 55 MW.

The first 20 MW PSP will be built in 2025 on the island of Santiago and will be operational in 2028, allowing a reduction in the import and use of fossil fuels of around 22%. The PSP project is part of the National Energy Sustainability Plan (PNSE) under Strategic Infrastructures and is a key investment indicated in the Electricity Sector Master Plan 2018-2040, requiring funding of around 60 million euros. Based on these projects and experiences, additional investments in long-term energy storage will be needed to achieve LT-LEDS by 2050, based on the long-term demand growth rates forecast in the Master Plan.

Reducing transport and distribution losses (T&D)

Transport accounted for 25% of national greenhouse gas emissions in 2019, second only to fossil fuel electricity generation. Therefore, the national strategy aims to gradually replace the current fleet of vehicles equipped with thermal engines (petrol or diesel) with EVs with no GHG emissions by 2050. This strategic vision for the country, in terms of increasing electric mobility, is set out in the Electric Mobility Policy Charter (CPME), with intermediate objectives of building a nationwide re-charging infrastructure and making the public administration fleet 100% electric by 2030.

With these goals in mind, the Programme to Promote Electric Mobility in Cabo Verde (ProMEC), with funding of around 7.2 million euros starting in 2020 and ending in 2025, among other incentives, aims to support the purchase of 600 EVs and 100 charging stations, as well as the development of a legal and regulatory framework for EVs. The impacts are already visible in terms of demand for support and requests for incentives. The projected growth in transport emissions in the BAU scenario highlights the importance of these policies and the need to continue replacing conventional vehicles with new EVs in order to move towards decarbonisation by 2050, based on the Intermediate Objectives stipulated in the CPME, the Electric Mobility Action Plan (PAME) and the NDCs.

Switching to lower carbon transport

Electric mobility has also been promoted through incentives for the purchase of urban passenger transport and electric school transport. The long-term vision defined in the long-term strategy takes into account the measures already proposed in the NDC aimed at creating incentives for a modal shift from private vehicles to Non-Motorised Transport (NMT) and public transport. These measures include:

- Reducing the need for high-carbon mobility through urban planning and digitalisation;
- Creating safe and attractive urban networks for cycling and walking; and
- Electrification of the vehicle fleet, prioritising public, public transport, heavy goods vehicles, service vehicles and commercial vehicles over private vehicles.

The implementation of these and other measures will have an important impact on mitigating the impact of private transport and reducing fossil fuel imports, as well as improving urban air quality and the negative impacts of traffic and congestion on public health and productivity.

The NDC recommends the development of a policy framework and a national action plan with the aim of reducing GHG emissions in national maritime transport (passenger, cargo and tourist ships, ports, fuel storage, supply chains, logistics). Electric mobility in the fisheries sector is also

a short- and medium-term priority for the country, which has just benefited from a GEF-funded project on electric mobility in artisanal fisheries from 2024-2028. In the long term, LT-LEDS has identified the need for a progressive commitment to sustainable aviation fuels (SAF). Cabo Verde therefore proposes implementing an increase in the mix of imported SAF with conventional aviation paraffin, in line with the European Union’s Objectives, from 5% in 2030 to around 63% in 2050. This would greatly reduce the use of aviation paraffin and the associated GHG emissions.

Application of the Energy Efficiency in Buildings Code (CEEE)

As reflected in the national strategic plans, energy efficiency is an important component for the energy transition and for achieving the country’s decarbonisation goal by 2050. Cabo Verde has the potential to reduce overall electricity consumption by around 15%, as well as reducing total electricity losses in the network to around 10% by 2030. To achieve this goal, several initiatives are being implemented, including the Energy Efficiency in Buildings Code (CEEE), the National Labelling and Requirements System for Electrical Equipment (SNEREE), the Minimum Energy Performance Standards (MEPS) and the creation of energy service companies (ESCOs). The commitment to training professionals and developing regulations is crucial to the success of these measures and, according to the PEDS, they are already being operationalised. As part of the next steps towards achieving the objectives, the PEDS also sets out the following important initiatives:

- Energy efficiency in public lighting (replacement of public lighting with LED lamps)
- Promoting energy efficiency in household appliances and buildings
- Energy efficiency in public administration
- Sustainable Schools Project
- Energy efficiency in industry and tourism
- Mass introduction of solar thermal energy systems and
- Incremental growth in access to clean cooking technologies.

In public lighting, the government and the Cabo Verde Electricity Distribution Company (EDEC), which provides public services (formerly ELECTRA), have launched a project to gradually replace all public lighting bulbs with LED bulbs in all municipalities, which represents a saving of 60% compared to current consumption. The Intensive Energy Consumers Scheme (RCIE), created with the aim of promoting energy efficiency and local energy production on the premises of final consumers who have significant energy consumption in their final consumption structure, is due to come into operation in 2024. LT-LEDS believes that all these measures will be implemented and extended beyond 2040. This is because Cabo Verde firmly believes that reducing energy consumption, including electricity, water and fuels, improves operational efficiency, contributes to the overall sustainability of the tourism sector, raises awareness of the importance of energy efficiency and sustainable practices and allows for seasonal adjustments and responses to changing environmental conditions, contributing to long-term adaptation.

8.4 Industrial waste and processes

8.4.1 Sustainable waste management

The development of a comprehensive and sustainable waste management policy in Cabo Verde is integrated into the country’s various environmental strategy documents and government policies. The legal and regulatory framework gives clear indications as to the direction to take in order to improve the sustainability of waste management, guaranteeing compliance with the country’s development objectives, as well as integrating sustainability principles into all programmes and avoiding the loss of natural resources.

The National Strategic Waste Management Plan (PENGeR) represents an important milestone for waste management in the country. It was drawn up not only from the perspective of sustainable waste management, but also incorporates the theme of preserving public health and the circular economy, in line with the objectives of the UNFCCC, the Durban Platform, the Barbados Programme of Action for the Sustainable Development of Small Island Developing States and the country’s development oriented towards the principles set out in the UN SDGs and the post-2015 development agenda. PENGeR runs from 2015 to 2030 and is particularly centred on the generation, management and prevention of municipal waste, but also addresses other types of waste that are important at national level, such as those generated by the industrial, commercial and services and healthcare sectors (hospital waste).

PENGeR is strongly based on the waste management hierarchy, as well as the management principles established in Cabo Verde’s General Waste Law ²⁵, which states that all waste management must be planned, implemented and executed according to the following hierarchy:

- Prevention and reduction
- Preparation for reuse
- Recycling
- Other types of recovery, including energy recovery and
- Elimination.

Waste management in Cabo Verde must comply with the following principles

- **Planning and management principles**, designed to promote the articulation of environmental policies through different sectoral policies and instruments, and to ensure, through regulation and inspection, unity of action for the best service.
- **Socio-economic principles**, which seek to promote economic rationality, the valorisation of waste as a resource, social equity and subsidiarity between central and local government.
- **Principles of information and knowledge**, with a view to developing a credible and transparent system of access to information, promoting the participation of all interested parties.
- **Environmental principles**, in order to guarantee the quality of the environment and the protection of public health through the minimisation of the use of non-renewable or non-valuable resources, prevention at source and the combined application of the best available technologies

25 Decree-Law 56/2015

PENGeR establishes specific objectives that translate into a waste prevention, production and management regime in general, showing coherence and uniformity in the national waste strategy. These objectives include the following:

- Procedures and systems with a high degree of efficiency and effectiveness and an optimised cost/benefit ratio
- Infrastructures that guarantee quality of service and environmental protection
- Eco-efficiency and environmental sustainability in the waste sector
- Economic and financial sustainability of the waste management system
- Waste valorisation
- Guaranteed access to information
- Encourage public participation
- Promoting knowledge
- Promote education, training and qualification of human resources
- Respect for the state’s obligations and the socio-economic principles associated with them
- Convergence in national waste management policy
- Liberalisation and regulation of the waste sector
- Ensuring effective competition in the waste market.

The government also intends to improve institutional and technical governance capacities in the waste sector by collecting and organising relevant information on the sector, designing an inter-municipal waste management system and, finally, empowering the public sector to involve private sector operators and technology providers.

The General Waste Law assigns responsibility for waste management to all players and stakeholders in the waste sector, from production to final destination. Table 8-1 summarises the responsibilities of each stakeholder.

Table 8-1: Roles and responsibilities in sustainable waste management	
Stakeholders	Roles and responsibilities
Government	The National Waste Authority (ANAS) ensures and monitors the implementation of policies and strategies for the waste sector, in particular with regard to • Planning, including mobilising partners and funding; • Licensing; • Issuing technical standards applicable to waste management operations; and • Standardisation of licensing procedures and international waste management requirements Implementation and management of the national waste information system (SIREs)
Municipalities	The municipalities are responsible for • Preparation and implementation of municipal and/or inter-municipal waste management plans; • Guarantee the principles of equivalence and proximity established by law; • Ensuring the sustainability of the systems, in particular through a framework of charges; • Supervising the correct application of the management systems, if they are concessioned; • Promote public participation; and • Promoting education, training, awareness-raising and information campaigns.

Stakeholders	Roles and responsibilities
Organisations	Organisations are responsible for: • Compliance with the objectives and public service obligations set by the National Waste Authority; • Ensure that waste management operations are carried out in appropriate facilities, using the most appropriate technology and methods to protect the environment and public health; • Follow the principles of eco-design and adopt measures to produce products with a lower environmental impact; and • Take financial responsibility for managing their waste
Civil society	Citizens are responsible for: • Adoption of waste prevention behaviours; • Adoption of practices that favour the reuse and recycling of waste, namely separation at source; and • Payment of the fees due to help sustain the national waste system

Source: Based on the General Waste Law (Decree-Law 56/2015)

Unsustainable waste management practices are responsible for a growing source of GHG emissions in Cabo Verde. In order to reduce emissions in the waste sector, PENGeR sets the following specific objectives:

- Closing rubbish dumps and improving the environment
- Development of treatment and final disposal infrastructures
- Improving collection systems and implementing waste recovery

Some important actions envisaged in the PENGeR are already being implemented, namely the drafting of municipal operational waste management plans, the drafting of a national hospital waste management plan, the closure of rubbish dumps, the operation of the Santiago waste treatment centre and complementary regulations for the sector, in particular plastics regulations and the tariff regime.

Cabo Verde’s LT-LEDS is based on these objectives and actions to outline a long-term vision for sustainable waste management, consistent with the country’s transition to net zero.

Figure 8 2 below shows a summary of the timetable for the development and implementation of each of the actions proposed to implement LT-LEDS in the waste sector. These actions complement the actions already planned and reinforce the strategies for mobilising funding for the waste sector at national level, with an emphasis on recycling, composting and the development of a biogas production system. In addition to reducing GHG emissions, these actions are aligned with PENGeR’s objective of increasing the efficiency of collection systems, reducing fossil fuel consumption by 15% by 2030.

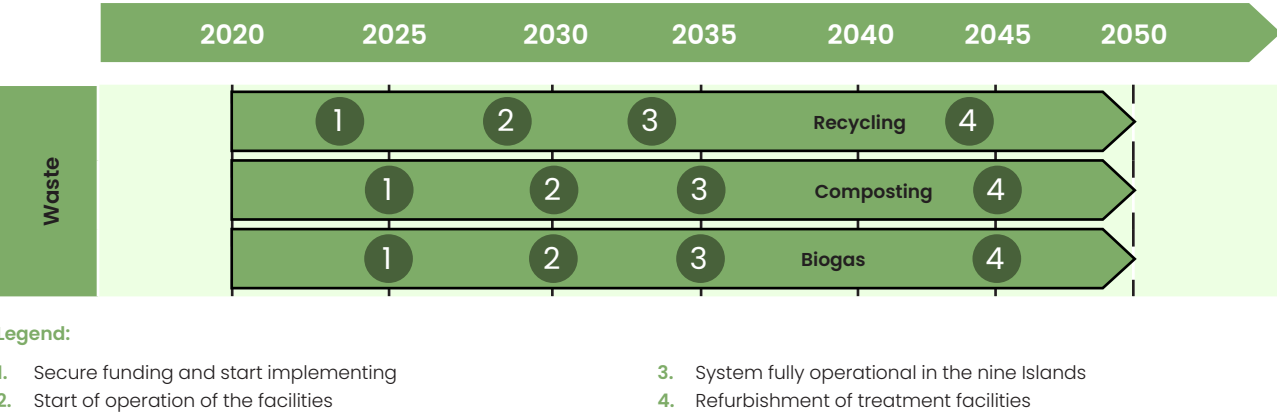


Figura 8-2: Roadmap for Waste

Each of the main mitigation measures and activities is described below.

Recycling

The policy measures in this area provide for the implementation of a selective collection system, as well as the construction of at least one sorting centre on each island, so that mainly plastic, paper/cardboard, glass and metal fractions can be sorted and prepared to be sent for recycling. This will create the necessary conditions for 60% of this waste to be sent for recycling/recovery by 2030. The Operational Plans for Urban Waste Management repeated this objective, extending its time horizon to 2035. Thus, at least one sorting, repair and recycling plant will be operational on each island by 2032.

Composting

Composting is a recovery process which, through physical-chemical decomposition followed by stabilisation of the biodegradable organic fraction, transforms the organic fraction of waste into organic compost. This process allows waste to be recovered by reducing its size and volume, obtaining a final material, compost, which can be used as a fertiliser or for soil correction. This process is central to the PENGeR guidelines and the Operational Plans for Urban Waste Management, whose implementation target is set for 2035. It is assumed that a 2nd generation composting unit will be built on each island, without neglecting the other options for implementing domestic composters, also envisaged within the scope of multi-municipal planning. Composting is a key mitigation action also related to the agricultural sector, which is why it is described in more detail under the Agriculture and LULUCF measures (see below).

Biogas development

Biogas is a clean, domestically produced renewable energy source that can be used to generate electricity and heat. LT-LEDS aims to produce biogas from animal manure. In addition to the benefits in terms of GHG emissions, the production of biogas from animal manure also has economic advantages for rural producers and can contribute to the production of fertilisers that can be applied in agriculture. This action is expected to be carried out in close partnership with the Directorate-General for Agriculture, Forestry and Livestock (DGASP). In parallel with the above-mentioned solutions, a biogas drainage network is to be implemented in landfill sites, with a view to

containing GHG emissions associated with the final disposal of waste, by installing biogas utilisation systems in 30% of the country’s landfill sites developed by 2030 and burning methane (landfill gas) in all landfill sites where there is no energy utilisation, as recommended in PENGeR.

8.4.2 Industrial processes

Replacement of fluorinated gases (F-gases)

The main source of emissions from industrial processes in Cabo Verde are fluorinated gases (or F-gases) which are currently imported for refrigeration, stationary air conditioning and mobile air conditioning. Recognising the need to phase out the use of these gases, Cabo Verde signed the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (UN, 2016) in 2021. The LT-LEDS includes a gradual reduction in imports of fluorinated gases to comply with the Kigali amendment and their replacement with alternative substances with a much lower GWP. It is assumed that, similar to the commitments made by European countries under the Kigali amendment, these imports can be reduced by up to 80% by 2030. In order to prepare the organisations affected, the government will raise awareness among the industrial sectors and commercial organisations affected regarding the substitution of fluorinated gases prior to a gradual reduction in imports in accordance with the Kigali amendment.

8.5 Agriculture and LULUCF

Figure 8-3 below shows a roadmap of actions for agriculture and LULUCF. The actions needed for implementation are described below.

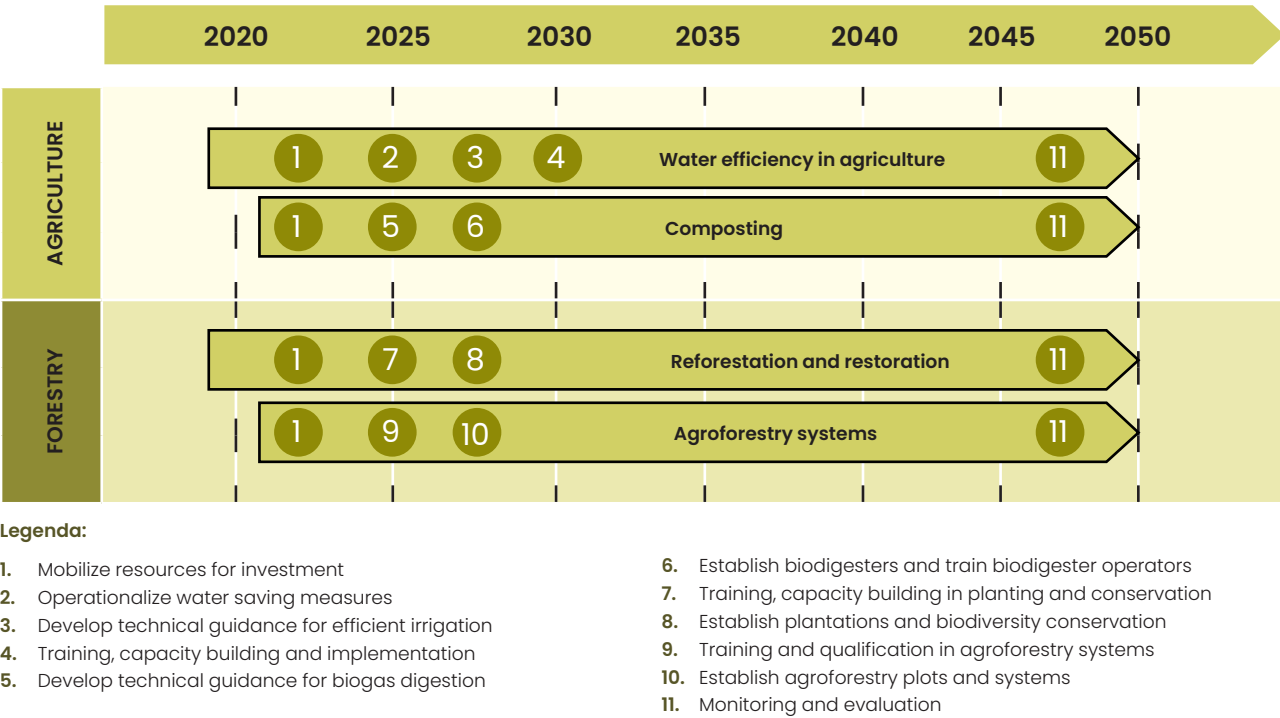


Figura 8-3: Roadmap for Agriculture and LULUCF

8.5.1 Agriculture

Composting

Composting is an important mitigation measure for both the waste sector (see above) and the agricultural sector. It represents a sustainable solution for controlling and reusing solid household waste, which in Cabo Verde is mainly organic. Waste can be kitchen, animal or garden waste. In Cabo Verdean conditions, composting projects can be carried out on a municipal or domestic scale and, in some cases, can be associated with the production of gas used for energy production. From an agricultural point of view, the main product is organic fertiliser, which is used to replace inorganic fertilisers and thus reduce the GHG emissions resulting from their use.

As described in the waste sector (see above), by 2030 PENGeR intends to install a biogas landfill for energy production on Santiago and build eight more biogas plants on the other islands. The dry matter resulting from biogas production is used to produce organic compost. In addition to these plants at municipal level, small biodigesters are to be installed at household level, where possible. The aim is to establish composting plants with a total capacity of up to 2,000 tonnes per year for processing biowaste by 2030. As part of the long-term strategy, this capacity could be increased to 10,000 tonnes per year around 2036 and maintained until 2050, limited by the availability of organic matter.

Composting has the added value of producing clean energy, improving the aesthetics and health of municipalities by reusing urban waste and reducing the workload of rural families. Implementing composting projects will require investments to be secured through climate finance. It will also be necessary to produce guidelines and technical manuals to guide the training of municipal agents and extension services to help families in the production and use of compost in agriculture.

Water efficiency in agriculture

Reducing the energy needed to desalinate, pump and transport water in the agricultural sector can be achieved through the use of more efficient irrigation systems, such as drip irrigation and sprinklers. As well as reducing the use of fossil fuels and associated greenhouse gas emissions, saving water will bring additional benefits for farmers and improve the quality of natural ecosystems.

Actions to realise this measure have already begun, with the creation of “Água de Rega”, which signed a concession with the Cabo Verdean government for the management, exploitation and distribution of water resources for irrigation. In 2022, it began the first project to modernise 360 ha of irrigated agriculture with efficient irrigation systems in Cabo Verde, of the existing 3,478 ha with potential for irrigation by 2030. The long-term goal is to use drip irrigation on the entire area with irrigation potential by 2050.

The additional benefits of this measure include reducing electricity consumption for pumping water and reducing the costs of pumping, storing and channelling water for irrigation, thus ensuring sustainable economic development and the practice of sustainable agriculture. The implementation of this measure will benefit private sector investments and small family producers.

Training will be needed for extension services and farmers in the installation and maintenance of efficient irrigation systems.

Implementation of renewable and energy-efficient pumping and desalination units

The adoption of measures to improve energy efficiency in water use and supply, including energy-efficient and renewable pumping and desalination units, is also an essential component of the long-term vision to reduce emissions from energy use. As well as reducing energy production from fossil fuels, such measures help to conserve water resources and reduce water stress, as well as increasing the resilience of urban and rural communities to drought and water scarcity. A good example is the Agricultural Water Mobilisation Programme on the island of Santiago, funded by the Hungarian government, which aims to finance water mobilisation projects through desalination and water wells with solar systems totalling 3.6 MW. The LT-LEDS plans to install renewable, energy-efficient pumping and desalination plants on all the islands of the archipelago over the next few years, making water available at any time and fuelled by clean, locally produced energy.

8.5.2 LULUCF

Reforestation and restoration

Reforestation and restoration of degraded ecosystems consists of planting fast-growing trees adapted to arid and semi-arid areas, with an emphasis on native species, as a mechanism for conserving degraded areas, as well as capturing and conserving carbon reserves.

The plantations will be carried out in monoculture and mixed system models and will store carbon through the growth of trees and shrubs established for environmental protection and firewood production. By 2030, this measure aims for a total of 7,000 hectares (ha), of which 4,700 ha will be plantations of various species of trees and shrubs and 2,300 ha are earmarked for the conservation of native species. Given Cabo Verde’s limited geographical area, the potential reforested area is considered very limited, with an increase to a maximum of 7,100 ha by 2035 and then remaining constant under a defined management regime until 2050. Trees and shrubs suited to national climatic conditions have an estimated carbon storage potential of between 30–65 tonnes/ha. As well as storing carbon, the plantations can be used to produce firewood with a potential of 5 tonnes/ha under a sustainable harvest management regime.

Cabo Verde’s Reforestation Policy was drawn up in 2021 and indicates the potential species applicable to the national territory. These include *Prosopis juliflora*, *Parkinsonia aculeata* and various species of the *Acacia* genus. *Prosopis juliflora*, despite being identified as an invasive species, is the species most used to combat desertification. The species represents around 83% of the 43,400 ha of forest estimated for Cabo Verde, which suggests that this species should be used with care. To combat desertification, Cabo Verde was the first African country, and the second in the world, to sign and ratify the United Nations Convention to Combat Desertification (UNCCD). In 2000, the government approved its National Action Programme to Combat Desertification.

The Cabo Verde Reforestation Project (REFLOR-CV) laid the foundations for Cabo Verde’s national forestry policy. The project began planting around 1,000 ha as part of the national reforestation

objectives. Since then, a project financed by the Global Environment Facility (GEF) has been approved as part of the national goal of achieving 3,000 ha of reforestation. This measure will restore biodiversity in reforested and restored areas and guarantee access to the ecosystem services provided by these areas, such as non-timber forest products, soil fertility conservation and recovery, water regulation, soil conservation and erosion reduction. Pilot reforestation projects have already been set up, which could be extended to fulfil the long-term goals.

Creating agroforestry systems

The establishment of agroforestry systems is a fundamental mechanism for conserving carbon reserves, conserving soils and establishing sustainable cultivation models. Agroforestry stores carbon through the growth of trees and shrubs created for environmental protection and fruit production. Additional benefits of agroforestry systems include reclamation, soil conservation and slope stabilisation, the promotion of gender integration, food diversification and sources of income for agroforestry practitioners. One of the objectives of REFLOR -CV, finalised in 2022, was to promote agroforestry systems to create sustainability in agricultural systems, as well as to encourage gender integration and equality.

The target set is 3,000 ha by 2030, which could be expanded to 3,250 ha by 2035 and maintained until 2050. The area will be covered by various agroforestry systems, with different combinations of spatial and temporal arrangements, using fruit species adapted to arid and semi-arid zones such as carambola, cashew, banana, tamarind, papaya, avocado, mango and avocado trees, following specific recommendations from the National Institute for Agricultural Research and Development (INIDA). A list of fruit species with the greatest potential for Cabo Verde has been established, but the technical measures for growing and processing the fruit still need to be tested and implemented.



09.

Financing the Transition

9.1 The need to mobilise funding for climate action

The role of finance is fundamental to global efforts to combat climate change. Financing climate action is necessary for climate change mitigation, as large-scale investments are needed to significantly reduce emissions. Significant upfront and ongoing costs will be required to implement clean technologies, new sustainable practices and a shift away from fossil fuel dependency. Financing climate action is equally important for adaptation, as significant financial resources are needed to adapt to adverse effects and reduce the impacts of a changing climate (UNFCCC, 2024).

Financing plays a crucial role in the transition to a low-carbon economy that is resilient to climate change. The transition to sustainable practices and climate change mitigation in the context of Small Island Developing States (SIDS) requires significant investments in clean energy, green infrastructure and adaptation measures. Without effective targeting of finance, climate goals will not be achieved. The Paris Agreement emphasises that financial flows must be consistent with a trajectory that leads to low GHG emissions and climate-resilient development ²⁶.

Although the needs are enormous in the context of high vulnerability and limited resources, mobilising climate finance remains a challenge for SIDS countries, including Cabo Verde. In fact, SIDS countries have limited eligibility when it comes to receiving conceptual funding and Official Development Assistance (ODA) (UN-OHRLS, 2020). The situation is exacerbated in the context of Cabo Verde, as the country achieved lower middle income country (LMIC) status in 2007 and was removed from the list of least developed countries (LDCs) in 2018 (World Bank, 2019). Together with the worsening impacts of climate change, this situation has only exacerbated the country's vulnerability. The Accelerated Modalities of Action for Small Island Developing States (SAMOA Pathway) recognises the special case of SIDS for sustainable development. It calls for the expansion of criteria and measures to define ODA, broadening eligibility requirements for conceptual funding and multidimensional assessments, and recognising the limitations of development assessments based on income alone (UN SAMOA, 2014). Therefore, the country needs a paradigm shift in mobilising national and international financial support to implement the mitigation and adaptation measures identified in this long-term strategy.

Despite efforts in recent years to improve the governance framework for mobilising climate finance, current funding flows fall far short of what will be needed to achieve the deep emission reductions compatible with a low-carbon pathway and to promote a sustainable economy resilient to climate change. Access to international climate finance and the opportunities emerging from carbon markets, as well as the mobilisation of national and regional private investment for mitigation and adaptation actions, will be crucial and require the resolution of a number of systematic obstacles and current challenges. In order to secure financial support from the international community, it is also necessary to monitor and communicate financial flows to build trust and accountability with regard to climate finance commitments and to track trends and progress in climate-related investments. This means creating systems and structures that can increase access to climate finance in Cabo Verde. A strategic response to mobilise climate finance will therefore be necessary if the country is to achieve the ambitious targets set out in the updated NDC, the NAP and the country's vision for a low-carbon, climate-resilient economy by 2050 as set out in this document.

²⁶ Paris Agreement. Article 2 (UNFCCC, 2015)

This section outlines a strategic framework for scaling up climate finance to help achieve the ambitions set out in this strategy. It describes the long-term financing requirements and actions consistent with achieving the low-carbon transition and long-term climate resilient development, whilst also being aligned with short-term planning aimed at mobilising finance for the implementation of Cabo Verde's NDC and NAP. It begins by assessing the country's climate finance flows to date and comparing them with the estimated levels needed to implement the long-term strategy. This is followed by a brief overview of global trends and prospects in international climate finance and the opportunities offered for Cabo Verde's climate change priorities. Finally, a framework of strategic actions and priorities is presented to overcome the barriers identified and ensure the success and expansion of the financial flows needed to ensure the low-carbon transition.

9.2 Climate finance flows to date

Cabo Verde does not yet have an official central source for reporting national and international climate finance flows. However, the OECD-DAC Climate-Related Development Finance (CRDF) database has data on climate finance flows for Cabo Verde until 2021. According to this source, from 2012 to 2021, a total financing flow of around USD 514 million is estimated, including co-financing. Bilateral financing accounts for most of the funding, with the main financiers being Japan, Portugal, USA, France, the EU and Luxembourg through the Luxembourg International Climate Finance (ICF). Multilateral finance sources include the World Bank and the African Development Bank (AfDB) through the Africa Climate Change Fund (ACCF).

Despite the efforts made, the scale of the gap between existing flows and the estimated levels needed to implement the mitigation measures in this strategy is very large. Of the total mitigation financing needs estimated at around 3.5 billion US dollars for 2020–2050, less than 50 million US dollars have been registered from 2020 to date. The size of the gap is particularly noticeable in the renewable energy and electric mobility sector, where mitigation projects typically require large sums of upfront investments to fund infrastructure and new equipment and technologies (Figure 9-1).

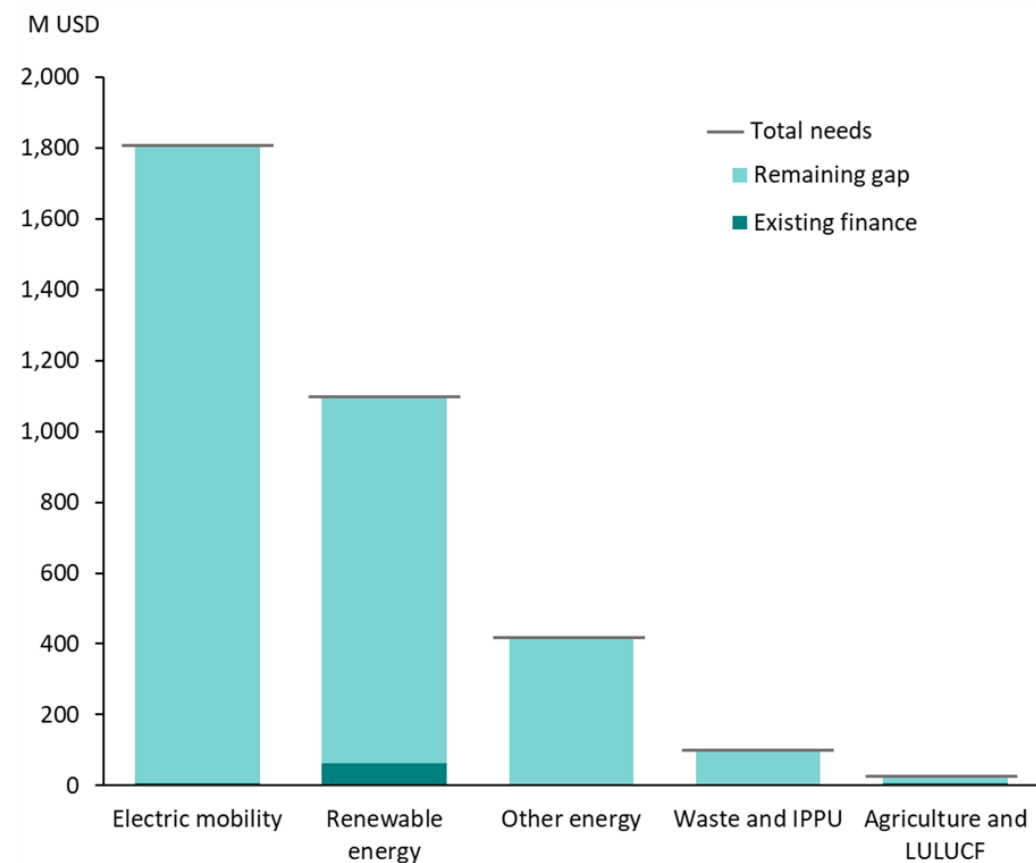


Figure 9-1: Estimated mitigation and deficit financing needs to 2050 by sector

9.3 Covering the funding gap

The scale of the gap between current climate finance flows and what will be needed to achieve the transition to a low-carbon economy is clear. Aligning climate interventions with global financial trends will facilitate more successful mobilisation of climate finance for Cabo Verde. It is therefore important to understand where global climate finance is being directed, the climate financiers interested in investing in SIDS, the financing mechanisms that target the specific needs and challenges of SIDS nations and in which sectors, as well as the current prospects for climate finance emerging from the international climate policy framework.

9.3.1 Increasing international climate finance

The need to increase international funding for climate action remains a critical issue in the international climate policy framework, especially the need to increase funding levels for least developing countries, where financial flows continue to be much lower than in developed and emerging economies. The Paris Agreement reiterated the commitments previously made by developed countries to channel at least 100 billion dollars of annual climate action funding to developing countries by 2020. The Glasgow Climate Pact (COP26) noted that this target was not met and reaffirms the international community’s commitment to meeting it and subsequently increasing it.

The Climate Change Financing Implementation Plan, published in the run-up to Glasgow, sets out how developed countries intend to meet the 100-billion-dollar target. The Plan also states that all developed countries must step up efforts to meet the target and defines ten key actions to improve the scale and effectiveness of climate finance flows. In particular, the Plan stressed that the current scale of private finance mobilisation is not what is needed, demonstrating that more efforts are needed to improve the effectiveness of mobilising private finance from public interventions.

While COP28 in Dubai focused mainly on the historic global stocktake and the establishment of the Global Adaptation Goal, COP29, which will be held in Baku, Azerbaijan, in November 2024, aims to focus on financing climate action. According to paragraph 53 of Decision 1/CP.21, parties decided to deliberate on a new collective quantified goal (NCQG) to raise the level of climate finance above the current annual target of 100 billion dollars. Parties are expected to agree on a new target at COP29 by the end of 2024.

As well as reaffirming the commitment to increasing the flows of climate finance, the potential role of international carbon markets in boosting mitigation efforts has become clearer with the finalisation of the Paris Agreement Rulebook, on the use of international carbon trading. Although many issues remain to be resolved, this provides the opportunity to generate additional financial flows through carbon markets: financing for climate action could be secured through the use of a Sustainable Development Mechanism, as well as through non-market-based approaches, such as results-based financing (RBF), to achieve low-carbon outcomes ²⁷. Debates at international level, currently ongoing, will shed more light on the potentially important role of Article 6 in promoting new investments in the transition to a low-carbon economy.

9.3.2 Sources of climate finance

Small Island Developing States (SIDS) face unique challenges related to climate change, including rising sea levels, extreme weather events and other environmental threats. To address these challenges, various sources of climate finance are available to support mitigation and adaptation efforts. In fact, the realisation of this LT-LEDS will need to draw on all available sources of national and international funding.

This section summarises the different types of climate finance for the implementation of the mitigation measures in this strategy (as well as their adaptation co-benefits), including the identification of specific funds and sources in key sectors and identified actions. Given the strategic importance of a national climate fund for financing national climate action and leveraging private sector investment, along with the ongoing challenges of national debt repayments (described below), special focus is given to the role of the new Climate and Environment Fund (FCA) that the Government of Cabo Verde is establishing and the opportunity offered by the use of debt-for-climate (DFC) mechanisms.

27 Low-carbon results refer to the benefits that can be obtained by reducing greenhouse gas (GHG) emissions. These benefits can be environmental, economic and social.

The main sources of funding for climate action are as follows:

- **Multilateral sources:** Multilateral financial institutions and funds, for example the World Bank and the African Development Bank (AfDB).
- **Bilateral sources:** Funding for climate action from countries that co-operate with Cabo Verde, such as Luxembourg, France, USA, Portugal, Spain, Hungary, EU, etc.
- **Climate funds under the UNFCCC:** including the Green Climate Fund (GCF), the Special Climate Change Fund (SCCF), the Adaptation Fund (AF) and the Global Environment Facility (GEF).
- **National sources:** Public and private sources, including national budgets and private sector investments.
- **Other sources:** Other sources of funding that are specialised for mitigation and that combine various donors such as MAF²⁸ etc., and philanthropic funds and resources that foundations make available in support of climate action.

Sources of funding are provided through a number of different instruments and mechanisms. These include the Official Development Assistance (ODA) currently provided to Cabo Verde through a series of climate funds and projects through bilateral co-operation with developed countries, the public debt-for-climate swap mechanism, and other regional and global mechanisms.

In fact, Cabo Verde has been a pioneer in the region in a number of climate finance instruments, such as blended finance loans, ESG bonds, blue bonds, sustainable bonds, climate debt swaps, and is considering carbon credit monetisation structures (ADB, 2023). These sources and instruments should be explored in the financing of this LT-LEDS.

9.4 Obstacles and challenges

Implementing the measures outlined in this strategy will require mobilising large amounts of funding across a wide range of sectors. However, as described above, climate finance has so far been very modest in Cabo Verde. The economic analysis presented in this strategy shows how most of the mitigation actions identified have adaptation and sustainable development co-benefits. These include additional job creation, reduced dependence on imported fossil fuels, new revenue streams for rural communities and increased industrial efficiency. The socio-economic case for funding low-carbon interventions such as renewable energies, clean transport and reforestation is therefore clear. The main challenge is therefore how to deal with the high initial cost of these investments.

Overcoming this central challenge will require rigorous efforts from all stakeholders. In line with the commitments made under the Paris Agreement and the Glasgow Climate Pact, developed countries will increase funding flows for climate action through multilateral and bilateral sources. The private sector also has a key role to play in providing additional capital and ongoing financing, provided the right incentives and financial instruments are put in place to overcome risks and create bankable and sustainable projects. Finally, the government has a key role to play in creating the right framework to successfully access international finance and mobilise private investment for low-carbon technologies and projects.

28 Mitigation Action Facility

Mobilising climate finance to the necessary levels of scale will require a joint approach in which all actors play their part in ensuring that climate finance opportunities are successfully accessed and directed towards Cabo Verde’s climate change priorities.

As part of framing a strategic response to this challenge, it is important to understand why Cabo Verde has not been successful in attracting more climate finance and to identify specific barriers and challenges. This will be important to secure short-term funding for a range of mitigation and adaptation projects from existing sources, but also to ensure that the right structures and processes are in place to benefit from emerging sources of long-term finance. Based on the most recent ADB report on Cabo Verde (ADB, 2023) and the IMF report on the country (IMF, 2024), and consultations with key stakeholders as part of the development of this strategy, the obstacles can be grouped according to (i) macroeconomic and development challenges; (ii) challenges in mobilising private finance; and (iii) challenges in accessing international climate finance. These are summarised in Figure 9-2 and discussed further below.

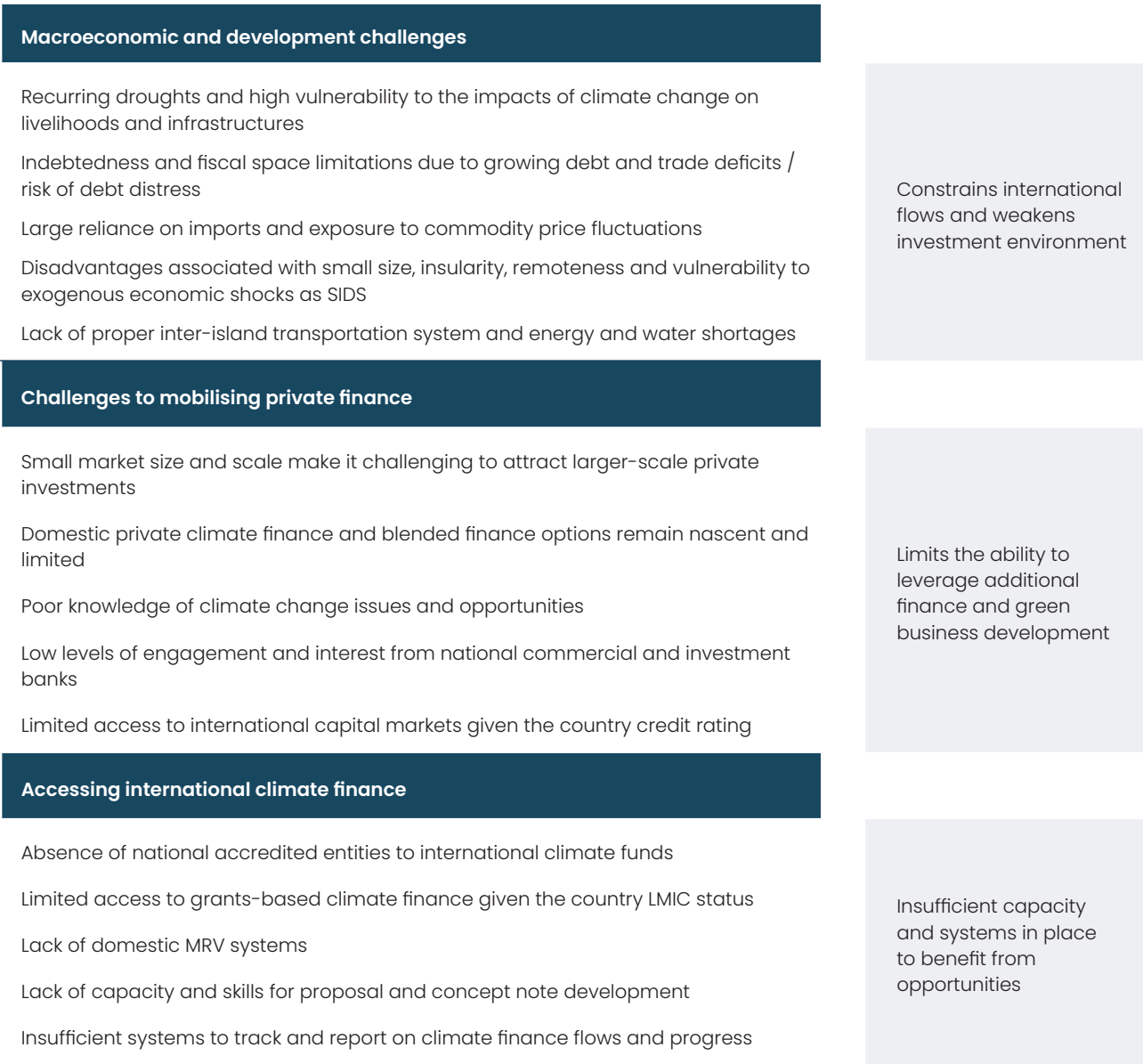


Figure 9-2: Summary of the main barriers and challenges to climate finance in Cabo Verde

9.4.1 Macroeconomic and development challenges

Cabo Verde's national circumstances have a major influence on its ability to access climate finance and make investments in mitigation and adaptation projects and programmes on the ground. These include a wide range of macroeconomic, geographical and development factors.

Cabo Verde, like many other SIDS, is highly vulnerable to the impacts of climate change, particularly in the form of recurrent droughts. The archipelago's vulnerability to climate change manifests itself in several areas, such as an increase in the frequency and intensity of floods and droughts, with losses in agriculture and a constant threat to livelihoods, biodiversity and the alteration of the hydrological regime, and an increase in the vectors of endemic diseases (IFRC, 2023).

Cabo Verde has suffered chronic droughts since the 1990s, which has led to people moving from the northern islands to the southern ones and settling in shallow valleys which are increasingly prone to flooding. Drought is a major challenge for the archipelago because its consequences affect many sectors of national life, including rural activities, agriculture and food security, as well as water resources. The most recent lack of rainfall between 2017 and 2022 seriously threatened food security in the country, forcing the government to announce an emergency plan to mitigate the effects of droughts.

Cabo Verde also faces challenges related to indebtedness and fiscal space limitations, mainly due to rising debt levels and trade deficits. These challenges in turn jeopardise the country's economic stability and development. The national economy is heavily dependent on imports of goods and services, which contributes to trade imbalances, leading to the accumulation of foreign debt. To cover trade deficits and finance development projects, the country resorts to foreign loans. In addition, Cabo Verde's small and open economy makes it vulnerable to external shocks, such as global economic downturns or fluctuations in commodity prices, including fossil fuels. The country's overall risk of over-indebtedness remains high, according to the latest joint WB and IMF debt sustainability analysis (DSA) (IMF, 2024). This situation severely limits the country's ability to mobilise funds on the international market and finance its low-carbon and resilient development in the face of the emerging impacts of climate change.

In addition, the country has a natural disadvantage associated with its small size, insularity, remoteness and vulnerability to exogenous economic shocks (ADB, 2014). The lack of an adequate inter-island transport system and the scarcity of energy and water also increase the sensitivity of local populations to climate change, natural disasters and extreme weather events.

9.4.2 Challenges to mobilising private funding

Mobilising private finance for adaptation and mitigation in Cabo Verde, as in many other SIDS countries, poses a number of challenges. These challenges are complex and interconnected, covering economic, financial, institutional and political issues. The main challenges include:

- the small size and scale of the market making it difficult to attract larger-scale private investment

- the fact that domestic private funding for climate action and blended finance options remain nascent
- insufficient knowledge of the issues and opportunities related to climate change
- low levels of involvement and interest from national commercial and investment banks; and
- limited access to international capital markets, given the country's credit rating.

The country's geographical location as an island nation off the coast of West Africa can pose logistical challenges and increase transport costs for the import/export of goods and services. This situation can affect the global competitiveness of the market.

Cabo Verde has a small economy that faces structural challenges in achieving scale. Indeed, the small population and limited size of the domestic market in Cabo Verde may not offer the same scale of opportunities for investors compared to larger economies. Investors often look for markets with a larger consumer base to maximise their returns.

According to the IMF, in 2019–20 an average of 21 million USD was invested in climate-related activities by the public sector, with a marginal contribution from the private sector (only around 2%) in Cabo Verde, which is very insufficient compared to the total amounts needed to achieve the goal of carbon neutrality by 2050. Therefore, given the limited budgetary space and the high level of public debt, the participation of the private sector must be improved. Strengthening the role of the private sector to boost investment requires reducing the main cross-cutting constraints: transport and logistics, energy and the business environment, including competition (IMF, 2023).

The World Bank's Country Economic Memorandum 2023 for Cabo Verde addresses firm-level productivity and recommends a menu of policies that, if implemented, would enable companies to upgrade their capacities, allow productive companies to grow and remove constraints to entry and exit. To achieve this goal, the Memorandum recommends the following:

- Reducing the misallocation of production factors by applying competition policy and eliminating the distortions associated with heavy regulation of product markets.
- Supporting the development of companies' capacities, targeting the most productive companies in terms of adopting technologies, innovation and strengthening competences.
- Supporting the entry and exit of businesses by incubating and accelerating promising young companies, increasing access to finance by resolving collateral constraints, improving financial literacy and promoting digital financial solutions.

9.4.3 Challenges in accessing international climate finance

The ability to access international climate finance and develop a pipeline of bankable projects aligned with Cabo Verde's mitigation and adaptation priorities depends on a number of factors, many of which are related to national and institutional capacities.

In order to access international climate finance, strong institutional coordination and technical capacity building are essential. As a first step, Cabo Verde has adopted Resolution 73/2019 creating the Interministerial Coordination Committee for Climate Funds to support the National

Designated Authorities (NDAs) for climate funds, including the Green Climate Fund (GCF) and the Adaptation Fund in promoting a national strategy for accessing and managing climate finance resources in Cabo Verde. However, the committee has not been operational, which makes access to climate finance resources a challenge for Cabo Verde. Meanwhile, in 2024 Cabo Verde approved the new Cabo Verde Climate Governance Framework in Resolution No. 38/2024. This emphasises the cross-cutting nature of climate issues and responds to the need for greater coordination and integrates the financing functions for implementing climate action.

The Directorate-General for Planning, Budget and Management (DGPOG) of the Ministry of Agriculture and Environment (MAA), which used to be the Nationally Designated Authority (NDA) of the GCF in has been replaced by the same Resolution by the National Directorate of Planning (DNP) of the Ministry of Finance and Business Development (MFFE). The NDA is in the process of building the capacities needed to improve climate knowledge and access to financial resources, including those from the GCF. To date, Cabo Verde has not benefited from any GCF-funded projects because it does not have accredited organisations, but above all because of the complexity of the fund's procedures. In 2024, various procedures and processes were revised to better respond to the needs of potential beneficiary countries and, more specifically, SIDS, taking into account the challenges that are specific to them. The country has only benefited from four preparation activities totalling 2 million US dollars, the last of which is regional and includes all African island countries. The other proposal approved in 2024 aims to support Cabo Verde in achieving an accredited entity with the GCF to facilitate direct access to climate finance, country ownership and alignment and faster implementation. Cabo Verde chose to create the FCA, thus partially compensating for the absence of a national green or climate bank to evaluate projects and disburse funds, and not limiting the country's access to bilateral and multilateral sources.

With the continuous investment in the acquisition of climate knowledge and skills over the last two years, Cabo Verde intends to equip the country to develop projects in the field of climate change. Existing experience indicates that this aspect of technical capacities and skills should be considered in the short and medium term by both the government and other support sectors, as well as by academia and those responsible for project development, for the preparation of proposals and concept notes with regard to accessing GCF funding.

Cabo Verde has limited access to grant-based climate finance, given its status as a middle-income country (MIC). As a MIC, the country faces a unique set of challenges when it comes to accessing international grant-based finance. MICs are often considered to have relatively higher levels of economic development than low-income countries. However, they can still encounter obstacles in obtaining external financial assistance, particularly in the form of grants.

Finally, attracting international funding also depends on ensuring project implementation and proving results, either through verified emission reductions or other performance indicators. This requires certain processes and systems to track the execution and ongoing performance of projects and programmes, and gives rise to data collection requirements and a Monitoring, Reporting and Verification (MRV) system. Robust MRV and project oversight will be increasingly important requirements for adaptation and mitigation projects submitted under Article 6 of the Paris Agreement, notably through the use of carbon markets and results-based payment approaches. With the support of the Climate Action Programme, Cabo Verde is currently establishing a National Transparency Framework.

Existing capacity is relatively weak in terms of data availability, emissions reporting and other technical aspects that are increasingly necessary to develop sound and verifiable emissions reduction projects. There are also challenges regarding the implementation and sustainability of adaptation project activities at national and municipal level.

9.5 A strategic approach to financing climate action

There is a large gap between current levels of national climate finance and the amounts needed to transition to a low-carbon economy in the coming decades. Furthermore, although international climate finance has increased year on year in response to global calls for greater action, flows to Cabo Verde have not evolved adequately to meet the needs required to implement priorities and achieve the country's climate goals. As described above, a number of barriers are restricting the country's ability to access existing and emerging sources of finance and create an enabling environment for low-carbon and climate-resilient investments. There is an urgent need for action involving all stakeholders.

Based on the above analysis, a strategic framework of eight action points to improve access to climate finance and its implementation is as follows:

1. **Strengthen coordination and integration of key actors:** More efforts need to be made to ensure better coordination between government institutions, donor partners and the private sector in order to support the programme implementation of climate finance. This will involve developing clearly defined roles and responsibilities for the relevant entities in terms of accessing and managing climate finance. Cabo Verde's new climate governance framework, including the proposed creation of a National Secretariat for Climate Action (SNAC), can play a key role in this institutional strengthening. A more holistic and joint approach will be essential for the successful prioritisation and acquisition of climate finance. New efforts are needed to increase the involvement of government planning and finance staff, as well as closer coordination and alignment of donor partners' activities to better target support needs, including through initiatives such as the NDC Partnership, which Cabo Verde has not yet joined. A specific coordination mechanism should be considered to facilitate this objective.
2. **Create a working group to mobilise support mechanisms for climate action:** The gaps in institutional and human capacity represent a major obstacle to mobilising support mechanisms for climate action in Cabo Verde, particularly during the project identification and development phase. It is necessary to develop technical capacities and skills, potentially through the creation of a working and support group for mobilising means of implementation, which will provide support for drafting proposals and developing concept notes within the framework of the SNAC. Assisted by donor support, such a group can provide an invaluable supportive role in developing high quality proposals aligned with national priorities and representing viable projects to funders.
3. **Developing a project portfolio and a cross-sectoral approach to project prioritisation:** A strategic approach is needed to prioritise projects in various mitigation sectors that have important co-benefits in terms of adaptation. Capital investment should be incentivised in technological and implementation choices that support a long-term development path

compatible with the Paris Agreement. Priority should be given to emission reduction projects and programmes that clearly demonstrate broader socio-economic benefits, adaptation co-benefits as identified in the LT-LEDS policy options, and contribution to the UN SDGs, given the importance of these broader considerations for many funders.

4. **Strengthening the private sector's contribution to financing climate action:** The government's institutional capacity limitations and lack of budget mean that private sector financing will be needed to boost funding levels, especially for renewable energy projects. Private sector participation and investment can best be encouraged by raising awareness and advocating for public-private partnerships (PPPs). These agreements may be best suited to the energy sector and infrastructure projects, but they can also be explored for financing adaptation. Attracting the interest of the private sector is a major challenge if the right framework is not created. To this end, it is necessary to strengthen the stability of the national regulatory and investment framework and the viability of financial instruments and incentives.
5. **Promoting a strong national climate fund and leveraging domestic climate finance:** Cabo Verde has created the Climate and Environment Fund (FCA). But in addition to facilitating the transfer and management of funds from bilateral and multilateral mechanisms, the FCA must be structured in such a way as to mobilise domestic resources to finance climate projects in Cabo Verde. Furthermore, promoting a strong national climate fund and leveraging domestic climate finance in Cabo Verde are essential to build resilience, ensure long-term sustainability and promote self-sufficiency in the face of climate change. It aligns with the country's specific needs and priorities, empowering local communities and institutions to take proactive steps towards a climate-resilient future. A strong national climate fund can serve as a catalyst to attract private sector investment in sustainable and climate-resilient projects. The fund can offer financial instruments and incentives that make such investments more attractive to private companies.
6. **Explore alternative funding sources and opportunities:** Cabo Verde, as a middle-income country, may face challenges in accessing traditional grant-based financing due to its classification. However, the country can explore alternative financing mechanisms, such as access to international carbon markets, to mobilise resources for climate change mitigation and adaptation projects. It is also important to consider and evaluate how to access funding from the growing and diverse range of emerging sources of climate finance, including bilateral sources and regional initiatives. Given the country's macroeconomic challenges, recent global initiatives such as DFCs represent a potentially significant development for Cabo Verde. The country plans to extend its recent DFC with Portugal to other key partners, easing the country's debt burden while promoting sustainable development and resilience to climate change.
7. **Developing systems to track and report financial flows and outcomes:** It is important to improve transparency, accountability and data sharing in order to give potential funders confidence and to assess results and the contribution to meeting climate goals. The Paris Agreement also requires robust reporting on financing, capacity building and technology transfer. A database system with clear government ownership is therefore needed to track public sector investment, development aid and private sector projects in the country. This should be integrated into the National Transparency Framework, as well as the climate markers of the State Budget, supported by the Climate Action Programme, as well as Cabo Verde's

National Investment System (SNI) and National Monitoring and Evaluation System (M&E), which were recently promoted by the Ministry of Finance and Enterprise Development (MFFE).

8. **Unlocking the potential of climate (including green and blue) bonds:** For Cabo Verde, being a SIDS vulnerable to the impacts of climate change, climate bonds can play a crucial role in financing sustainable and resilient initiatives. Cabo Verde launched its first blue bonds in 2023 through the Blu-X sustainable finance platform, a regional platform for listing and trading sustainable and inclusive financial instruments. This is the first private issuance that does not depend on a public guarantee, but is backed solely by market demand. The strategic partnership between the Cabo Verde Stock Exchange and the UNDP, as part of Cabo Verde's Integrated National Financing Framework (INFF), has already led to four sustainable bond issues totalling 32.5 million USD. Building on this momentum, the proceeds of the blue bonds are earmarked exclusively for sustainable marine and ocean projects that generate returns for the economy, society and the environment (AfDB, 2023). So, by strategically utilising climate bonds, Cabo Verde can access the financing needed to address climate challenges, build resilience and transition to a low-carbon, climate-resilient future. It is essential to align bond issuance with the country's sustainable development goals and, at the same time, fulfil international standards to attract a diverse range of investors.

This list of actions is not exhaustive. There are several additional issues that the country will seek to improve in strengthening its institutional structures, capacities and competences and strategic priorities for increasing climate finance in the coming years.



Ribeira Brava São Nicolau Island

10.

Monitoring and Evaluating Progress

A robust Monitoring and Evaluation (M&E) framework is essential to track and report on the progress of Cabo Verde's mitigation actions and targets, consistent with the country's long-term goal of achieving net zero. In order to monitor global progress on climate change, the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) established certain monitoring and reporting requirements for all signatory Parties, which have since been elaborated through a set of agreed rules and procedures. In addition, evaluating the performance of policies and progress in their implementation is key to designing and reviewing best practices.

This section establishes a framework for monitoring Cabo Verde's low emissions strategy. It builds on existing national institutional arrangements and the climate governance framework and ongoing efforts to improve transparency and MRV systems, including in relation to Cabo Verde's Nationally Determined Contribution (NDC) under the Paris Agreement. The framework builds on existing provisions and indicators, such as those in the updated NDC, but aims to provide a more comprehensive and long-term approach aligned with sectoral strategic planning, as well as international requirements and best practice. The report also aims to be fully aligned with and support the Enhanced Transparency Framework (ETF) technical training currently being implemented in Cabo Verde.

10.1 Monitoring progress

10.1.1 Why track progress?

In addition to the international reporting requirements mentioned above, the domestic reporting of Cabo Verde's GHG emissions and mitigation measures is important to create national transparency around the country's climate response – as well as to help inform good policy-making. In addition, the potential support for mitigation actions provided through the Paris Agreement's Article 6 mechanism and/or results-based finance (RBF) provides a strong incentive for robust reporting and accounting that reflects international guidance and best practice; international carbon finance is based on sound GHG accounting and the ability to demonstrate real and measurable emissions reductions and removals.

Solid monitoring of mitigation policies and measures, both at international and national level, is therefore necessary to fulfil the following three objectives:

- **Objective 1: Evaluate the effectiveness of policies and measures.** The long-term strategy identifies a large number of mitigation measures covering a wide range of policies, measures and projects in various sectors. A successful monitoring system will enable Cabo Verde not only to monitor GHG emissions and related emission reductions, but also to assess whether certain actions produce the expected impacts in terms of other expected policy and socio-economic development outcomes, including co-benefits (e.g. reduced fuel imports). The same applies to the implementation of prioritised adaptation measures. Information on the values of key indicators to demonstrate progress in implementing these actions should therefore be considered valuable additional information. Reporting on mitigation actions aggregated at sectoral level is also useful because the indicators used to monitor the impacts of specific mitigation measures can help to understand changes in sectoral GHG emissions over successive years.

- **Objective 2: Monitor GHG emissions and progress towards emission reduction targets.** The LT-LEDS provides the long-term framework within which Cabo Verde's NDCs set successively ambitious – or “enhanced” – targets over five-year periods. The nature of Cabo Verde's targets, including the coverage of sectors, will determine the specific information that needs to be monitored to track NDC progress in accordance with UNFCCC rules. The mitigation contribution in the first NDC is currently defined in relation to a BAU baseline in 2030 and covers the entire economy. The emissions reduction achieved in each year will therefore be determined by the relative difference between the level of emissions achieved through the application of NDC mitigation actions (“with measures” scenario) and a business-as-usual emissions projection for the same year. The latter projection represents the case in which no additional measures are taken to those already being implemented to reduce GHG emissions (“no measures” scenario).
- **Objective 3: Monitoring consistent with requirements under international finance and trading mechanisms.** The modalities, procedures and guidelines (MPGs) agreed under the Katowice Pact require Cabo Verde to report on financial, technical and capacity building needs, as well as indicate the support received to help meet these needs. If Parties, including Cabo Verde, choose to trade emissions under Article 6 of the Paris Agreement, the use of internationally transferred mitigation outcomes (ITMOs) must be robust and verifiable to allow for corresponding adjustments (CA) in the GHG inventory of Cabo Verde and the other country. The provision of RBF to support mitigation activities will also require monitoring the implementation of projects/policies/programmes and impacts consistent with international MRV rules and standards.

10.2 Institutional provisions

The Paris Agreement requires a system to transparently report progress towards Cabo Verde's emission reduction targets and to track the means of implementation, including climate finance. Such a system should also capture broader non-GHG impacts such as environmental, social and economic impacts resulting from the implementation of measures in order to assess their contribution to achieving broader development goals.

In this context, there is a need for Monitoring and Evaluation (M&E) of mitigation and adaptation measures as part of the oversight of national policies including the NDC, the NAP and the LT-LEDS. Considering that these national and international requirements are closely linked and should be reflected in national institutional arrangements, the proposed institutional arrangements for the M&E of the Cabo Verde long term strategy are based on existing systems and good practices for the M&E of the Sustainable Development Strategic Programme (PEDS) 2022–2026, the National Framework for Climate Transparency, and the institutional arrangements established by Cabo Verde's National Framework for Climate Governance, as recently adopted in April 2024 by the Council of Ministers of the Government of Cabo Verde.

10.2.1 Overview

Figure 10-1 summarises the institutional arrangements for M&E of climate policies in Cabo Verde, including the national enhanced transparency framework (ETF) for tracking the implementation of successive NDCs, the National Adaptation Plan (NAP) and the LT-LEDS. These also provide the framework for data collection for the reporting and subsequent monitoring of the progress of climate strategies including the NDC, NAP and other climate policy documents.

The following LT-LEDS M&E framework is in synergy with the institutional arrangements for climate governance in Cabo Verde and the new governance framework operationalised through the recent creation of the Department for Transparency and Means of Implementation (DTMI), as one of the four (4) departments of the National Secretariat for Climate Action (SNAC). The monitoring and reporting of the data and information needed to track national emissions and mitigation efforts is provided by the technical departments of the sectoral ministries, through the National Framework for Climate Services in Cabo Verde.

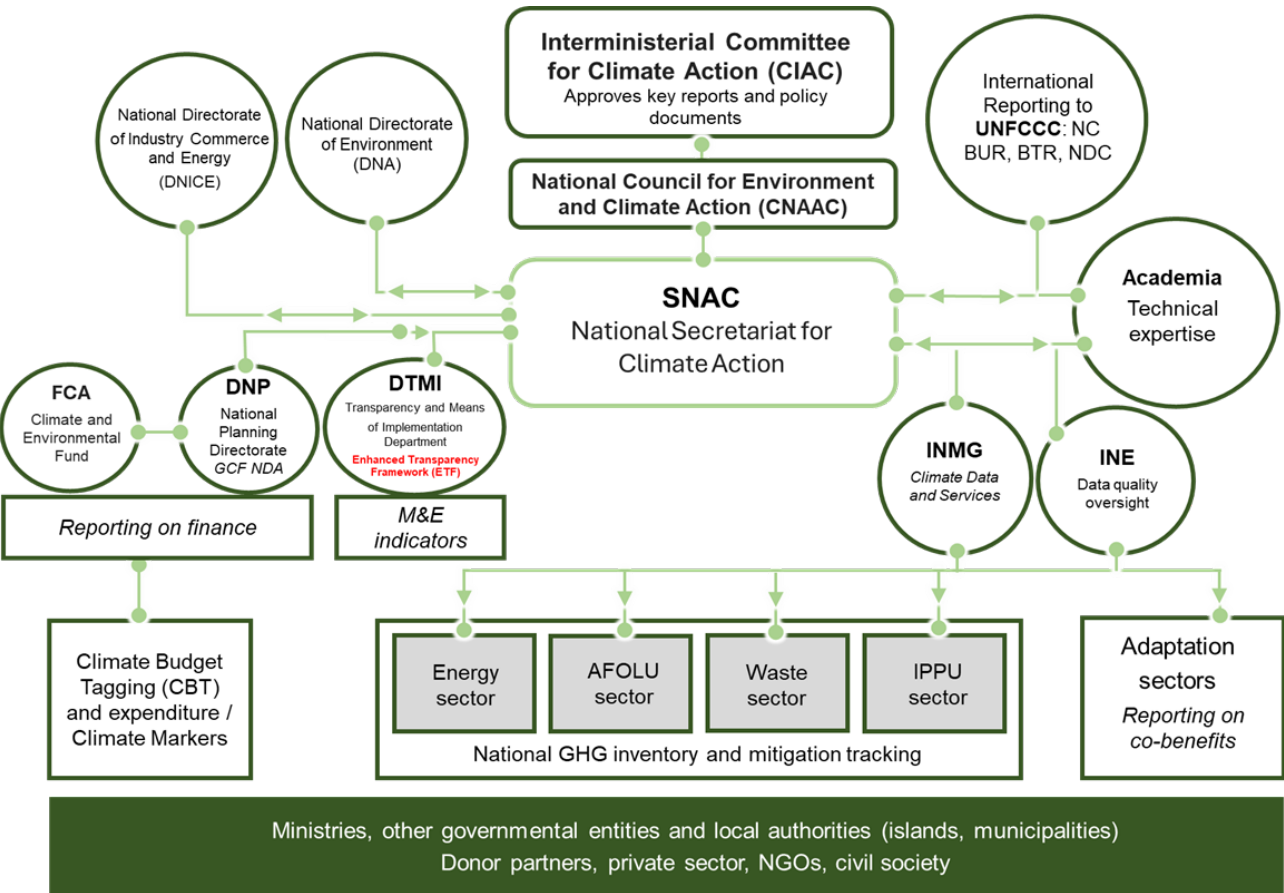


Figure 10-1: Institutional arrangements for monitoring Cabo Verde’s climate progress

10.3 National monitoring and reporting system

The M&E system of the long-term strategy will be coordinated by the Transparency and Means of Implementation (DTMI) department of the National Secretariat for Climate Action (SNAC). The DTMI will take responsibility for promoting transparency in climate initiatives, ensuring effective accountability and reporting such as national communications and transparency reports, and also playing a key role in implementing the ETF guidelines, as established by Article 13 of the Paris Agreement.

Through the new framework, Cabo Verde works to address challenges in collecting and consolidating data considering the fact that there is scattered information across various institutions and departments. As noted in the new governance framework, the implementation of M&E systems requires actions such as establishing an integrated ETF framework, prioritising the use of efficient monitoring and reporting processes, integrating climate data into the statistical management system, raising awareness and building the capacity of the entities involved and developing detailed climate information.

For M&E systems to operate efficiently and effectively, several actions must be implemented, including:

- Establish an integrated ETF framework to report and measure the performance, results and benefits of mitigation, adaptation and related capacity building actions and the amount of climate support requested and received – finance, capacity building and technology, with a view to the timely, accurate, comparable and consistent preparation of the BTR;
- Prioritise the use of existing ETF processes and Monitoring, Reporting and Verification (MRV) frameworks that are efficient for data collection and information management, in order to ensure efficiency in monitoring, reporting and measuring climate change benefits;
- Integrate the climate change parameters, data and information required for the ETF into the national statistical management system;
- Keep the national ETF system transparently linked to national sustainable development planning, budgeting and monitoring systems;
- Raise awareness and empower national and municipal entities to participate in the ETF process and systems; and
- Develop improved climate information at a detailed scale on trends and focus on creating pathways to communicate information to end users and decision-making authorities for climate-proof investment and development actions.

Tabela 10-1: Institutional arrangements	
Overview of institutional arrangements	
Levels of political and strategic decision-making	Roles and responsibilities
Interministerial Committee for Climate Action (CIAC)	The Interministerial Committee for Climate Action (CIAC) is the decision-making body on climate policy and sectoral policies with an impact on national climate change objectives, chaired by the Prime Minister and made up of the members of the government responsible for the environment, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, education and science. The CIAC approves important reports and policy documents including reporting obligations to the UNFCCC: NC, BUR, BTR, NDC.
National Council for the Environment and Climate Action (CNAAC)	The National Council for the Environment and Climate Action (CNAAC) is an advisory body on major policy options and cooperation between public and private entities in the field of the environment and climate action, chaired by the member of the government responsible for the environment and climate action and made up of the government departments responsible for the environment, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, energy, spatial planning, finance, agriculture, the sea, the economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, education and science, municipalities, civil society organisations, the private sector and academia.
National Secretariat for Climate Action (SNAC)	The National Secretariat for Climate Action (SNAC) is an executive body that reports directly to the member of the government responsible for climate change, in close liaison with the CIAC and CNAAC. It is responsible, among other things, for proposing and evaluating policies, norms and initiatives and defining strategies relating to the National Policy on Climate Change, promoting the coordination and cooperation of actions relating to climate change, coordinating the implementation of the NDC, the NAP and other national plans and instruments on climate change. It also acts as the executive secretariat of the CIAC and the CNAAC. The SNAC works together with CNAAC and CIAC to create and operationalise the institutional framework, integrate climate change into national and municipal planning, promote sectoral policies and adaptation and mitigation initiatives and others related to the issue of loss and damage.



Overview of institutional arrangements	
Levels of political and strategic decision-making	Roles and responsibilities
National Climate Transparency System (NCTS)	Cabo Verde has also designed a new National Climate Transparency System (NCTS). The aim of the NCTS is to increase accountability, promote transparency and facilitate informed decision-making on climate action. This system involves comprehensive monitoring, reporting and verification mechanisms to track progress towards national climate goals, such as the emission reduction targets set out in international agreements (NDC, NAP) like the Paris Agreement. The main units of the system's architecture are: i) the GHG inventory module, ii) the NDC monitoring and evaluation module, iii) the mitigation module (NDC progress), iv) the adaptation module (NAP progress) and v) the support module (MRV of support). For system operations, the data providers are selected focal points in each of the NDC implementing entities, providing data for the NDC M&E, Inventory and Support modules. The data-providing institutions include: • Directorate-General for Agriculture, Forestry and Livestock (DGASP) • National Institute for Territorial Management (INGT) • National Environmental Directorate (DNA) / Ministry of Agriculture and Environment (MAA) • National Institute of Public Health (INSP) • National Directorate of Industry, Trade and Energy (DNICE) / Ministry of Industry, Trade and Energy (MICE) • Ministry of Tourism and Transport (MTT) • Ministry of Internal Affairs (MAI) • National Association of Cabo Verde Municipalities (ANMCV) • National Civil Protection and Fire Service (SNPCB) • National Water and Sanitation Agency (ANAS) / National Water and Sanitation Council (CNAS) • Cabo Verdean Institute for Gender Equality and Equity (ICIEG) • Institute of the Sea (IMAR) / Ministry of the Sea (MM) • Cabo Verde Climate and Environment Fund (FCA-CV) • National Planning Directorate (DNP) / Ministry of Finance and Business Development (MFFE).

10.4 National efforts to strengthen MRV and transparency

Cabo Verde has increased its efforts in recent years to strengthen its institutional capacity in relation to MRV and accompanying national climate policy. These will help support the implementation of the improved M&E framework needed to move forward as part of the long-term strategy.

The **Fourth National Communication and First Biennial Update Report for the Republic of Cabo Verde under the UNFCCC** is funded by the GEF to help Cabo Verde prepare its Fourth National Communication (4NC) and First Biennial Update Report (FBUR) for the implementation of its obligations under the United Nations Framework Convention on Climate Change (UNFCCC). Cabo Verde’s FBUR²⁹ was submitted to the UNFCCC secretariat on 31 May 2024.

The **Lusophone Cluster of the Climate Transparency Platform** presents itself as a one-stop shop for transparency, covering everything related to the Paris Agreement’s ETF and the reports produced under the UNFCCC. The Platform is part of the Capacity Building Initiative for Transparency

29 GoCV, 2024. Cabo Verde’s first biennial update report (BUR).

- Global Support Programme (CBIT-GSP). The Lusophone Group was created during COP22 in November 2016 with the aim of promoting the exchange of experiences between Portuguese-speaking countries, including Cabo Verde, and strengthening their capacities in order to fulfil the reporting and transparency obligations included in the UNFCCC and the Paris Agreement. The group includes the nine member states of the Community of Portuguese Speaking Countries (CPLP) and is open to the participation of all countries with an interest in mutual learning on the themes of the partnership.

With the support of the Climate Action Programme, Cabo Verde has also designed a new **National Climate Transparency System (NCTS)**. The aim of the NCTS is to increase accountability, promote transparency and facilitate informed decision-making on climate action. This system involves comprehensive monitoring, reporting and verification mechanisms to track progress towards national climate goals, such as the emission reduction targets set out in international agreements like the Paris Agreement and national climate policy instruments (NDC, NAP). The main units of the system’s architecture are: i) the GHG inventory module, ii) the NDC monitoring and evaluation module, iii) the mitigation module (NDC progress), iv) the adaptation module (NAP progress) and v) the support module (MRV of support). For system operations, the data providers are selected focal points in each of the NDC implementing entities, providing data for the NDC M&E, Inventory and Support modules.

10.5 Table of progress indicators

This section establishes a high-level framework of M&E indicators for use in tracking the implementation of Cabo Verde’s mitigation and adaptation policies and measures. The framework reflects the requirements of the UNFCCC under the ETF and the MPGs, as well as the need to monitor and evaluate the progress of climate projects and programmes in line with the needs for robust political oversight and international support and funding.

A series of tables are provided to allow annual monitoring of GHG emissions, as well as the effectiveness of mitigation measures in each sector. Indicators are proposed that monitor emissions, as well as non-GHG progress indicators, closely linked to each of the mitigation actions in Cabo Verde’s long-term strategy in each of the main emitting sectors. The choice of indicator was also informed by existing indicator frameworks applied internationally in the context of climate change, which also support the metrics required by the ETF. The indicators are intended to be feasible to monitor and evaluate in the context of Cabo Verde’s national circumstances and institutional arrangements.

Separate tables of indicators are proposed for each of the key sectors covered by the long-term strategy, providing a more detailed framework for monitoring progress. These indicators are consistent with the BTR requirements for reporting on progress in implementing the NDCs.

Each of the sectoral tables is structured as follows:

- **Key indicators:** these quantitative indicators include a breakdown by sector category of the annual emissions in the national GHG inventory and the annual emissions in the base-line scenario, against which the annual reductions are tracked. They also include other high-level indicators specific to each sector related to emissions and mitigation activity.

- **Supporting indicators:** the core indicators are supported by a set of other indicators that track progress in implementing the mitigation measures needed to achieve sustainable emission reductions. A series of supporting indicators help quantify progress in implementing specific actions in each sector.
- **Other factors:** several factors will act as drivers of emissions in the coming years, many of which are beyond Cabo Verde’s control. No quantitative indicators are proposed for these factors, but they can be tracked as part of a monitoring framework to understand and communicate their influence on NDC implementation.

Tables are presented for the main components of BTR reporting, including energy, IPPU, waste, agriculture, and land use, land use change and forestry (LULUCF). In addition, an aggregated model for monitoring overall progress at an economy-wide level is presented. Not all years up to 2050 are presented, although the necessary data and information should be monitored and recorded for all years of each subsequent NDC period. It should be noted that not all information will be available for a given year; for example, there is usually a time lag between certain important statistical data, such as GDP, population data and energy generation on the grid, and the emissions reported in the national GHG inventory.

PROGRESS INDICATORS: ALL SECTORS						
GHG EMISSIONS		2019	2020	2021	2022	etc.
BAU "without measures" GHG emissions (ktCO ₂ e)	Energy					
	IPPU					
	Agriculture					
	Waste					
	LULUCF					
	Total emissions					
	Total net emissions					
Actual GHG emissions (tCO ₂ e)	Energy					
	IPPU					
	Agriculture					
	Waste					
	LULUCF					
	Total emissions					
	Total net emissions					
Reduction compared to the current situation (%)	Total excl. LULUCF					
	Total incl. LULUCF					
Mitigation achieved with all "measures" (ktCO ₂ e)	Total excl. LULUCF					
	Total incl. LULUCF					
OTHERS		2019	2020	2021	2022	etc.
GDP (million USD)						

Population (millions)						
FINANCING AND MECHANISMS		2019	2020	2021	2022	etc.
Domestic funding for climate action (millions of USD)	Direct					
	Indirect					
International funding for climate action (millions of USD)	Grants					
	Others					
Internationally transferred mitigation outcomes; ITMOs (ktCO2e)						
Technology development and transfer (describe the activities carried out)						
Development and capacity building (describe the activities carried out)						
Other forms of voluntary co-operation (describe the activities carried out)						

PROGRESS INDICATORS: ENERGY (ELECTRICITY AND HEAT PRODUCTION)						
KEY INDICATORS	2019	2020	2021	2022	etc.	
BAU "without measures" GHG emissions (ktCO2e)						
Actual greenhouse gas emissions (ktCO2e)						
BAU electricity demand (MWh)						
Actual electricity demand (MWh)						
BAU emissions intensity from grid supply (tCO2e/MWh)						
Actual emissions intensity of grid supply (tCO2e/MWh)						
Share of renewable energy in total grid supply (%)						
SUPPORTING INDICATORS	2019	2020	2021	2022	etc.	
Electricity supply	2019	2020	2021	2022	etc.	
Electricity production	Solar (MWh)					
	Wind (MWh)					
	Diesel (MWh)					
	Fuel oil (MWh)					
	TOTAL (MWh)					

Mitigation measures		2019	2020	2021	2022	etc.
Renewable energy connected to the grid	Solar PV (MW)					
	Wind (MW)					
Off-grid photovoltaic solar energy	# Off-grid solar systems					
	MW installed					
Losses in T&D	% of losses (total network)					
	% annual improvement					
International funding and support		2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)						
Technology transfer and capacity-building activities (indicate activities)						
OTHER FACTORS						
Progress in the development of renewable energies (key projects implemented, new IPPs, targets achieved, etc.)						
Development and reinforcement of network infrastructures, including network losses (indicate main developments)						
National electrification rate (evolution of the grid connection rate and rural access to electricity)						

PROGRESS INDICATORS: ENERGY (TRANSPORT)						
KEY INDICATORS	2019	2020	2021	2022	etc.	
BAU "without measures" GHG emissions (ktCO2e)						
Actual greenhouse gas emissions (ktCO2e)						
SUPPORTING INDICATORS	2019	2020	2021	2022	etc.	
Mitigation measures	2019	2020	2021	2022	etc.	
Electric mobility	Total number of registered vehicles					
	Number of EVs					
	Share of EVs in the total (%)					
Modal shift: from private to public transport	Total passenger kilometres (est.)					
	Public passenger kilometres (est.)					
	Share of public transport (% of total passenger kilometres)					

Sustainable aviation fuel (SAF)	Imported SAF (million litres)					
	Share of all aviation fuel (%)					
International funding and support		2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)						
Technology transfer and capacity-building activities (indicate activities)						
OTHER FACTORS						
Activity indicators by mode of transport, e.g. occupancy rates; average distances						
Activities and trends related to fuel economy and vehicle emission standards						
Availability and cost of new, low-carbon energy technologies and practices.						
PROGRESS INDICATORS: ENERGY (OTHER SECTORS)						
KEY INDICATORS		2019	2020	2021	2022	etc.
BAU "without measures" GHG emissions (ktCO ₂ e)						
Actual greenhouse gas emissions (ktCO ₂ e)						
SUPPORTING INDICATORS		2019	2020	2021	2022	etc.
Energy efficiency in buildings		2019	2020	2021	2022	etc.
Low-energy lighting	% penetration rate					
MEPS ³⁰ for appliances in the domestic sector	# MEPS and appliances					
Solar thermal systems (STS)	# STS installations					
Energy service companies (ESCOs)	# ESCOs					
Energy efficiency in water consumption		2019	2020	2021	2022	etc.
Water supply, consumption and pumping	Number of new pumping installations					
	Average efficiency (%)					
International funding and support		2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)						
Technology transfer and capacity-building activities (indicate activities)						

30 Minimum energy performance standards

OTHER FACTORS						
Ongoing developments in construction practices and energy use by households and SMEs						
Programmes, policies and actions to support increased energy efficiency in all sectors (e.g. CEEE)						
Availability and cost of new, low-carbon energy technologies and practices						
PROGRESS INDICATORS: IPPU						
KEY INDICATORS		2019	2020	2021	2022	etc.
BAU "without measures" GHG emissions (ktCO2e)						
Actual greenhouse gas emissions (ktCO2e)						
SUPPORTING INDICATORS		2019	2020	2021	2022	etc.
F-gas replacement		2019	2020	2021	2022	etc.
HFC imports	HFC-134a (tonnes)					
	Other (tonnes)					
	Other (tonnes)					
Alternative imports	Specify the gas (tonnes)					
	Specify the gas (tonnes)					
Replacement rate	% non-HFC					
International funding and support		2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)						
Technology transfer and capacity-building activities (indicate activities)						
OTHER FACTORS						
Progress and/or challenges encountered in replacing HFCs						
Progress in the application of the MRV of energy and emissions in industry (indicate progress)						

PROGRESS INDICATORS: WASTE					
KEY INDICATORS	2019	2020	2021	2022	etc.
BAU "with measures" GHG emissions (ktCO2e)					
Actual greenhouse gas emissions (ktCO2e)					
Total waste generation (tonnes)					
Total waste disposal (tonnes)					
Disposal of organic waste (tonnes)					
SUPPORTING INDICATORS	2019	2020	2021	2022	etc.
Biogas installation	2019	2020	2021	2022	etc.
Biogas - MSW	# units				
Biogas - WWT	# units				
Biogas - on farms	# units				
Waste reduction, reuse and recycling	Recycled waste (tonnes)				
	(and by type)				
	Percentage of total waste recycled (%)				
Waste water	2019	2020	2021	2022	etc.
Wastewater treatment plants (WWTP)	# Wastewater treatment plant facilities				
	# HH connected to the WWTP				
International funding and support	2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)					
Technology transfer and capacity-building activities (indicate activities)					
OTHER FACTORS					
Investment in waste infrastructure and management measures (indicate activities)					
Development of national and regional waste regulations and their application					
Progress in waste recycling (e.g. policies and practices; recycling rates for plastic, metals and paper)					

PROGRESS INDICATORS: AGRICULTURE					
KEY INDICATORS	2019	2020	2021	2022	etc.
BAU "without measures" GHG emissions (ktCO2e)					
Actualgreenhouse gas emissions (ktCO2e)					
Plant production (total tonnes of plant biomass)					
Livestock production (# population)					
SUPPORTING INDICATORS	2019	2020	2021	2022	etc.
Mitigation measures	2019	2020	2021	2022	etc.
Energy efficiency in agriculture	Total energy consumption (GJ)				
	Number of new energy-efficient pumps (#)				
Efficient use of fertilisers and manure management	Application area (Ha)				
	Compost and organic fertiliser production (t)				
INTERNATIONAL FUNDING AND SUPPORT	2019	2020	2021	2022	etc.
International contribution to financing mitigation measures (indicate activities and amounts)					
Technology transfer and capacity-building activities (indicate activities)					
OTHER FACTORS					
Compost production and distribution policy (describe progress and results)					
Agricultural and horticultural production, domestic food demand and developments in export markets					
Climatic factors and other key factors influencing yields and agricultural practices					

PROGRESS INDICATORS: LULUCF					
KEY INDICATORS	2019	2020	2021	2022	Etc.
Emissions "without measures" of the current situation (ktCO2e)					
Removals "without measures" from the current situation (ktCO2e)					
BAU "without measures" net emissions (ktCO2e)					
Actual greenhouse gas emissions (ktCO2e)					
Actual removals (ktCO2e)					
Net actual greenhouse gas emissions (ktCO2e)					
Total forest area (ha)					
Total forest area (% of total land area)					
SUPPORTING INDICATORS	2019	2020	2021	2022	etc.
Afforestation and restoration	2019	2020	2021	2022	etc.
Afforestation	Total planted area (ha)				
	by species (ha)				
Restoration	Total area restored (ha)				
	by species (ha)				
Agroforestry	2019	2020	2021	2022	etc.
Agroforestry (wood, fruit and fodder)	Total area covered by agroforestry (ha)				
	by product / species (ha)				
International funding and support	2019	2020	2021	2022	etc.
International contribution to financing mitigation measures, including support for REDD+ (amounts)					
Technology transfer and capacity-building activities (indicate activities)					
OTHER FACTORS					
REFLOR-CV implementation (e.g. progress, targets and activities)					
Climatic factors with an impact on afforestation and restoration activities (e.g. desertification)					
Implementation of Cabo Verde's afforestation policy (e.g. progress, targets and activities)					

References

Cabral Pinto, M.M., Silva M.M.V.G, Ferreira da Silva E., Miranda P., and Marques, R., Prudêncio I., and Rocha F., 2014. Uranium contents in the lithological formations of Santiago Island, Cabo Verde. Procedia Earth and Planetary Science, December 2014. <https://doi.org/10.1016/j.proeps.2014.05.005>

Chiquier, S., Patrizio, P., Bui, M., Sunny, N. and MacDowell, N., 2022. A comparative analysis of the efficiency, time and permanence of CO removal pathways2 . Energy & Environmental Science 15(10), 4389–4403. <https://doi.org/10.1039/D2EE01021F>.

Creed, J.C., Engelen, A.H., D’Oliveira, and E.C., 2016. First record of seagrasses in Cabo Verde, eastern Atlantic. Mar Biodivers Rec 9, 57 (2016). <https://doi.org/10.1186/s41200-016-0067-9>

DNICE (National Directorate for Industry, Trade and Energy), 2018. Action Plan for Electric Mobility 2018.

EC (European Commission), 2018. In-depth analysis in support of the Commission Communication COM(2018) 773: A Clean Planet for All; A strategic European long-term vision for a prosperous, modern, competitive and climate-neutral economy, European Commission, 2018.

EC, 2021. European Green Deal: the Commission proposes transforming the EU’s economy and society to fulfil climate ambitions. June 2021. https://ec.europa.eu/commission/presscorner/detail/en/ip_21_3541

EC, 2022. EDGAR online database on GHG emissions, accessed on 12 June and 9 November 2023 from: https://edgar.jrc.ec.europa.eu/report_2022?vis=tot#emissions_table

ECOCV (Cabo Verde Ecotourism Association), 2023. Cabo Verde’s new largest seagrass meadow. Published online on 23 June 2023. Available at <https://www.ecocv.org/2023/06/23/the-new-largest-seagrass-meadow-in-cabo-verde/>

Fransen, T., E. Northrop, K. Mogelgaard and K. Levin. 2017. “Enhancing NDCs by 2020: Achieving the Goals of the Paris Agreement”. Working paper. Washington, DC. World Resources Institute.

Geden, O., Khourdajie, A.A., Bataille, C., Berndes, G., Buck, H.J., Calvin, K. et al. Carbon dioxide removal – key characteristics and multiple roles in mitigation strategies. In Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Shukla, P.R., Skea, J., Reisinger, A., Slade, R., Fradera, R., Pathak, M. et al. (eds.). Cambridge and New York: Cambridge University Press. 1261–1263. <https://www.ipcc.ch/report/ar6/wg3/>

Gesto Energy Solutions, 2011. Cabo Verde Renewable Energy Atlas. Available at https://www.al-er-renovaveis.org/contents/lerpublication/gesto_2011_jun_-atlas-e-projectos-de-energias-renovaveis-de-cabo-verde.pdf

GoCV (Government of Cabo Verde), 2019. Electricity Sector Master Plan 2018–2040.

GoCV, 2023. Boa Vista International Partners Conference 2023 (CIP23): Energy 2023. 27/28 April, 2023

GoCV, 2024. Cabo Verde's First Biennial Update Report. URL: <https://unfccc.int/documents/638907>

IEA (International Energy Agency), 2023. Direct air capture. Consulted on 29 November 2023 at <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/direct-air-capture>

IPCC (Intergovernmental Panel on Climate Change), 2006. 2006 IPCC guidelines for national greenhouse gas inventories. URL: <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>

MAA (Ministry of Agriculture and Environment), 2021a. First update of Cabo Verde's NDC in 2020. Ministry of Agriculture and Environment.

MAA, 2021b. Cabo Verde National Adaptation Plan. Ministry of Agriculture and Environment.

National Institute for Territorial Management (INGT). 2021. Report on the pilot methodology for producing a draft map of climate mitigation and adaptation.

Pisciotta, M., Davids, J. and Wilcox, J., 2022. Greenhouse gas removal: Overview and current status of deployment. In Greenhouse Gas Removal Technologies. Bui, M. and Mac Dowell, N. (eds.) London: Royal Society of Chemistry. <https://doi.org/10.1039/9781839165245-00006>

Touron-Gardic, G. et al, 2022. Monetary evaluation of ecosystem services provided by marine herbivores in West Africa: case studies in Sénégal, Cabo Verde and Guinea-Bissau. ResilienSea Project, Mava Foundation, 167p.

UN (United Nations Organisation), 2016. Amendment to the Montreal Protocol on substances that deplete the ozone layer, Kigali, 15 October 2016.

UNFCCC, 2015. The Paris Agreement, FCCC/CP/2015/L.9/Rev/1, available at <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

UNFCCC, 2021. Glasgow Climate Pact. Draft decision -/CMA.3. FCCC/PA/CMA/2021/L16. 13 November 2021.

United Nations Environment Programme (UNEP), 2023. Emissions gap report 2023: Broken Record. Available at: <https://www.unep.org/resources/emissions-gap-report-2023>

ANNEX

Implementation Plan

The following tables present the Implementation Plan for the mitigation measures in this LT-LEDS. They are based on discussions with the sectors and experts, as well as an analysis of national strategic and policy planning documents. The measures are grouped by sector and summarised according to the main aspects of implementation planning, including the responsible government ministries and implementing entities, the planned timetable and the estimated funding requirements up to 2050. Adaptation and resilience co-benefits of are also presented, as well as the main links with delivery of the UN SDGs.

MEASURE	KEY MINISTRY (FOCAL POINT)	OTHER KEY PLAYERS	PLANNED FUNDING	CO-BENEFITS FOR ADAPTATION	ALIGNMENT WITH THE SDGs	SCHEDULE		
						2020–2025	2025–2040	2040–2050
ENERGY								
LOW CARBON ELECTRICITY SUPPLY								
Expand wind power production: Increase wind power production capacity by around 240 MW, in accordance with the Electricity Sector Master Plan, including through large-scale IPP wind farms and small-scale distributed production.	MICE DNICE	CABEO-LIC	M USD 622	It allows for greater use of local resources, reducing dependence on fossil energy sources imported from abroad. It improves the energy sector's adaptation to climate change and reduces the risks of its impacts.		✓	✓	✓
Action 1 Construction of large-scale IPP wind farms						✓		✓
Action 2 Small-scale distributed production						✓	✓	✓
Action 3 Maintaining and updating established systems						✓	✓	✓
Action 4 Monitoring and evaluation						✓	✓	✓
Expanding photovoltaic solar energy and energy storage: Increasing photovoltaic solar production capacity by around 315 MW, in accordance with the Electricity Sector Master Plan, through large-scale IPP solar photovoltaic projects, accompanied by batteries and pumped storage, and small-scale distributed production.	MICE DNICE	Private companies and public organisations	M USD 473	It allows for greater use of local resources, reducing dependence on fossil energy sources imported from abroad. Distributed solar generation helps reduce demand on traditional electricity grids			✓	✓
Action 1 Increase storage and energy through batteries and PSP							✓	✓
Action 2 Construction of large-scale IPP solar plants with storage							✓	
Action 3 Maintenance of solar photovoltaic systems							✓	✓
Action 4 Monitoring and evaluation							✓	✓

Reducing transmission and distribution (T&D) losses: Investment in a series of cost-effective measures to improve the efficiency of the national electricity transmission system, reducing losses from around 20% today to 10%	MICE	EDEC	MUSD 168	Reduced operating costs for utilities and lower costs for consumers. Reducing energy costs and mitigating impacts. Reduces pressure on sensitive ecosystems and natural habitats. Rational use of endogenous resources, fossil fuels and water.				
Action 1 <i>Investment in network modernisation and energy efficiency measures</i>							✓	✓
Action 2 <i>Monitoring and evaluation</i>							✓	✓
LOW CARBON TRANSPORT								
Electric mobility: Increasing the share of the national road vehicle fleet from electric vehicles (EVs) to replace conventional internal combustion engine (ICE) vehicles, aiming for 100% of all vehicle registrations by 2050. Accompanied by a series of on- and off-grid solar photovoltaic charging infrastructures	MICE, MTT		1,805 MUSD	Improving air quality in urban areas. Reduced dependence on imported fuels, reducing vulnerability to fluctuations in oil prices and other geopolitical factors. Promotes greener practices in transport infrastructure.			✓	✓
Action 1 <i>Replacement of all types of ICE vehicles</i>							✓	✓
Action 2 <i>Development of solar photovoltaic charging infrastructures</i>							✓	
Action 3 <i>Infrastructure maintenance</i>								✓
Action 4 <i>Monitoring and evaluation</i>							✓	✓
Modal shift measures: Modal shift from private vehicles to non-motorised transport (NMT) and public transport through new investments in urban infrastructure and public campaigns	MTT, Municipalities	NAMA Public transport company	M USD 153	Improving urban air quality to reduce diseases caused by atmospheric pollution. Reducing traffic and strengthening response capacities in urban areas. Increasing the resilience of public transport and its adaptability to predicted climatic phenomena.			✓	✓
Action 1 <i>Switching to modes of transport with lower greenhouse gas emissions</i>								✓
Action 2 <i>Organising public campaigns</i>							✓	✓
Action 3 <i>Monitoring and evaluation</i>							✓	✓
Sustainable aviation fuels (SAF): blending imported SAF with conventional aviation fuel, in line with the European Union Objectives, increasing from 5% in 2030 to reach 63% in 2050	MTT		M USD 44	Reduces dependence on imported jet kerosene. The use of SAF improves the circular economy by taking advantage of endogenous and renewable resources, such as oils of organic and animal origin.				✓
Action 1 <i>Gradual increase in the use of sustainable aviation fuels (SAF)</i>								✓
Action 2 <i>Monitoring and evaluation</i>							✓	✓

MEASURES	KEY MINISTRY (FOCAL POINT)	OTHER KEY PLAYERS	PLANNED FUNDING	CO-BENEFITS FOR ADAPTATION	ALIGNMENT WITH THE SDGs	SCHEDULE		
						2025–2030	2030–2040	2040–2050
WASTE								
SUSTAINABLE WASTE MANAGEMENT								
Recycling: Reducing the use of virgin materials to produce plastics, metals and glass. The reduced use of virgin materials will result in lower energy consumption to produce the virgin materials and will reduce greenhouse gas emissions. On the other hand, the creation of waste value chains and the implementation of material recovery facilities will also lead to an increase in the project's emissions associated with the production process (fuel consumption, electricity consumption).	Ministry of Agriculture and the Environment (MAA) National Water and Sanitation Agency (ANAS)	Municipal waste Operators of Treatment and Recovery Centres; ANMCV, Environmental Fund (FA), Private Sector, Universities and Education Centres, NGOs	M USD 65	Preservation of ecosystems, reducing pressure on ecosystem services. Greater availability of raw materials to increase resilience.		✓	✓	✓
Action 1 Secure funding and start implementation (construction of sorting centres and preparation for recycling)						✓		
Action 2 Start the operation (training, recruitment, others)						✓		
Action 3 Full operation on nine islands							✓	✓
Action 4 Remodelling of treatment facilities								✓
Composting: The production of compost from (part of) the organic fraction of municipal solid waste will divert organic waste from landfill and, as such, avoid methane emissions from biomass and other organic matter that would otherwise have been left to decompose anaerobically at a solid waste disposal site.	Ministry of Agriculture and the Environment (MAA) National Water and Sanitation Agency (ANAS)	Municipal waste Operators of Treatment and Recovery Centres, ANMCV, DGASP and Agriculture Delegations	Included in the above sum	More resilient agricultural ecosystems. Improved soil and water quality.		✓	✓	✓
Action 1 Secure funding and start implementation (construction of composting units)						✓		
Action 2 Start the operation (training, recruitment, others)						✓		
Action 3 Full operation on nine islands							✓	✓
Action 4 Remodelling of composting facilities								✓

Development of biogas: Introduction of small-scale biogas plants on livestock farms, waste disposal sites and wastewater treatment facilities with the potential to produce electricity, following the National Strategic Plan for Waste Management (PENGEr).	Ministry of Agriculture and the Environment (MAA)	Municipal waste	Included in the above sum	Support for sustainable agriculture using agricultural waste and animal manure and the opportunity for an additional source of income for farmers.	     	✓	✓	✓
	National Water and Sanitation Agency (ANAS)	Operators of treatment and recovery centres, DNICE, DGASP and agricultural delegations		Reduce dependence on non-renewable sources.				
Action 1 <i>Secure funding and start implementation (Construction of biogas production units, including landfill drainage network)</i>					✓			
Action 2 <i>Start the operation (training, recruitment, others)</i>					✓			
Action 3 <i>Full operation on nine islands</i>						✓		✓
Action 4 <i>Remodelling of biogas plants</i>								✓

MEASURES	KEY MINISTRY (FOCAL POINT)	OTHER KEY PLAYERS	PLANNED FUNDING	CO-BENEFITS FOR ADAPTATION	ALIGNMENT WITH THE SDGs	SCHEDULE		
						2025-2030	2030-2040	2040-2050
INDUSTRIAL PROCESSES								
F-gas replacement								
Gradual reduction in imports of fluorinated gases to comply with the Kigali amendment and their replacement by alternative substances with a much lower GWP. It is assumed that, in line with the commitments made by European countries under the Kigali amendment, these imports can be reduced by up to 80% by 2030.	Ministry of Agriculture and the Environment (MAA)	DNICE; Companies in the sector that use fluorinated gases	M USD 16,5	None identified.		✓		
Action 1 Raising awareness among the affected industrial sectors and commercial organisations of the need to replace fluorinated gas						✓		
Action 2 Reduce national imports of fluorinated gases in line with the Kigali amendment and replace them with substitutes with lower GWP						✓		

MEASURES	KEY MINISTRY (FOCAL POINT)	OTHER KEY PLAYERS	PLANNED FUNDING	CO-BENEFITS FOR ADAPTATION	ALIGNMENT WITH THE SDGs	SCHEDULE		
						2025–2030	2030–2040	2040–2050
AGRICULTURE AND LULUCF								
Composting								
PENGer aims to install a biogas landfill for energy production on Santiago and build eight more biogas plants on the other islands. In addition to these plants, at municipal level, the installation of small biodigesters at domestic level is planned, where feasible. Establish composting plants with a total capacity of up to 2,000 tonnes per year for processing biological waste by 2030, increased to 10,000 tonnes per year by 2036 and maintained until 2050.	Ministry of Agriculture and the Environment (MAA) – DGASP National Water and Sanitation Agency (ANAS)	Urban solid waste treatment and recovery centres ANMCV, Environmental Fund (FA), Private Sector, Family Farmers, National Directorate for Industry, Trade and Energy (DNICE)	M USD 14	Composting has the added value of producing clean energy, improving the aesthetics and health of municipalities by reusing urban waste and reducing the workload of rural families.	13 AÇÃO CLIMÁTICA 15 PROTEGER E VIDA TERRESTRE 11 Cidades e Comunidades Sustentáveis 12 Produção e Consumo Sustentáveis 7 Energias Renováveis e Acessíveis 2 ERADICAR A FOME	✓	✓	✓
Action 1 Mobilising resources to implement composting projects						✓		
Action 2 Draw up technical guidelines for the construction, maintenance and operation of municipal and community biodigesters						✓		
Action 3 Setting up biodigesters and training operators						✓	✓	✓
Action 4 Monitoring and evaluation of projects						✓	✓	✓
Water efficiency in agriculture								
Improving and increasing the efficiency of water consumption in the agricultural sector will be done by introducing measures to save and use water efficiently in the agricultural sector through the use of more efficient irrigation systems, such as drip and sprinkler irrigation.	Ministry of Agriculture and the Environment (MAA) – DGASP National Water and Sanitation Agency (ANAS)	Private sector (e.g. irrigation water), farmers, agricultural co-operatives, family farmers	See Energy (energy efficiency)	Reduced electricity consumption for pumping water, reduced costs for pumping, storing and channelling water for irrigation.	2 ERADICAR A FOME 6 ÁGUA POTÁVEL E SANEAMENTO 15 PROTEGER E VIDA TERRESTRE 9 INDÚSTRIA, INOVAÇÃO E INFRAESTRUTURAS 12 Produção e Consumo Sustentáveis 13 AÇÃO CLIMÁTICA	✓	✓	✓
Action 1 Mobilising resources to implement the water efficiency in agriculture project						✓		
Action 2 Operationalisation of the water-saving policy in agriculture						✓		
Action 3 Development of a technical guide and training manual for efficient irrigation projects						✓		
Action 4 Training, capacity building and implementation of efficient irrigation systems						✓	✓	✓
Action 5 Monitoring and evaluation						✓	✓	✓

Reforestation and restoration								
Reforestation and recovery of degraded ecosystems consists of planting native, fast-growing species as a mechanism for conserving degraded areas, as well as capturing and conserving carbon reserves. The aim is to reach a total of 7,000 ha by 2030 (4,700 ha of plantations and 2,300 ha of conservation of native species), increasing thereafter to 7,100 ha.	Ministry of Agriculture and the Environment (MAA) – DGASP	Municipalities Family farmers and the private sector	M USD 15,5	Restoration of biodiversity in the revegetated areas and guaranteed access to the ecosystem services provided by the revegetated areas, such as non-timber forest products, conservation and recovery of soil fertility, water regulation, among others, soil conservation and erosion reduction.	   			
Action 1 Mobilising resources to implement the reforestation and ecosystem conservation project								
Action 2 Training producers in tree planting and conservation								
Action 3 Establishment of plantations and biodiversity conservation initiatives								
Action 4 Monitoring and evaluation (Forest inventory)								
Agroforestry								
Establishment of agroforestry systems as a mechanism for conserving carbon reserves, conserving soils and establishing sustainable models for growing fruit trees in agricultural fields and homes. The aim is to establish 3,000 hectares by 2030, which can be expanded to 3,250 by 2035 and maintained until 2050.	Ministry of Agriculture and the Environment (MAA) – DGASP	Municipalities Family farmers and the private sector	M USD 6,8	Recovery, soil conservation and slope stabilisation, promotion of gender integration, food diversification and sources of income among agroforestry system practitioners.	   			
Action 1 Mobilising resources to implement the reforestation and ecosystem conservation project								
Action 2 Training to strengthen producers' and farmers' capacities in agroforestry systems								
Action 3 Establishment of fields with agroforestry systems								
Action 4 Monitoring and evaluation								

