climate action AUTHORITY

MALTA'S FIRST BIENNIAL TRANSPARENCY REPORT

THE FIRST BIENNIAL TRANSPARENCY REPORT OF MALTA UNDER THE PARIS AGREEMENT

2024

Malta's First Biennial Transparency Report
December 2024

REPORT PURSUANT TO

in accordance with the modalities, procedures and guidelines (MPGs) information referred to in Article 13 of the Paris Agreement at their discretion.

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Prepared by the Climate Action Authority on behalf of the Ministry for Environment, Energy and Public Cleanliness (MEEC).

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Gases

CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
F-gases	Fluorinated gases
HFCs	Hydrofluorocarbons
N_2O	Nitrous oxide
NF_3	Nitrogen trifluoride
NH_3	Ammonia
NMVOC	Non-methane volatile organic compound
NOx	Nitrogen oxides
PFCs	Perfluorocarbons
SF6	Sulphur hexafluoride
SO_2	Sulphur dioxide

Other

AWMP	Agriculture Waste Management Plan for the Maltese Islands
BTR	Biennial Transparency Report
CAP	Common Agricultural Policy
CoGAP	Code of Good Agriculture Practice for Malta
CO_2eq.	Carbon dioxide equivalent
C&D	Construction & Demolition
COP	Conference of the Parties
CRF	Common Reporting Format
CTF	Common Tabular Format
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guarantee Fund
EC	European Commission
EEA	European Environment Agency
ETF	Enhanced Transparency Framework Reporting tool
FAOSTAT	Food and Agriculture Organization Statistics
GHG	Greenhouse Gas
GWP	Global Warming Potential

IMP	Integrated Pest Management
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LULUCF	Land-Use Change and Forestry
LUM	Land Use Matrix
MBT	Mechanical Biological Treatment Plant
MCAST	Malta College of Arts, Science & Technology
MEEC	Ministry for the Environment, Energy and Public Cleanliness
MPGs	Modalities, Procedures and Guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement
MRF	Material Recovery Facility
NAP	Nitrates Action Programme
NDC	Nationally Determined Contribution
NIR	National Inventory Report
NSO	National Statistics Office
OPP	Organic Processing Plant
QA/QC	Quality Assurance/Quality Control
RDP	Rural Development Programme
SEA	Strategic Environmental Assessment
SIMTAP	Self-sufficient Integrated Multi-Trophic AquaPonic project
STP	Sant'Antnin Sewage Treatment Plant
UAA	Utilised Agricultural Area
UNFCCC	United Nations Framework Convention on Climate Change
UWWTD	Urban Waste Water Treatment Directive
WMP	Waste Management Plan
WPM	With Policy Measures scenario
WtE	Waste-to-Energy facility

EXECUTIVE SUMMARY

Chapter 1 Introduction

This report presents Malta's First Biennial Transparency Report (BTR) as required by Article 13 of the Paris Agreement.

The Biennial Transparency Report (BTR) is a key component of the Enhanced Transparency Framework established under Article 13 of the Paris Agreement. Its primary purpose is to provide a transparent and comprehensive account of climate action in alignment with the objectives of the convention and the enhanced implementation outlined in Article 2 of the Paris Agreement. The BTR facilitates the tracking of progress towards the achievement of parties' nationally determined contributions (NDCs) as set forth in Article 4. Additionally, it addresses support provided and received, as well as Parties' adaptation actions under Article 7, including the identification of good practices, priorities, needs, and gaps, to inform the global stocktake under Article 14.

Chapter 2 National Inventory Report

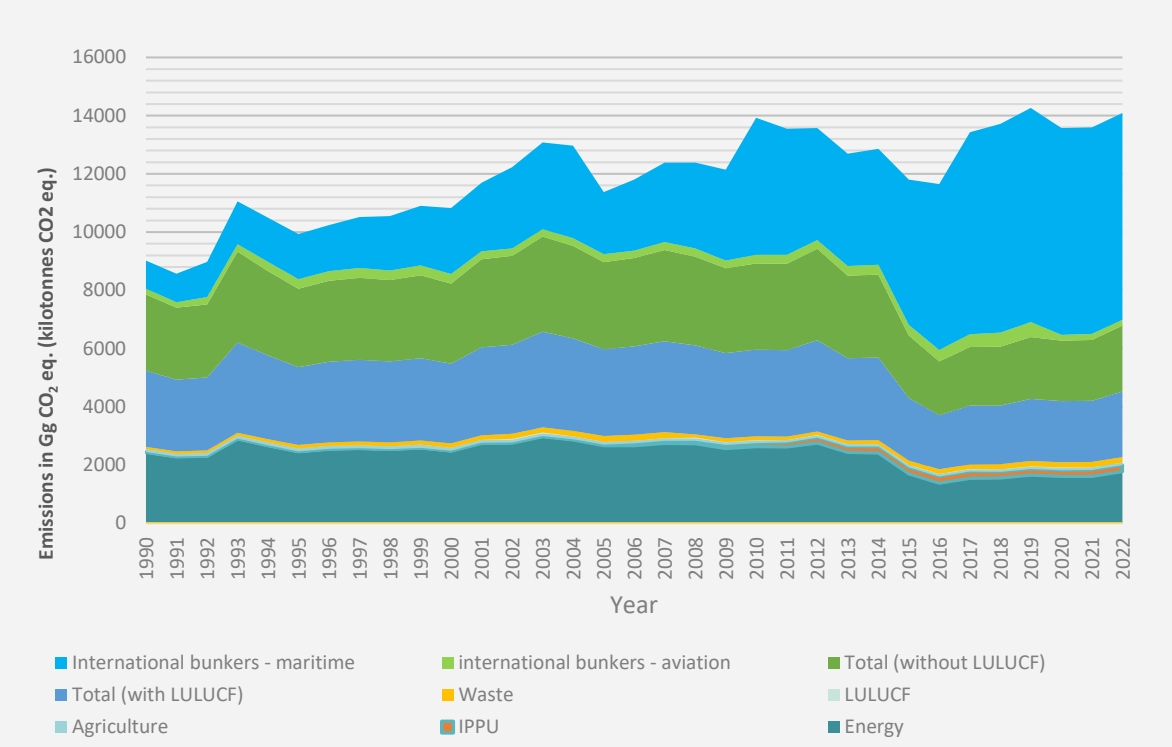
Malta's latest greenhouse gas emissions and removals report (NIR) for the 1990-2022 period has been submitted in September 2024. This report is made up of the national inventory document along with the Common Reporting Tables (CRT) and relevant Annexes. Such report offers a quantitative and qualitative overview of Malta's greenhouse gas emissions and removals, over the said period.

Main trends in Malta's greenhouse gas emissions and removals

The overall profile of total national emissions over the timeseries 1990 to 2022 shows a general decrease in emissions, from 261626 Gg CO_2 eq. with LULUCF in 1990, to 2263.44Gg CO_2 eq. in 2022.

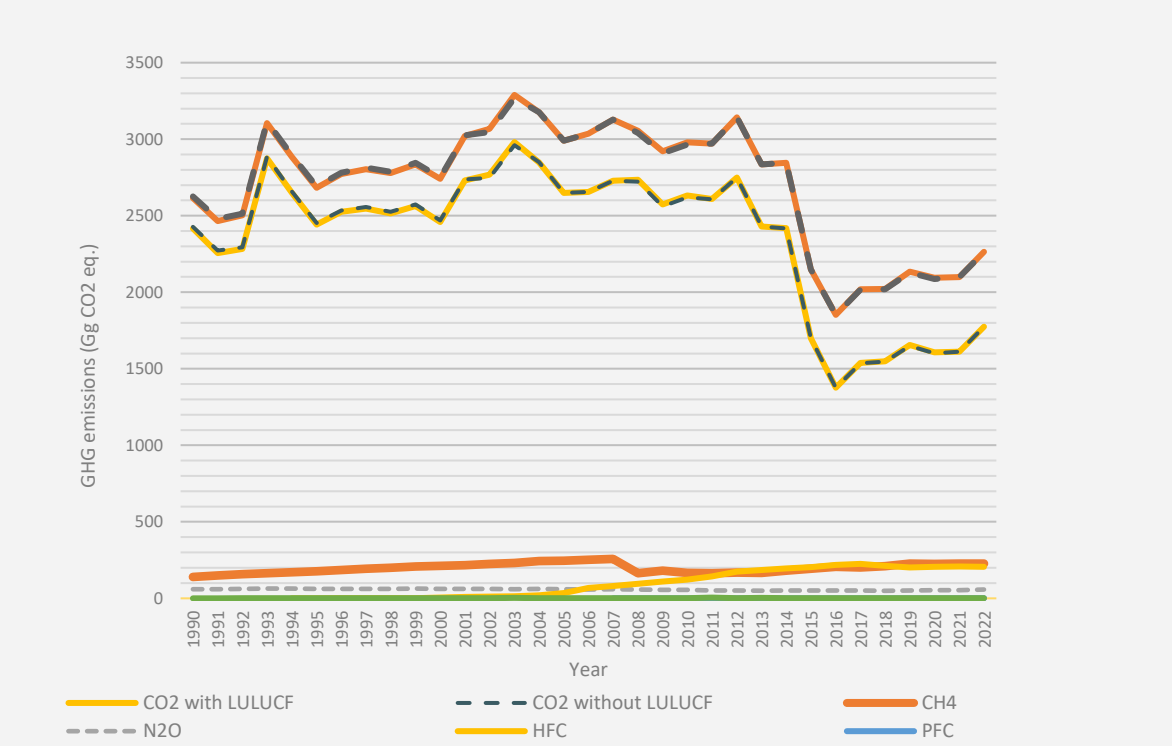
As seen in Figure 1, the overall trend in national greenhouse gas emissions closely mirrors that of the Energy sector. The Energy sector is the largest contributor to emissions, significantly outpacing other sectors, particularly in the early years of the time-series. Consequently, its impact on the total emissions profile is substantial. As estimated for year 2022, the energy sector contributed to 78.52% of Malta's total GHG emissions, followed by IPPU, Waste, Agriculture and LULUCF, respectively.

Figure 1: National greenhouse gas emission trends by sector, including international aviation and maritime bunkers



Throughout the entire time series, carbon dioxide emissions consistently accounted for more than 70% of total national greenhouse gas emissions, exceeding 90% until 2003. This is largely due to the dominant role of the Energy sector in national emissions compared to other sectors, particularly Industrial Processes and Product Use (IPPU). As emissions from the Energy sector have decreased in recent years, and HFC emissions have increased, the relative share of carbon dioxide emissions has declined. Conversely, the rise in HFC emissions from the IPPU sector has led to a growing proportion of HFCs in total national emissions.

Figure 2: Greenhouse gas emission trends by gas



Chapter 3 Information necessary to track progress

As an EU Member State, Malta contributes to the implementation of the European Union's Nationally Determined Contribution (NDC) under the Paris Agreement. In line with the Multilateral Progress and Governance System (MPGS), each EU Member State, including Malta, is required to provide information on the institutional arrangements used to track progress in achieving its climate and energy targets. These arrangements align with the EU's overall monitoring and reporting mechanisms, ensuring standardized reporting for both the EU and its Member States in their Biennial Transparency Reports (BTRs).

The EU's Regulation (EU) 2018/1999, known as the Governance Regulation, establishes a robust governance framework to track the progress of both the Union and its Member States towards their climate and energy commitments. This includes monitoring greenhouse gas (GHG) emissions and removals, reporting on policies and measures, projecting future emissions, and assessing adaptation efforts. The EU has developed a Union Inventory System to ensure that data submitted by the Member States is timely, transparent, accurate, and consistent. This system incorporates a quality assurance and quality control programme, which helps ensure the credibility of the data used to track progress towards the EU's climate goals, including the NDC target of a 55% net emission reduction by 2030 compared to 1990 levels.

Each EU Member State, including Malta, compiles its GHG inventory following the Paris Agreement guidelines and the Intergovernmental Panel on Climate Change (IPCC) standards. These inventories are submitted electronically to the European Environment Agency (EEA), where they undergo rigorous quality checks before being integrated into the EU-wide inventory. The data is crucial for tracking progress toward the EU's climate goals, including those related to international aviation and maritime emissions, which are accounted for separately based on specific methodologies provided by the Joint Research Centre.

Additionally, under the Governance Regulation, Member States are required to report biennially to the European Commission on the progress of their national energy and climate plans (NECPs). These reports are essential for ensuring that the EU and its Member States remain on track to achieve their climate-neutrality objectives and make progress on adaptation.

Overall, Malta's role in the EU's collective climate efforts is integral to meeting the EU's ambitious targets for 2030, 2040 and 2050.

The European Union (EU) and its Member States have established a comprehensive framework to meet the EU's climate change mitigation targets, with the European Climate Law setting a goal of climate neutrality by 2050 and a 55% reduction in net greenhouse gas (GHG) emissions by 2030, compared to 1990 levels. This 2030 target aligns with the EU's Nationally Determined Contribution (NDC). To ensure these targets are met, the 2030 Climate and Energy Framework was introduced, consisting of key policies such as the EU Emissions Trading System (EU ETS), the Land Use, Land Use Change and Forestry (LULUCF) Regulation, and the Effort Sharing Regulation (ESR). These policies aim to manage emissions across various sectors, including energy, industry, transport, agriculture, and waste.

The EU ETS, which caps GHG emissions from energy, industry, aviation, and maritime transport, has been revised to increase its emission reduction ambition from 43% to 62% by 2030, compared to 2005 levels, and now includes international maritime transport. Additionally, a new carbon pricing system will be applied to road transport, buildings, and small-emitting sectors (ETS2), with a 42% emission reduction target. The ESR has also been updated, increasing the EU-level target for the covered sectors to 40% by 2030. Furthermore, the LULUCF Regulation sets an EU-wide target of 310 Mt CO_2 equivalent in net removals by 2030.

Under the ESR, each Member State is assigned specific national GHG reduction targets and is subject to progressively decreasing annual emission limits from 2021 to 2030. Progress is tracked through regular reporting and annual assessments, with flexibility options available to ensure compliance. The Governance Regulation oversees the implementation of these policies, ensuring that GHG inventories, policies, and projections are regularly monitored and reported by the European Environment Agency (EEA).

To support the effective implementation of these measures, the European Commission evaluates national progress through the review of National Energy and Climate Plans (NECPs), providing recommendations for improved planning and actions. Stakeholder engagement is a key part of the legislative process, with the EU employing "better regulation tools" to ensure that policy decisions are based on evidence and stakeholder input. Member States are also required to involve the public in the preparation of their NECPs to ensure broad participation and transparency.

Overall, the EU's climate policy framework is designed to guide Member States towards achieving the ambitious 2030 and 2050 climate targets with continuous monitoring and opportunities for adjustment to ensure progress is on track.

Policies and measures and projections

To help the EU and its Member States meet their goals, the 2030 Climate and Energy Framework was established. Key components of this framework include the EU Emissions Trading System (EU ETS), which limits greenhouse gas (GHG) emissions in sectors such as energy, industry, aviation, maritime transport, and, with the introduction of ETS 2, emissions from road transport and buildings; the LULUCF Regulation, setting national targets for net removals in the land use, land-use change, and forestry sector; and the Effort Sharing Regulation (ESR), which defines national GHG reduction targets for sectors not covered by the EU ETS or LULUCF Regulation. The ESR is supported by additional sector-specific policies at both the European and national levels. The 2030 framework's legislative acts require the European Commission and EU Member States to establish the necessary institutional structures for policy implementation. The progress of these efforts is monitored under the Governance Regulation.

On the national front, Malta, has launched the development of a forward-looking economic vision for 2050 - Vision Malta 2050. This vision will set the strategic direction for the country over

the coming decades, with the central aim of enhancing the quality of life for all citizens, focusing on important areas like digital innovation, infrastructure, education, healthcare, sustainability, and jobs. It will include key milestones up to 2035 to ensure continuous and significant progress towards these strategic objectives. This initiative arises from the need for Malta to adapt to the increasingly complex challenges and opportunities of the 21st century. Vision Malta 2050 will address emerging issues such as climate change, technological advancements, demographic shifts, and global market dynamics, with the goal of positioning Malta as a resilient, competitive, and sustainable nation. The vision will serve as a roadmap for the country's economic, social, and environmental development, focusing on digital innovation, infrastructure, education, healthcare, and sustainability to ensure a higher quality of life for both present and future generations. This vision is a key element in Malta achieving its climate neutrality and securing a sustainable future.

Malta's emissions projections for 2023 - 2030 are presented in Table , according to the sector as well as by gas. This scenario includes only the with existing measures.

Table 1: Emissions projections "with existing measures" by sector and by gas

Energy	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	1802.51	1823.51	1852.77	1786.56	1774.96	1555.95	1512.35	1479.84
CO_2 (in kt)	1792.88	1813.79	1842.97	1776.81	1765.22	1546.42	1502.90	1470.48
CH_4 (in kt)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
N_2O (in kt)	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02
IPPU	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	208.99	207.94	206.00	204.03	202.07	200.25	198.41	197.88
CO_2 (in kt)	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
CH_4 (in kt)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
N_2O (in kt)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
F-gases (in kt of CO_2 Eq.)	202.75	201.70	199.74	197.77	195.81	193.98	192.13	191.60
Agriculture	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	86.62	83.51	81.49	82.26	77.66	78.13	78.82	77.59
CO_2 (in kt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CH_4 (in kt)	1.69	1.65	1.65	1.68	1.64	1.66	1.67	1.64
N_2O (in kt)	0.15	0.14	0.13	0.13	0.12	0.12	0.12	0.12
LULUCF	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	0.93	3.37	2.31	2.35	3.29	2.57	2.95	3.16
CO_2 (in kt)	0.38	2.83	1.78	1.82	2.76	2.04	2.41	2.61
CH_4 (in kt)	NA	NA	NA	NA	NA	NA	NA	NA
N_2O (in kt)	NA	NA	NA	NA	NA	NA	NA	NA
Waste	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	188.14	187.98	182.52	177.60	176.85	176.77	174.21	166.75
CO_2 (in kt)	0.25	0.25	0.97	0.97	0.98	0.97	0.97	0.97
CH_4 (in kt)	6.46	6.46	6.29	6.14	6.14	6.14	6.05	5.78
N_2O (in kt)	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01

Chapter 4 Climate change impacts and adaptation

Malta, as a small island nation, faces significant risks from climate change due to its limited land area, reliance on coastal infrastructure, and dependence on vulnerable economic sectors such as tourism and agriculture amidst others. The importance of climate adaptation has gained global recognition, with the EU highlighting the need for climate resilience through the 2021 adaptation strategy and the European Climate Law, which stresses the necessity of sector-specific measures to withstand climate impacts. In 2024, the European Environment Agency's Climate Risk Assessment identified 36 critical climate risks, particularly affecting Southern Europe and coastal regions, including Malta. These risks include heatwaves, droughts, flooding, and sea-level rise, all of which threaten both economic stability and environmental health.

The European Climate Risk Assessment emphasizes the importance of integrated, multi-level governance actions to enhance resilience and adapt policies. This aligns with the global push for adaptation, as outlined in Article 7 of the Paris Agreement and the UAE Framework for Global Climate Resilience, which sets targets for adaptation actions. Malta is closely monitoring these international efforts, including the two-year UAE-Belém work programme focused on developing indicators for progress.

Locally, Malta is taking proactive steps to address climate adaptation. The country's Low Carbon Development Strategy (LCDS) outlines a pathway to achieve carbon neutrality by 2050, with 47 sector-specific measures across areas such as energy, transport, buildings, and agriculture. Additionally, Malta's Vulnerability Risk Assessment (VRA) provides an in-depth analysis of sectoral vulnerabilities and adaptive capacities, informing the development of targeted adaptation strategies. These initiatives are essential for guiding Malta's climate resilience efforts and will be further explored in the following chapters.

Chapter 5 Support provided and mobilised

Despite not being classified as an Annex II country under the United Nations Framework Convention on Climate Change (UNFCCC), Malta has actively contributed to global climate change efforts, a notable achievement given its small size and limited natural resources. Malta's primary contributions focus on providing financial aid and capacity-building support to developing countries, helping them enhance resilience to climate change and transition to sustainable development.

Malta allocates this financial support through its annual budget, with various ministries and public entities involved in directing funds to effective climate action projects. The country prefers grant-based assistance, offering concessional, non-repayable funds, which is especially beneficial for developing nations facing economic challenges and limited access to other funding sources.

Given its limited administrative capacity to manage large-scale aid programs, Malta channels its contributions through multilateral organizations, with the Green Climate Fund (GCF) being a key platform for supporting developing countries' climate efforts. Additionally, through its "Island for Islands" initiative, Malta focuses on assisting small island developing states (SIDS), which are particularly vulnerable to climate change. These contributions reflect Malta's commitment to global climate resilience and sustainable development.

From 2013 to 2022, Malta has provided over €1.2 million of climate finance contributions. Malta has repeatedly increased yearly climate finance contributions over these last ten years, with the amount provisioned in 2022 increasing by 667% from the first contributions in 2013, as well

as doubling from the contributions in 2021. Aid provided through multilateral channels was yet again doubled in 2023 and is projected to remain constant in the coming years.

In conclusion, this Biennial Transparency Report highlights Malta's commitment to climate action under the Paris Agreement. The report presents critical data on Malta's emissions trends, adaptation strategies, and contributions to global climate finance, demonstrating the country's continued dedication to sustainable development and climate resilience. Looking ahead, Malta will continue to refine its policies and enhance its contribution to both national and international climate goals, ensuring that the necessary steps are taken to mitigate and adapt to the challenges of climate change. This report underscores the importance of collaboration and transparency in driving global climate progress and achieving long-term sustainability.

CHAPTER 1 INTRODUCTION

This report presents Malta's First Biennial Transparency Report (BTR).

Under the Enhanced Transparency Framework (ETF), all Parties under the Paris Agreement are obligated to submit Biennial Transparency Reports (BTR) every two years, with the first submission due by 31 December 2024.

In the BTR, Parties are required to evaluate the actions they have taken to fulfil their climate commitments. Countries must detail their efforts to reduce emissions, outline the climate policies they are implementing, and demonstrate how they are ensuring the provision of climate finance where it is most needed.

As outlined in the modalities, procedures, and guidelines (MPGs) for the ETF (as detailed in the annex to decision 18/CMA.1), the BTR must include information on national inventory reports (NIR), progress towards achieving Nationally Determined Contributions (NDCs), implemented policies and measures, the impacts of climate change and adaptation efforts, as well as the levels of support for financial resources, technology development and transfer, and capacity-building. The BTR should also address capacity-building needs and identify areas for improvement.

Malta submitted its fifth Biennial Report in December 2022 and its latest National Inventory Report (covering the period 1990-2022) to the UNFCCC in September 2024, accompanied by the CRT tables and Annexes.

CHAPTER 2 NATIONAL INVENTORY REPORT

2.1 INTRODUCTION

Malta submitted its latest National Inventory Report (covering the period 1990-2022) to the UNFCCC in September 2024 as a standalone report, accompanied by the CRT tables and Annexes.

Kindly refer to the national inventory document of September 2024 submission which is saved at Malta_GHGInv_1990-2022_NID_Sep2024_Final.pdf

With regards to the reference referred in paragraph 22 of the MPGs (paragraph provided below), the reference is not applicable for Malta as all categories follow the 2006 IPCC Guidelines.

Paragraph 22 of the MPGs states that "*nationally appropriate methodologies may be used if they better reflect a Party's national circumstances, provided they are consistent with the 2006 IPCC guidelines referenced in paragraph 20. In such cases, each Party must transparently explain the national methods, data, and/or parameters selected*".

Furthermore, paragraph 23 of the MPGs states that a party "*may be unable to adopt a higher tier method for a particular key category owing to lack of resources. In such cases, the Party may use a tier 1 approach, and shall clearly document why the methodological choice was not in line with the corresponding decision tree of the IPCC guidelines referred to in paragraph 20 of the MPGs*".

The table below includes the explanation of the methodologies used for each key category according to the sector and the reason it deviates from the decision tree of the guidelines.

Table 2: Explanation of methodologies used for each key category, for year 2023.

Sector	Key Category	Method used	Explanation
Energy	1A1 Public electricity and heat production – Gaseous Fuels – CO_2	T2	Country specific emission factors are used to calculate CO2 emissions from public electricity and heat production. This methodology choice is in line with the decision tree of the IPCC Guidelines since no detailed estimation model is available.
Energy	1A1 Public electricity and heat production – Liquid Fuels – CO_2	T1	The methodology used differs from the suggestion to use of higher tiers by the IPCC Guidelines due to unavailability of detailed estimation models and country specific emission factors for CO2
Energy	Manufacturing industries and construction – Liquid Fuels – CO_2	T1	The methodology used differs from the suggestion to use of higher tiers by the IPCC Guidelines due to unavailability of detailed estimation models and country specific emission factors for CO2
Energy	Commercial/Institutional – Liquid Fuels – CO_2	T1	The methodology used differs from the suggestion to use of higher tiers by the IPCC Guidelines due to unavailability of detailed estimation models and country specific emission factors for CO2

Energy	Residential - Liquid Fuels – CO_2	T1	The methodology used differs from the suggestion to use of higher tiers by the IPCC Guidelines due to unavailability of detailed estimation models and country specific emission factors for CO2
Energy	Agriculture/Forestry/Fishing – Liquid Fuels – CO_2	T1	The methodology used differs from the suggestion to use of higher tiers by the IPCC Guidelines due to unavailability of detailed estimation models and country specific emission factors for CO2.
Transport	1.A.3.d: Domestic Navigation -CO_2	T1	According to the IPCC guidelines, a higher Tier methodology should be used if domestic navigation is identified as a key category. While CO_2 emissions from domestic navigation are considered a key category for Malta, the lack of country-specific emission factors prevents the transition to Tier 2 methodology. As a result, Malta continues to use Tier 1 for estimating these emissions.
IPPU	2F1 Refrigeration and Air Conditioning	T2	The approaches used for the estimation of emissions from the sub-categories of 2F1 are in line with Figure 7.6 of Chapter 7 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; either Tier 2a or Tier 2b.
Agriculture	Enteric Fermentation	T1, T2	Following the suggestions from the 2006 IPCC guidelines, the categories of Cattle and Sheep follow Tier 2 method, and the categories of Swine, Rabbits, Horses, Goats and Hinnies follow Tier 1 method.
LULUCF	Not Applicable	Not Applicable	Not Applicable
Waste	Solid Waste Disposal	M, T2	Since Tier 3 methods require the use of nationally developed key parameters or country-specific measurements, Malta applies Tier 2 methods, utilizing the IPCC First Order Decay (FOD) method along with default parameters and good quality country-specific activity data, as outlined in the 2006 IPCC Guidelines.

With regards to paragraph 39 of the MPGs which states that "*Each Party shall report methods used, including the rationale for the choice of methods, in accordance with good practice elaborated in the IPCC guidelines referred to paragraph 20, and the descriptions, assumptions, references and sources of information used for the emission factors and activity data used to compile the GHG inventory*". This is explained under each sectoral chapter in the NIR, under the 'overview of sector' section, found in chapters 3 till 7.

The table below includes an explanation for the sources and sinks which are not being estimated for in the NIR since these are not relevant in the context of Malta. This is in accordance with paragraph 30 of the MPGs which states that "*Each Party should indicate the*

sources and sinks (categories, pools and gases) that are not considered in the national inventory report but for which estimation methods are included in the IPCC guidelines referred to in paragraph 20 and explain the reasons for such exclusion".

Table 3: Sources and sinks that are not considered in the national inventory report and their explanation.

Sector	Category/Categories	Explanation
Energy	1A1aii Combined Heat and Power Generation (CHP)	In Malta, Combined Heat and Power (CHP) plants are not available for direct public use hence this category is reported as NO in the NIR submission, for all timeseries.
Energy	1A1aiii Heat Plants	In Malta, there is no production of heat from main activity producers for sale by pipe network, hence this category is reported as NO in the NIR submission, for all timeseries.
Energy	1A1b Petroleum Refining	In Malta, there are no petroleum refining activities, hence this category is reported as NO in the NIR submission, for all timeseries.
Energy	1Ac Manufacture of Solid Fuels and Other Energy Industries	In Malta, there are no activities for manufacturing secondary and tertiary products from solid fuels, hence this category is reported as NO in the NIR submission, for all timeseries.
Energy	1B - Fugitive emissions from fuels	National data on fugitive emissions is not available in Malta, hence this category is reported as NA in the NIR submission, for all timeseries
Energy	1C – Carbon dioxide – Transport and Storage	In Malta, there are no carbon dioxide transport and storage activities, hence this category is reported as NO in the NIR submission, for all timeseries.
Transport	1.A.3.c- Railways	This category is not applicable to Malta, as the country does not have any railway infrastructure.
IPPU	2C Metal Industry 2E Electronics Industry 2H Other	These categories are reported as NO in the 2025 submission of the NID because they did not occur in Malta; 2C and 2H did not occur throughout the whole timeseries, whereas 2E did not occur intermittently, including in the year 2023.
Agriculture	Buffalos	This livestock category exists in the IPCC guidelines but in Malta we do not have buffalos, hence they are not included in our NIR.
Agriculture	Other (e.g., Llamas, Alpacas, Deer)	Other livestock, such as Llamas, Alpacas and Deer exist in the IPCC guidelines but in Malta we do not have them, hence they are not included in our NIR.
LULUCF	Harvested Wood Products	In Malta there is no relevant harvest commercialized for material use, and wood for material use is currently imported from other countries.
Waste	5.C.2. Open burning of waste	Open burning of waste does not take place in Malta hence, no data is available. This has been confirmed by the regulator for waste management operators, Environment and Resources Authority, ERA. Refer to section 7.4.8 of the NIR.

2.1.1 GENERAL UNCERTAINTY EVALUATION, INCLUDING DATA ON THE OVERALL UNCERTAINTY FOR THE INVENTORY TOTALS

In accordance with paragraph 29 and 44 of the MPGs, an Approach 1 assessment of uncertainty is being provided in the National Inventory Report of the 2024 submission. Total inventory uncertainty has been determined at 6.07% and trend uncertainty at 6.32%.

As part of its ongoing capacity building project, the inventory agency has recently undertaken support from external consultants (Aether Ltd., UK) by setting up a tool which provides detailed Uncertainty to Malta's national GHG inventory by updating the method to determine sector-specific uncertainties and determining overall inventory and trend uncertainties, for reporting in subsequent submissions.

Further information is provided in Article 12 Annex X of the Implementing Regulation (EU) 2020/1208.

The section below summarizes the main trends in Malta's greenhouse gas emissions and removals as outlined in Chapter 2 of the 2024 submission inventory report.

Furthermore, in September 2024, all data inputted in the CRF software tool was transferred to the new reporting tool, the ETF, since year 2024 marks a transitional period.

2.2 SUMMARY

2.2.1 DESCRIPTION AND INTERPRETATION OF EMISSION TRENDS FOR AGGREGATED GREENHOUSE GAS EMISSIONS

The emissions given in this chapter are calculated using the AR5 GWPs in accordance with the Governance Regulation where Member States have to report using the Global Warming Potentials (GWP) emanating from the IPCC Fifth Assessment Report (AR5). In view of this, the reporting of estimations will be updated from AR4 GWPs to AR5 GWPs.

The overall profile of total national emissions over the time-series 1990 to 2022 (*Figure* 3) shows a general increase in total national emissions from 1990 (2616.26 Gg CO_2 eq. with LULUCF; 2626.17 Gg CO_2 eq. without LULUCF) up to the year 2012 (3143.30 Gg with LULUCF CO_2 eq.; 3142.60 Gg CO_2 eq. without LULUCF), and a subsequent rapid general decrease until 2016 (1852.18 Gg CO_2 eq. with LULUCF; 1851.27 Gg CO_2 eq. without LULUCF).

Total national emissions again showed an increase between 2017 and 2019 (2019.08 Gg CO_2 eq.; 2134.06 Gg CO_2 eq.), and then decreased slightly in 2020 (2094.38 Gg CO_2 eq. with LULUCF; 2085.83 Gg CO_2 eq. without LULUCF), the year of the Covid-19 pandemic. In 2022, the total national emissions including LULUCF was 2263.44 Gg CO_2 eq. and the total national emissions excluding LULUCF was 2262.67 Gg CO_2 eq.

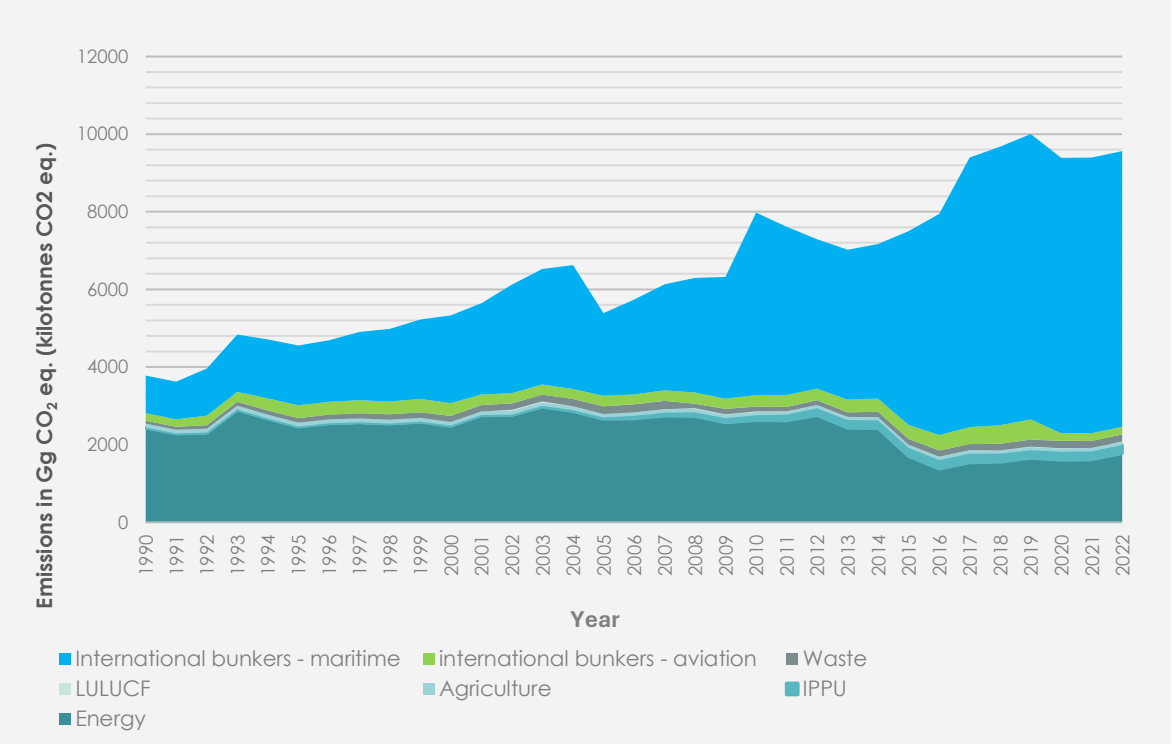


Figure 3: Greenhouse gas emission trends, by sector, including international maritime and aviation bunkers.

As may be observed, the trend profile of total national greenhouse gas emissions follow closely that of the Energy sector. The Energy sector is the highest overall contributor to greenhouse gas emissions, by a significant margin over other sectors, especially towards the beginning of the time-series; thus, its influence on the total emissions profile is decisive. In turn, the Energy sector total is mostly determined by emissions emanating from the two main category contributors, energy generation and transport. Both contribute towards the increase up to 2012. Investment in new generation capacity, fuel switching, and alternative sourcing of electricity all contribute towards the rapid decrease in emissions observed for the years after 2012. This trend is reversed between 2016 and 2017, as there was a shift back towards local electricity generation as opposed to the previous use of the interconnector with mainland Europe's electricity grid.

2.2.2 DESCRIPTION AND INTERPRETATION OF EMISSION TRENDS BY GAS

Carbon dioxide emission have by far the highest influence on total national emissions among all greenhouse gases reported. In fact, the trend for total national emissions closely follows a profile which is very similar to that of carbon dioxide emissions. It is important to also note the significant rate of increase in emissions of hydrofluorocarbons, particularly during the second half of the time-series, which contrasts with the trends of the other greenhouse gases reported. No emissions of nitrogen trifluoride are reported to occur in Malta.

Across the whole time-series, carbon dioxide emissions have always accounted for more than 70% of total national greenhouse gas emissions, surpassing 90% until 2003. This reflects primarily the influence of emissions from the Energy sector in total national emissions in comparison with emissions from other sectors, especially IPPU. As Energy sector emissions have decreased in recent years, coupled with the increase in emissions of HFCs in particular, the relative share of carbon dioxide emissions has decreased. On the other hand, the increase in emissions of HFCs from activities in the IPPU sector is represented by an increase in the share of HFCs in total national emissions.

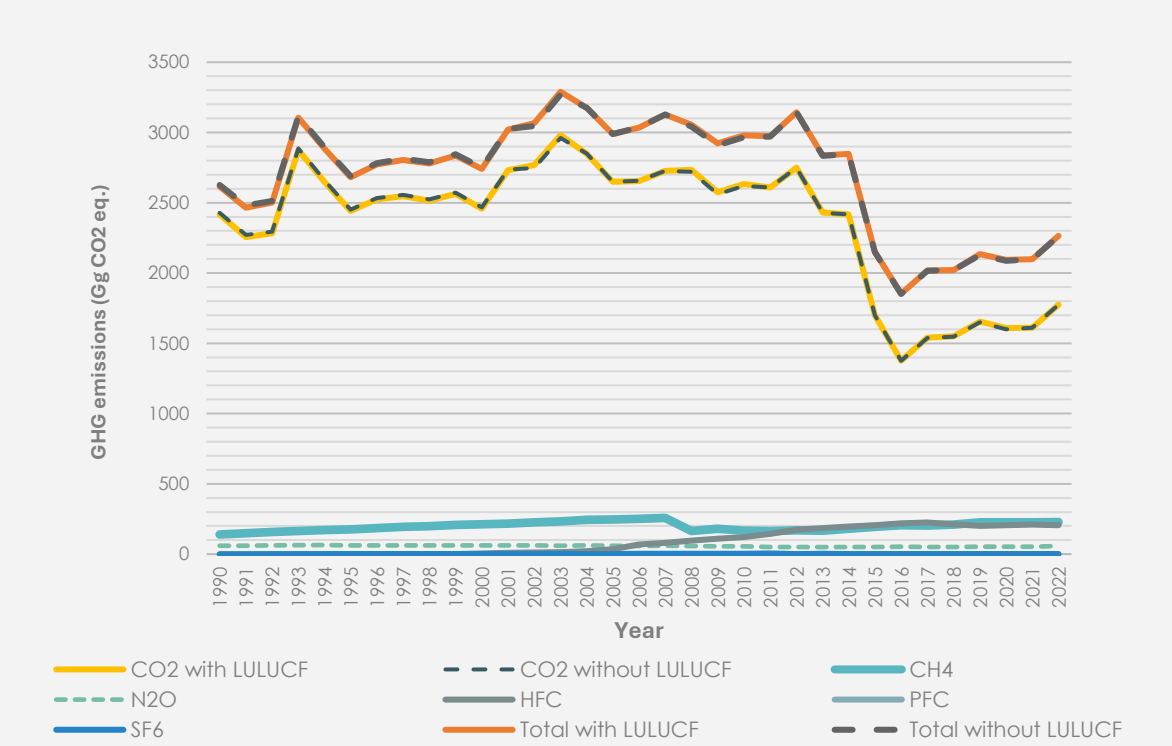


Figure 4: Greenhouse gas emission trends by gas

Carbon dioxide

As already noted, the sector that has the highest contribution towards total CO_2emissions is Energy, being responsible for more than 99% of total carbon dioxide emissions in all years.

Methane

Sectors Waste and Agriculture are the two main contributors towards total national methane emissions. In 2022, sector Waste accounted for 78.81% of total national methane emissions, with a 20.07% contribution by sector Agriculture. A much smaller share is provided by the Energy sector (1.12%). No methane emissions are reported for sectors IPPU and LULUCF.

Nitrous oxide

The main source of emissions of nitrous oxide in Malta is the Agricultural sector, with smaller, but still relatively important contributions by sectors Waste and Energy, and an even lower share for IPPU and LULUCF.

The relative share of sector Agriculture in total national nitrous oxide emissions in 2022 was 71.40%. The relative share of sector Energy had been increasing over time, while that of sector Waste was decreasing, but this trend has reversed recently.

Fluorinated gases

Fluorinated greenhouse gases encompass hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (no emissions of nitrogen trifluoride are reported in Malta), emissions of which are reported under sector IPPU. HFCs are by far the most important class of fluorinated gases

reported by Malta, in terms of overall emissions. The rapid increase in emissions of HFCs is evident since the early 2000's when their emissions start making a contribution to national total emissions.

The importance of emissions of HFCs is also reflected in the fact that this class of gases accounts for a very high share of total sector IPPU emissions. Suffice to say that in 2022, emissions of HFCs account to 96.17% of total emissions, of all gases, in sector IPPU.

2.2.3 DESCRIPTION AND INTERPRETATION OF EMISSION TRENDS BY SECTOR

The below table(Table 4) provides a summary of the percentage contribution of Malta's total GHG emissions by sector for the reporting year 2022 where the Energy sector has the highest % contribution, followed by IPPU, Waste, Agriculture and LULUCF sectors.

Table 4: Contribution (%) of Malta's total GHG emissions by sector in 2022.

Sector	% Contribution of Malta's total GHG emissions
Energy	78.52
IPPU	9.42
Agriculture	3.80
LULUCF	0.03
Waste	8.22

2.2.3.1 Sector Energy emissions

The trend profile for the Energy sector can be split into two main sub-trends, namely a general increase in emissions up to 2012, followed by a rapid decrease over the space of the subsequent few years until 2016, with emissions growing again in 2017. As estimated for year 2022, the energy sector contributes to 78.52% of Malta's total GHG emissions.

Up to 2012, the growth in emissions reflects growing demand for energy, especially electricity generation and transport. The significant efficiency gains achieved in the energy generation sector post-2012 have then impacted on the overall sector emissions in recent years: these gains have been achieved primarily through technical developments taking place in recent years, including investment in new, more efficient local generation capacity, the sourcing of electricity through an interconnector with mainland Europe, and fuel switches including the discontinuation of use of heavy fuel oil. The increase in emissions observed in 2017 compared to 2016 is mainly due to a renewed shift towards indigenous electricity generation, as opposed to outside sourcing, though the impact is markedly subdued because of the shift to natural gas as the main generation fuel.

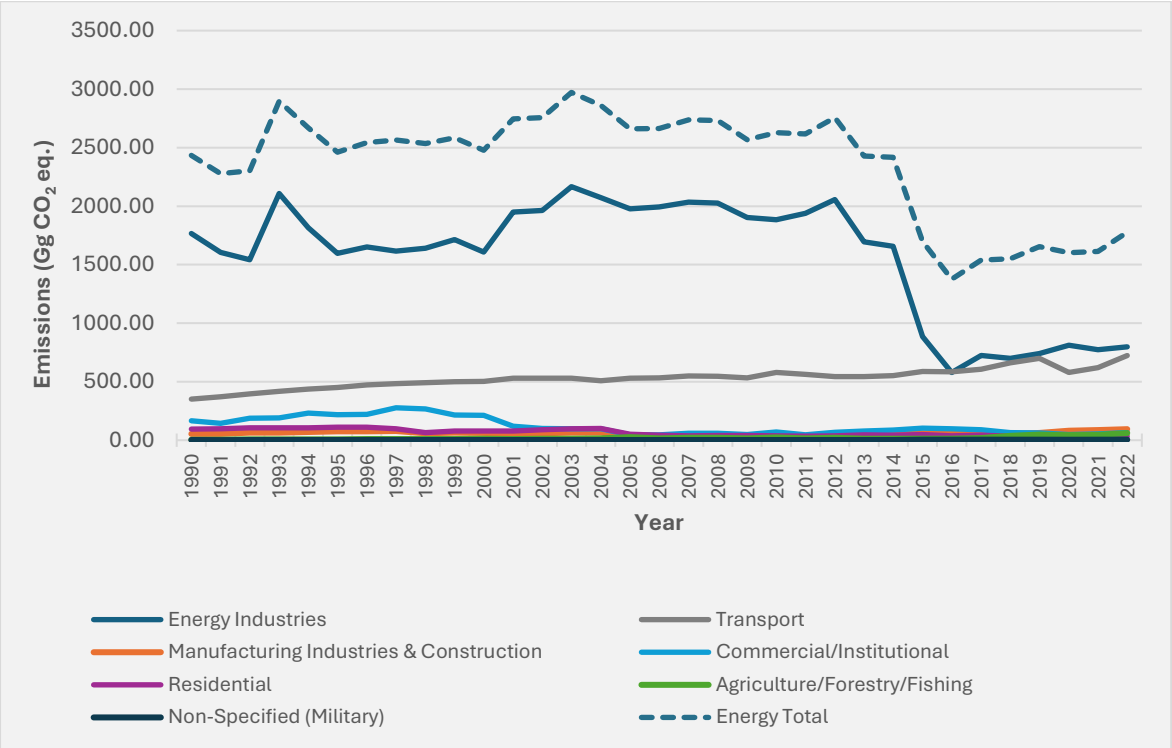


Figure 5: Emission trends for sector Energy, by category

The sharp change in the trend for emissions from category Energy Industries (1A1) clearly shows the potentially high impact of focused policies and measures targeted towards an activity which is defined by a relatively small number of clearly identifiable point sources, especially in the context of a small country such as Malta. It is to note that up to 2016, Public Electricity Production was concentrated in two power generation plants, the Marsa Power Station and what was formerly called the Delimara Power Station. In 2017, the latter was split into two separate commercial enterprises with a fourth new installation built adjacent. Thus, Malta now has four distinct electricity generation plants, with the Marsa plant operating in a much-reduced form and only run on stand-by basis for emergency use.

Emissions from the Transport category (1.A.3), which includes road transport, civil aviation, and national navigation within the Maltese Islands, make up a significant part of national emissions. This category excludes international aviation and navigation activities, which are reported as memo items and are not included in national totals. In recent years, emissions from Transport have been comparable to those from the Energy Industries category. Notably, Transport emissions have exhibited a sustained, gradual increase over the entire time series, with 2016 marking the highest recorded emissions for any category, even exceeding those of Energy Industries.

Sub-category Road Transport (1A3b) is by far the biggest contributor to national total emissions among the three Transport sub-categories mentioned above. This reflects primarily the continued growth in the number of road vehicles.

The bulk of emissions from the Energy sector are carbon dioxide; in 2022, emissions of methane and nitrous oxide for this sector accounted for 0.14% and 0.38% respectively.

The trend of road transport emissions has increased proportionally with the increase in Malta's car fleet. The stock of licensed vehicles in Malta stood at 424,904 by Q4 of 2022. According to

a National Statistics Office News Release entitled 'Motor Vehicles: Q4/2022', a total of 4,992 newly licensed vehicles were added to Maltese roads in 2022 with the majority or 60% being passenger cars. This figure was followed by 1,601 newly licensed motorcycles and e-bikes or 33% of all the newly licensed vehicles.

As stated in paragraph 36 of the MPGs, *"each Party should compare the national estimates of CO2 emissions from fuel combustion with those obtained using the reference approach, as contained in the IPCC guidelines referred to in paragraph 20 and report the results of this comparison in its national inventory report".*

The Sectoral Approach is a 'bottom-up' methodological approach to estimate emissions for individual categories based on activity statistics pertaining to end-users' consumption. This activity data thus presented reflects the activity of the various economic sectors, residential households and other end-users operating within their respective sub-category.

On the other hand, the Reference Approach is a 'top-down' methodological approach to estimate emissions. The activity data used represents total national consumptions, by fuel type, using the national oil balance. Eurostat data was used for compiling the reference approach.

Table 5 shows the comparison between the Reference Approach and the Sectoral Approach for 2022. The total aggregated difference in energy consumption between both approaches is –2.15 and -0.62% difference in CO2 emissions.

Table 5: Differences between the Reference and Sectoral Approach

FUEL TYPES	REFERENCE APPROACH			SECTORAL APPROACH		DIFFERENCE	
	Apparent energy consumption	Apparent energy consumption (excluding non-energy use, reductants and feedstocks)	CO2 emissions	Energy consumption	CO2 emissions	Energy consumption	CO2 emissions
	(PJ)	(PJ)	(kt)	(PJ)	(kt)	(%)	(%)
Liquid fuels (excluding international bunkers)	14.17	13.72	1020.82	14.17	1020.23	-3.16	0.06
Solid fuels (excluding international bunkers)	NO	NO	NO	NO	NO	NO	NO
Gaseous fuels	13.51	13.51	758.17	13.65	747.47	-1.02	1.43
Other fossil fuels	NO,NE	NO	NO,NE	0.01	0.36	-100.00	-100.00
Peat	NO	NO	NO	NO	NO	NO	NO
Total	27.69	27.23	1778.99	27.83	1768.06	-2.15	0.62

The difference in energy consumption, hence CO2 emissions emerges from the different data sources used to compile the sectoral approach. Data from Eurocontrol was used to report

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emissions from international aviation. In addition, the amount of fuels consumed by military was obtained from the Armed Forces of Malta. These amounts (except fuels for automotive purposes) are subtracted from the totals and are reported under category 1.A.5.

Furthermore, biomass data from Eurostat regarding the road transport category is being used. The percentage of FAME in biomass is obtained by the national oil balance or the Fuel Quality Directive and is inputted into the COPERT model which estimates the fossil part of biomass for road transportation. Then this fossil part is ultimately reported under other fossil fuels in category 1A3, (refer to chapter 3.2.6 of the NIR). Unfortunately, biomass is reported as a total number in the Energy Balance from Eurostat, including both the biogenic and fossil part of biomass. Therefore, the discrepancy between both approaches for other fossil fuels is 100%.

Ultimately, gaseous fuels reported under the reference approach are derived from Eurostat. In the sectoral approach, gaseous fuels are taken from reporting by electricity generation plants under the scope of the EU ETS. This is data that is duly verified by independent and competent verifiers in accordance with the rules of the EU ETS. There are two plants that operate on natural gas. These plants use in-line equipment that calculates CO2 directly from analysis of the flowing natural gas.

2.2.3.2 Sector IPPU emissions

The trend profile for sector IPPU (figure below) is clearly dominated by the emissions trend of HFCs, particularly from category Refrigeration and Air-conditioning (CRF 2.F.1). Emissions of HFCs, and, consequently, IPPU emissions, have increased from the early 2000s. Category Refrigeration and Air Conditioning, accounted for 94.51% of all direct greenhouse gas emissions estimated for the IPPU sector in 2022. Emissions from other industrial processes are minimal or even non-existent, considering the nature of the industrial sector in Malta, where industrial activities found in other countries either do not exist or only take place at very small scales.

The emissions contribution from the IPPU sector to the total national GHG emissions in Malta amounted to 9.42% in 2022.

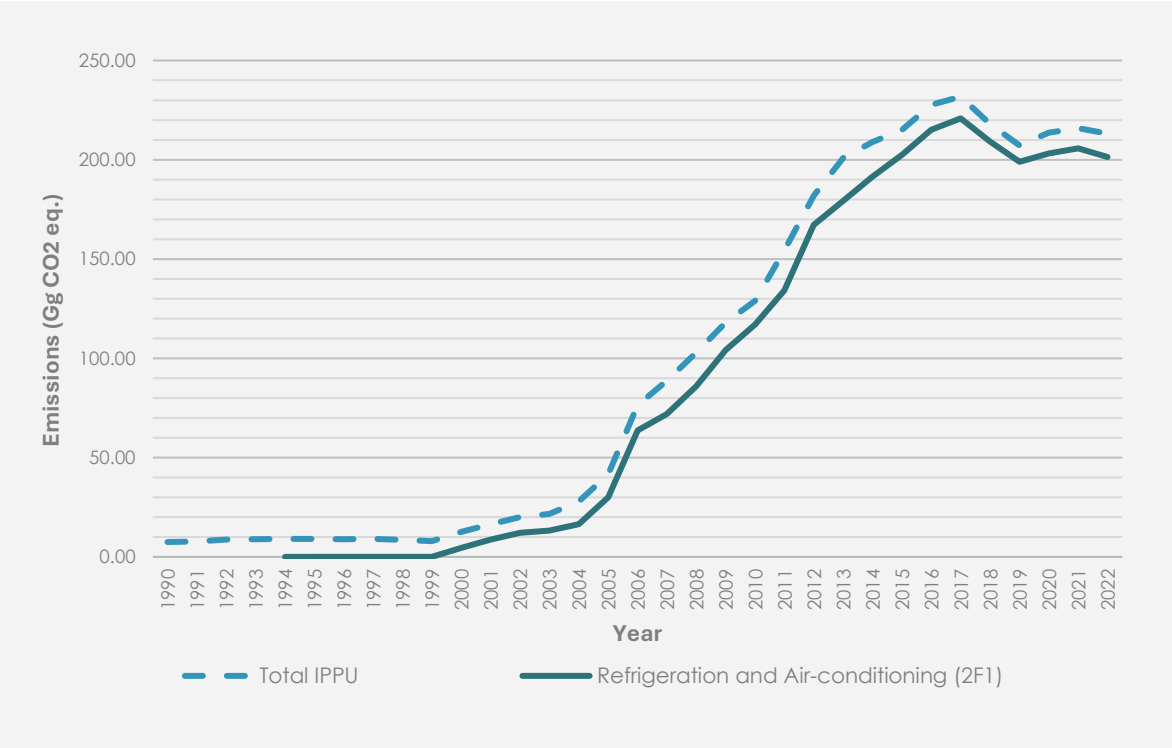

Figure 6: Emission trends for sector IPPU.

2.2.3.3 Sector Agriculture emissions

In general, the agriculture sector is certainly not a major contributor towards total national emissions, as has already been discussed above. The sector has seen a decrease in emissions of around 20% over the 1990 and 2022 period. Within this sector (figure below) the category Enteric Fermentation (3A) has always had the highest share of total sector emissions. In 2022, Enteric Fermentation accounted for around half of the agriculture emissions (45.67%) (figure below), while manure management accounted for 20.59% and agricultural soils accounted for 33.74% of total emissions. In agriculture only two gases are being reported, Nitrous oxide and methane. Methane emissions originate from enteric fermentation and manure management, while nitrous oxide emissions are emitted from manure management and agricultural soils.

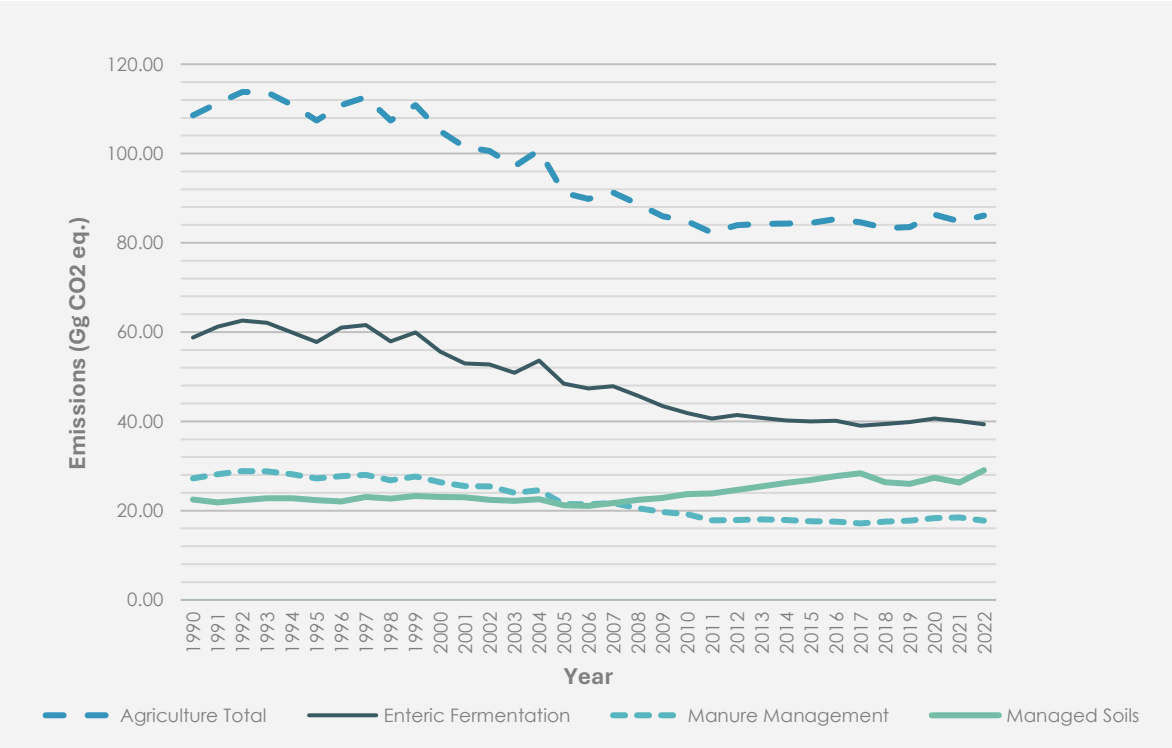

Figure 7: Emission trends for sector Agriculture

Livestock populations have decreased significantly compared to 1990 levels. These changes could be attributed to the rise in the import of meat and dairy products. As a result of these changes in livestock populations and manure management systems, methane emissions from Enteric Fermentation and Manure Management have also declined. The total agricultural area, UAA and fodder crop land, have also decreased; consequently, so have the nitrogen application rates and the Nitrous Oxide emissions.

Methane emissions accounted for 53% of total agriculture emissions, while nitrous oxide accounted for 47% respectively. Enteric fermentation accounted for 86% of total methane emissions, whereas those coming from the management of manure accounted for 14%. Manure management was responsible for 17.67% of nitrous oxide emissions, while 72% of N2O emissions originated from Agricultural soils.

GHGs from manure management and agricultural soils are emitted both directly and indirectly, the latter of which occurs through atmospheric deposition and through leaching and runoff. During 2022, indirect emissions from atmospheric deposition and leaching/runoff totalled to 7.26 Gg CO_2 eq, while direct emissions amounted to 21.79 Gg CO_2 eq. Although in the Maltese agricultural sector both inorganic (synthetic fertilizer) and organic fertilizer (animal manure) is applied to soils, animal manure is applied for the most part. In 2022, it estimated that around 1,987,927 KgN of animal manure were applied per hectare, while 2,054,448 KgN of synthetic fertilizer and 396,035 KgN of organic fertiliser were applied per hectare.

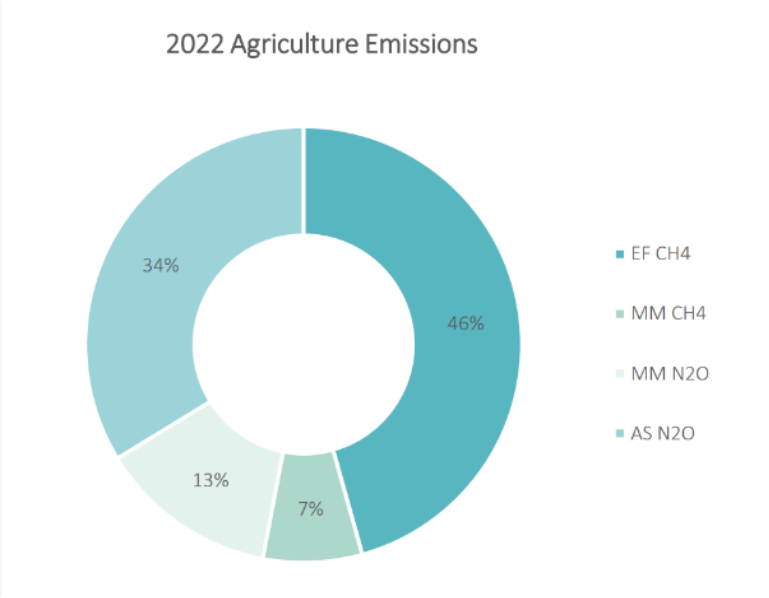

Figure 8: Percentage share of agriculture emissions by gas and category for the year 2022

2.2.3.4 Sector LULUCF emissions

The LULUCF sector has undergone updates with regards to the land use matrix (LUM). The LUM was developed to better develop the land use representation, in view of the implementation of the new updates, based on the land use imagery developed during the project in collaboration with the Malta College of Arts, Science & Technology (MCAST). A collaboration project was started together with MCAST, to address the issue of achieving a complete spatial explicit representation of land use and tracking changes over time in Malta. This includes data related to land and land use imagery and land statistics for the determination of the areas for each category as activity data, including among others, imagery of the Maltese Islands, Copernicus datasets and national statistics. The project assisted in the generation of the Land-use and Land coverage mapping of the Maltese Islands. Details on the technical information of the project are indicated in the 2024 GHG National Inventory Document.

As a result, noting the revision in the land use matrix to better represent the different land use categories of Malta and the conversion within the years, some estimations were recalculated for certain years as relevant.

In the GHG National Inventory, the LULUCF sector comprises estimate calculations from the categories Forest Land (CRF 4.A), Cropland (CRF 4.B), Grassland (CRF 4.C), Wetlands (CRF 4.D), Settlements (CRF 4.D) and Other Land (4.E). CO_2 is the main greenhouse gas emission source and sink from the various categories. Non-CO_2 emissions also occur in the sector including N_2O and CH_4. As of the latest inventory, the sector in Malta represents a net removal of -9.91 $ktCO_2$ eq. in 1990, decreasing to 0.77 $ktCO_2$ eq. by 2022. The sector accounted for less than 1% of Malta's total GHG emissions in 2022.

The main source of emissions throughout the whole time-series as per Figure 9 was represented by the land transitioning to Cropland. Land transitioning to Grassland represents the main sink in the time-series. One can instantly notice the sharp shifts in the emission and removal profile of Cropland. The spikes that are occurring in the estimations in the sector, to the category Land Converted to Cropland in some of the years, are due to the big annual changes occurring in Annual Cropland, where in some of the years, national statistics for 2001, 2003, 2005, 2007 and 2010 etc. are present, while assuming a linear interpolation for the years without data. Unfortunately, this presents an issue and is very challenging to solve, since getting rid of these spikes would mean changing national statistics data. Work is currently ongoing to acquire an improved land use representation data, and thus update the land use time series as necessary.

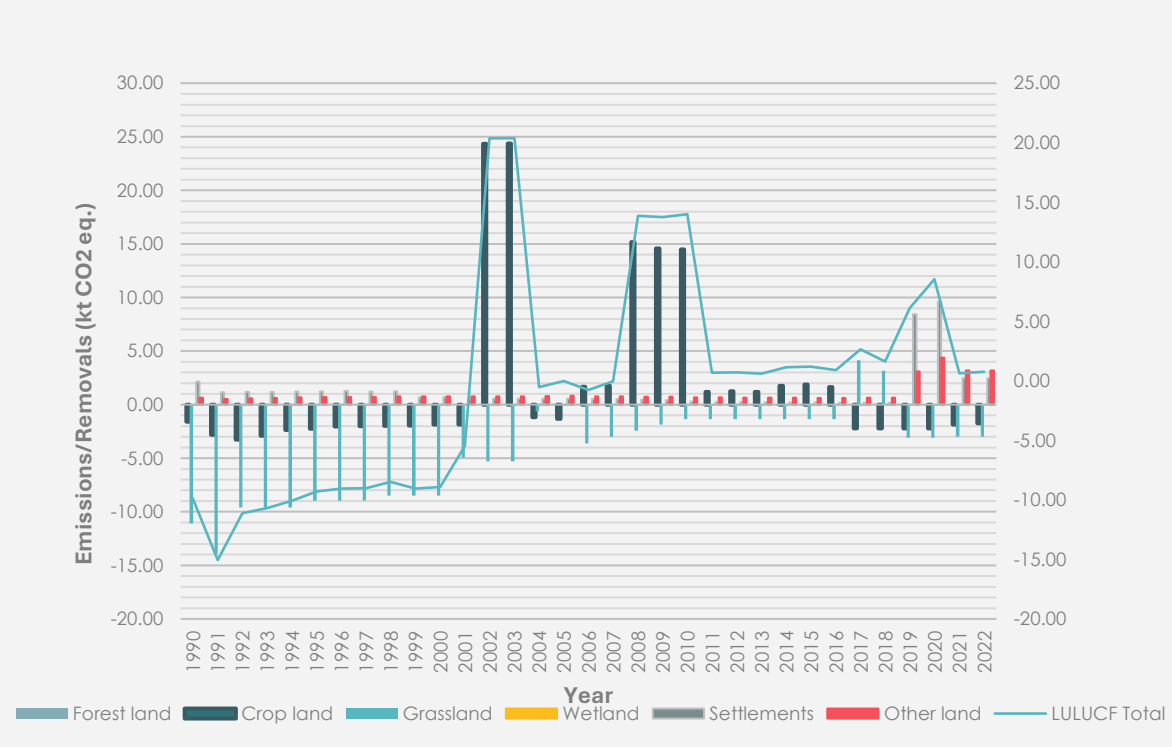

Figure 9: Emission trends for sector LULUCF.

2.2.3.5 Sector Waste emissions

Until the upsurge in IPPU emissions, Waste was the second highest contributing sector towards total national emissions in Malta. The general profile of the trend of emissions from sector Waste is evidently greatly influenced by the profile of emissions for category Solid Waste Disposal (category 5A), this also being the category with the highest share of emissions in this sector. Until the upsurge in IPPU emissions, Waste was the second highest contributing sector towards total national emissions in Malta.

In 2022, 90.59% of all sector Waste emissions were generated by the category Solid Waste Disposal (refer to the figure below). Methane emissions from this category are also the predominantly emitted greenhouse gas in this sector; emissions of nitrous oxide and carbon dioxide have relatively small shares of total sector emissions. In fact, a relatively large proportion of emissions reported are emitted from landfill operations.

As estimated for year 2022, the Waste sector contributes to 8.22% of Malta's total GHG emissions.

Methane emissions from the waste sector

The waste sector, together with the agriculture sector, are the two main contributors to total national methane emissions, with the share from the waste sector increasing over time. In fact, in 2022, the waste sector accounted for 78.8% of total methane emissions.

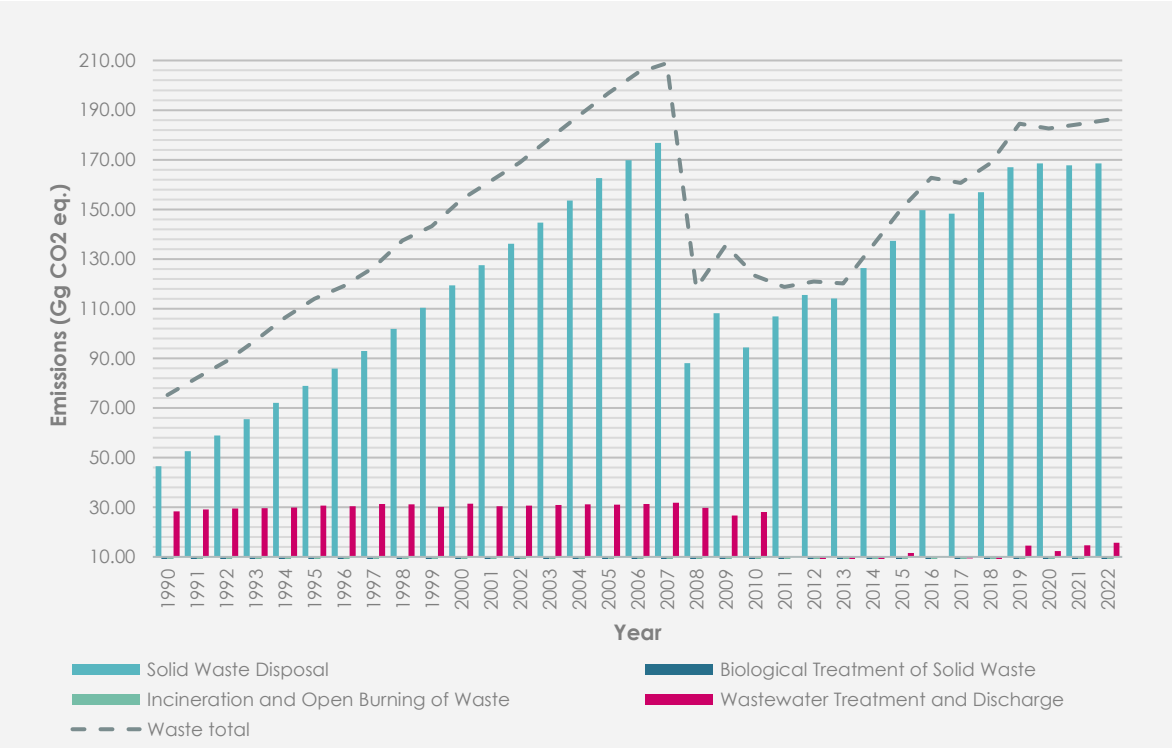

Figure 10: Emission trends for sector Waste.

As presented in the figure below, the trend in the waste sector displays a growth of emissions throughout the period up to year 2007. However, a drastic decrease in emissions is manifest in year 2008, mainly in the Solid Waste Disposal on Land category (5.A). The reasons behind this abrupt change of trends are further explained in detail in the sector-specific sections describing the respective categories (refer to section 7.2 of the National Inventory Document). However, the reason for the significant reduction in year 2008 from the Solid Waste Disposal category was due to the commencement of operations at the Material Recovery Facility in the Sant Antnin Waste Treatment Plant. The aim of this facility was to reduce emissions from the Waste sector. Nonetheless, and despite showing a number of year-to-year fluctuations, emissions from the waste sector continue to show a general increase over the years following 2009, mainly due to the continuation of landfilling practices.

Waste sector emissions have increased by 147% since 1990 and reduced by 5% since 2005.

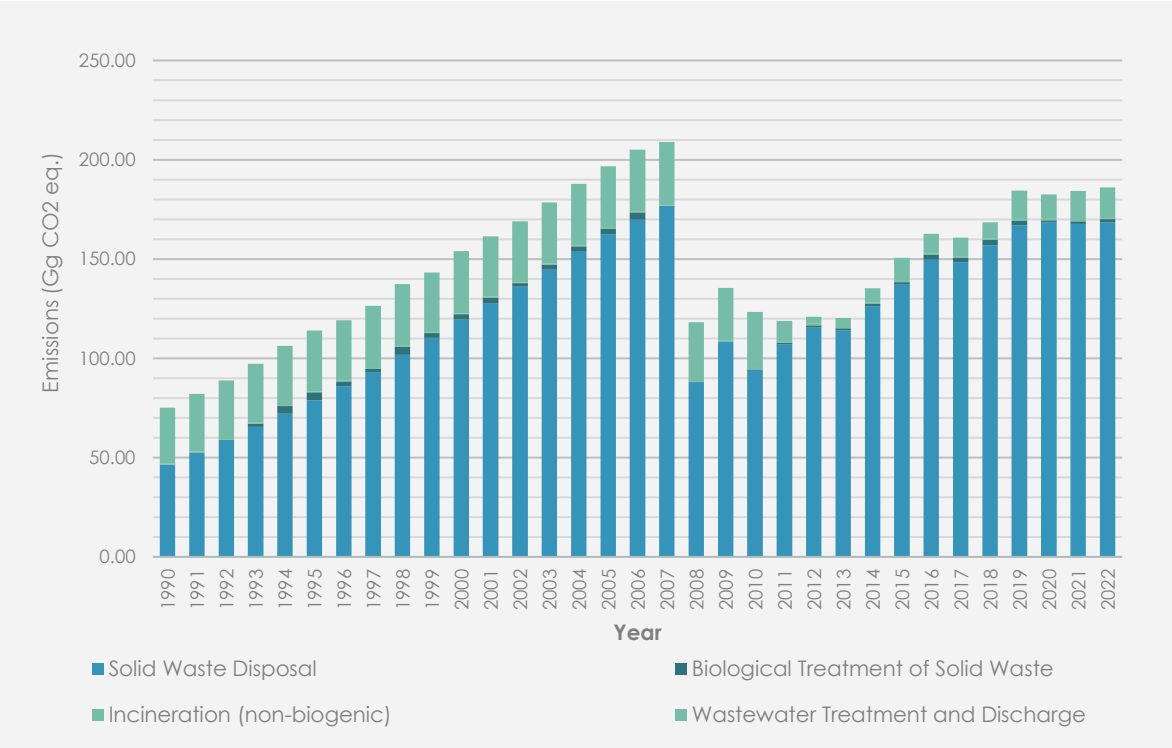

Figure 11: Total GHG emissions from waste management overview by activity for sector Waste

Furthermore, the below figure shows the contribution in carbon dioxide equivalents (CO_2 eq.) of carbon dioxide, methane and nitrous oxide emissions in the latest inventory year. As shown, a large proportion of percentage share is from CH4 emissions resulting mostly from solid waste disposal on land category. SWD on land is then followed by methane emissions in wastewater treatment and discharge category, biological treatment of solid waste, and incineration. The second percentage share of emissions are N2O from wastewater treatment and discharge category and incineration, and then followed by CO_2 emissions from incineration.

However, waste management practices are continuously being improved with newer technologies being planned and implemented mainly in the solid waste treatment sector, with an increased amount of organic fraction being directed to alternative processes (such as bio-digestion), increased recycling and material recovery and aerobic treatment of liquid waste. The need to divert organics in general from solid waste disposal is the main reason behind such trends. Please refer to the sector-specific sector section 7.1 of the National Inventory Report regarding waste facilities in Malta.

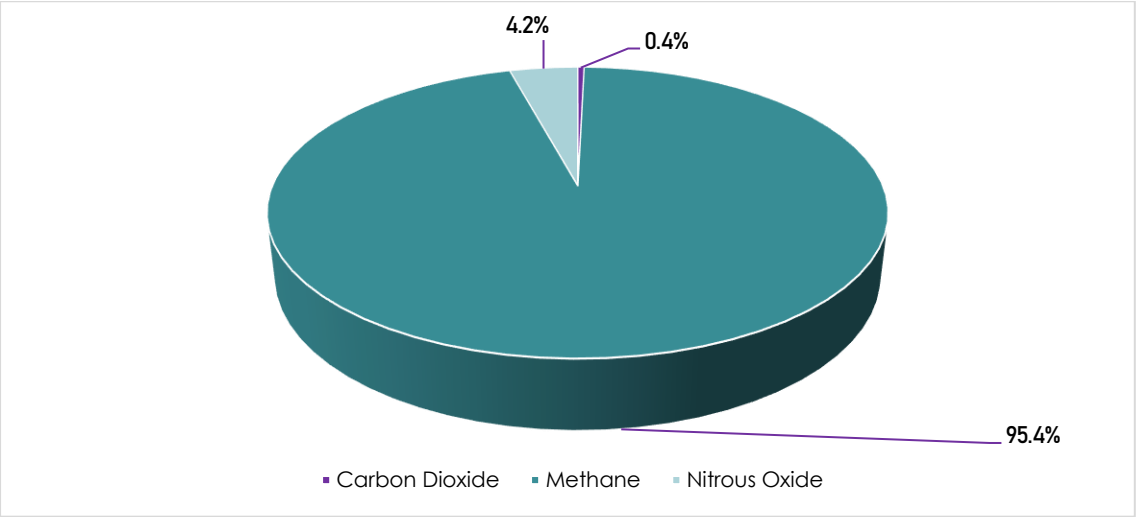

Figure 12: Share of emissions, by gas, for sector Waste (% share by gas, based on CO_2 equivalents).

2.3 DESCRIPTION OF THE NATIONAL INVENTORY ARRANGEMENTS

2.3.1 INSTITUTIONAL, LEGAL, AND PROCEDURAL ARRANGEMENTS

A first national GHG inventory was compiled as a stand-alone exercise in the context of the preparation of Malta's First National Communication to the UNFCCC, submitted and published in 2004. At the time, Malta was a non-Annex I party to the Convention and reporting obligations were those applicable to such a status. This first inventory was carried out by a team of inventory compilers coordinated by the University of Malta.

In 2004, Malta acceded to full membership of the European Union (EU). Despite retaining the non-Annex I status under the UNFCCC, reporting obligations relating to greenhouse gas emissions and removals became more stringent, and in line with the EU's Monitoring Mechanism *(Formerly Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol; replaced by Regulation (EU) No 525/2013)*, which included the requirement to report a national GHG inventory on an annual frequency with strict timeframes, namely: the submission of a 'provisional' inventory on 15th January of each year to the European Commission, covering the time series from 1990 (as base year) to the year before last (X-2); a 'final' inventory submission by the following 15th March, that may include changes to the January submission; and the submission under the UNFCCC by 15th April.

As of 2010 Malta's status under the UNFCCC changed to that of Annex I Party, which means that reporting obligations relating to such a status became fully applicable to Malta.

The inventory reporting requirements under EU legislation, and then also under Annex I status, made it necessary to establish a process whereby annual inventory reporting could be fulfilled. The Malta Environment and Planning Authority (MEPA) was initially entrusted to take on this obligation, subsequently followed by a migration of this and other climate action responsibilities to the Malta Resources Authority (MRA) as of 2010.

As of October 2024, the Malta Resources Authority has been replaced by the Climate Action Authority, established by virtue of the Climate Action Act, 2024, Chapter 643. The Climate

Action Authority (CAA) has taken on all climate-related responsibilities previously undertaken by the MRA, including being the national GHG inventory agency of Malta.

Political ownership and overall responsibility of the national GHG inventory is vested in the Ministry responsible for climate change policy, this being the Ministry for the Environment, Energy and Public Cleanliness (MEEC). MEEC is the Single National Entity in respect of national GHG inventories.

Any Annex I Party to the UNFCCC has an obligation to establish a National Greenhouse Gas Inventory System, defined by decision 19/CMP.1 "Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol" as:

"all institutional, legal and procedural arrangements made within a Party included in Annex I for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information."

This obligation has also been transposed into EU law. A first recommendation for the setting up of a national inventory system was made in 2005, following discussions with inventory experts from the Federal Environment Agency of Austria. This led to the recruitment of staff to work on national inventories (greenhouse gases and air quality) and the first steps towards a more structured inventory compilation process.

Following this recommendation, MEPA commissioned a more in-depth assessment of inventory compilation practices in place at the time to draw up recommendations for the formal establishment of a national inventory system that would be in accordance with requirements under the Kyoto Protocol; the intention was to integrate inventory reporting relating to both climate change and air quality obligations. Unfortunately, due to several reasons, this assessment and its recommendations could not be followed-up with concrete action. Malta's accession to Annex I status, the ratification requirements of the Doha Amendments to the Kyoto Protocol and the obligations arising from EU law make it imperative that a fully functioning national inventory system that meets the requirements of decision 19/CMP.1 is established.

To this effect, the Climate Change Unit at MRA had taken the initiative, in 2013 to submit a report "Establishing a National Greenhouse Gas Inventory System for Malta" (Climate Change Unit-Malta Resources Authority; 30th May 2013) to the relevant local authorities to instigate and inform the decision-making process. As a result of this initiative, the "National System for the Estimation of Anthropogenic Greenhouse Gas Emissions by Sources and Removals by Sinks Regulations of 2015" establish a national system for greenhouse gas inventories *(Legal Notice 259 of 2015, National System for the Estimation of Anthropogenic Greenhouse Gas Emissions by Sources and Removals by Sinks Regulations, 2015 (Subsidiary Legislation 543.01); this legal notice has now been transferred under the Climate Action Act, Chap 643, and references as Subsidiary legislation 643.04)*.

The national inventory system legal notice, among other aspects, formally identifies the Minister responsible for climate change as the Single National Entity (SNE) in accordance with the relevant UNFCCC requirements. The SNE "*shall have overall responsibility for the national greenhouse gas inventory system*" and shall ensure that the national system is operated in accordance with criteria set out in Schedule 1 to the legal notice and with relevant international and European Union requirements. The SNE shall define and allocate specific responsibilities in the inventory preparation process specifying the roles of, and cooperation between, government agencies and other entities involved in the preparation of the

inventory, as well as the institutional, legal and procedural arrangements made to prepare the inventory, shall establish quality objectives for the national system, establish processes for the independent review, official consideration and approval of national greenhouse gas inventory reports and ensure timely submissions.

The legal notice also provides for the formal designation of an inventory agency. The responsibilities of the inventory agency are laid out in regulation 5 of the Legal Notice as follows:

"The Inventory Agency shall, annually, and in accordance with deadlines established by the COP and, or the COP/MOP and deadlines set out in Regulation (EU) No 525/2013, prepare a national greenhouse gas inventory report in accordance with relevant decisions of the COP and, or, the COP/MOP, and Regulation (EU) 525/2013."

Through a Government Notice (No 1036 of 27th October 2015) published pursuant to this same legal notice, the Malta Resources Authority has been designated as Malta's Inventory Agency. Specific functions relating to inventory preparation and management are laid out in Schedule 2 of Legal Notice 259 of 2015.

2.3.2 OVERVIEW OF INVENTORY PLANNING, PREPARATION, AND MANAGEMENT

The CAA is responsible for the planning, preparation and management of the national GHG inventory. Staff within the Unit perform duties related to the inventory, including: the preparation of the annual greenhouse gas inventory submission of Malta, performing most of the functions involved, starting from the gathering of data from the relevant data providers, to estimating sectoral emissions or removals of greenhouse gases; drafting of this report and the inputting of data into the ETF Reporting Tool; and, final submission to the European Commission, the European Environment Agency and the UNFCCC Secretariat. As necessary, the Unit also engages outside contributors to assist in the preparation of submissions. Starting from September 2024 one-off submission, all data inputted in the CRF software tool was transferred to the new reporting tool, the ETF.

The preparation of the annual inventory submission is spread over a whole year cycle, starting with initial planning of an inventory cycle and concluding with the last review of that cycle's submission. It is normally the case that each inventory cycle overlaps with the previous and subsequent cycles, especially because the review by the UNFCCC of an inventory submission tends to take place at a time when the next inventory cycle has started. This highlights the importance of looking at the inventory process as a continuous process, linking one submission with the next: indeed, each inventory cycle builds on the previous inventory cycle, and will itself be the starting point of the subsequent inventory cycle.

The work on an inventory submission goes beyond the gathering of data, estimation of emissions and removals, preparation of report text, entry of data into the ETF reporting tool and submission. These processes are underpinned by additional steps, including quality assurance and control, the documentation of all actions taken in the preparation of an inventory, and archiving of historic documentation.

An inventory cycle is normally concluded with the peer review of the UNFCCC of that cycle's submission. Peer reviews are not seen solely as an assessment of the work undertaken for the compilation of a submission and a confirmation of the final quantified total national net

emissions. Reviews are also an important contributor towards continuous improvement, indicating where existing practices are delivering satisfactory results and highlighting areas where further efforts are required to improve Malta's national greenhouse gas submissions. Findings from reviews provide a basis for the internal evaluation of each submission.

Data gathering is another area where efforts must continue to ensure that reliable data is sourced from the most appropriate sources and in an effective manner. As will be seen in later sections of this report, data is gathered from a diverse range of sources, both public and private. So far, the data gathering process has depended largely either on access to publicly available official data, or on one-to-one relationships built with organisations, or individuals within organisations, in a relatively informal manner. The CAA has identified the need to establish formal channels of data gathering to ensure timely provision of reliable data, including, where appropriate, through formal written agreements with key data providers. Work on this aspect has started. The current approach to greenhouse gas inventory compilation in Malta is pictorially presented in the below figure.

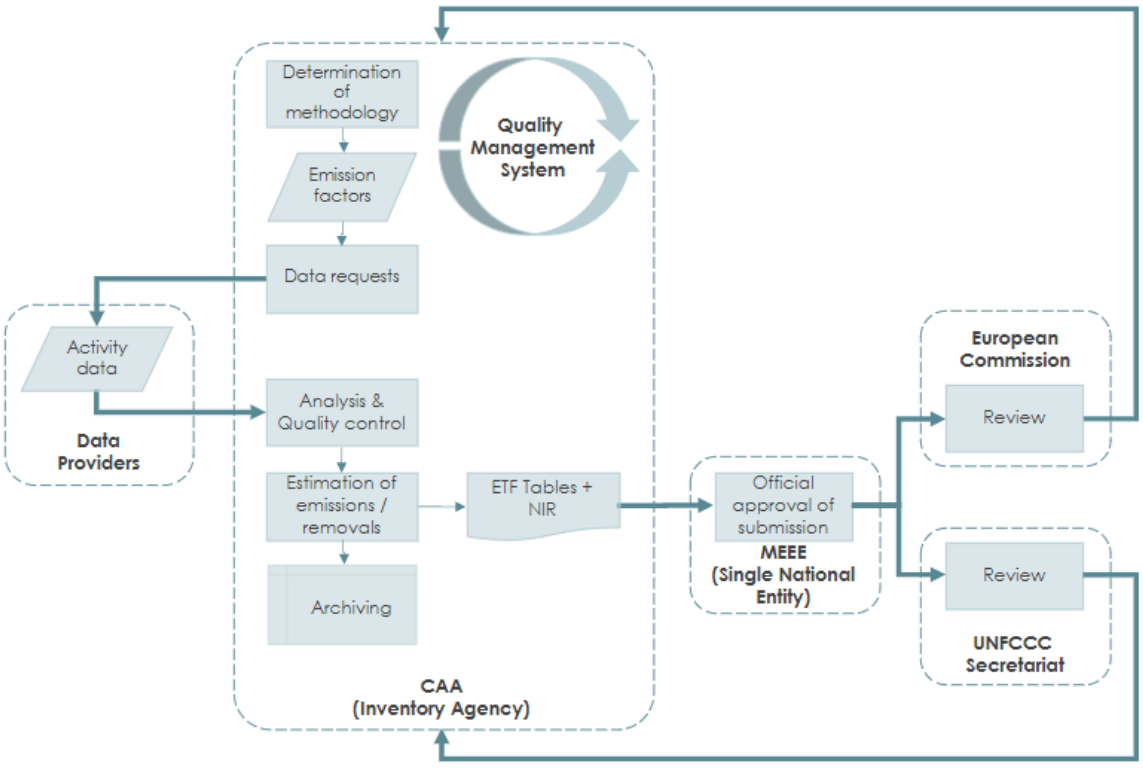

Figure 13: Schematic representation of the institutional and procedural arrangements for the preparation and submission of national greenhouse gas inventories of Malta.

2.3.3 QUALITY ASSURANCE, QUALITY CONTROL AND VERIFICATION PLAN

According to paragraph 34 and 35 of the MPGs, which states that '*Each Party shall elaborate an inventory QA/QC plan in accordance with the IPCC guidelines referred to in paragraph 20, including information on the inventory agency responsible for implementing QA/QC; those developing country Parties that need flexibility in the light of their capacities with respect to this provision are instead encouraged to elaborate an inventory QA/QC plan in accordance with the IPCC guidelines referred to in paragraph 20, including information on the inventory agency responsible for implementing QA/QC*' and that '*Each Party shall implement and provide information on general inventory QC procedures in accordance with its QA/QC plan and the IPCC guidelines referred to in paragraph 20; those developing country Parties that need flexibility in the light of their capacities with respect to this provision are instead encouraged to implement and provide information on general inventory QC procedures in accordance with its QA/QC plan and the IPCC guidelines referred to in paragraph 20. In addition, Parties should apply category-specific QC procedures in accordance with the IPCC guidelines referred to in paragraph 20 for key categories and for those individual categories in which significant methodological changes and/or data revisions have occurred. In addition, Parties should implement QA procedures by conducting a basic expert peer review of their inventories in accordance with the IPCC guidelines referred to in paragraph 20*.

The below text is referring to the QA/QC and verification plan of the authority, in accordance with paragraph 46 of the MPGs.

The process of inventory preparation and management aims at ensuring the accuracy, comparability, consistency, completeness, transparency and timeliness of national inventory submissions. "*It is good practice to implement quality assurance and quality control (QA/QC) procedures in the development of national greenhouse gas inventories*" (GPG2000, IPCC, 2000) to meet the listed quality criteria.

A properly established QA/QC framework is a crucial element of the National Inventory System, according to paragraph 34 of the MPGs. In fact, the Marrakech Accords include minimum requirements for the quality system of a National Inventory System of an Annex I party, stating that Parties shall elaborate an inventory quality plan and implement the quality procedures described in the plan as part of their annual inventory preparations and reporting cycle. The term 'Quality System' is further elaborated upon as follows:

"*[S]hall include a description of the quality assurance and quality control plan, its implementation and the quality objectives established, as well as information on internal and external evaluation and review process.*"

In August of 2017 MRA brought into effect a formally documented Quality Management System (QMS) for the inventory process. The Quality Management System was set up to define the quality assurance and quality control parameters deployed by MRA for the compilation of

Malta's national inventory, MRA's mission in this respect being to "*seek to excel in the fulfilment of its obligations as the national Inventory Agency of Malta through the use of Continuous Improvement practices, methods and tools*" (Operations and Quality Manual; Malta Resources Authority; 18th April 2018).

The documented Quality Management System reflects the implementation, by the MRA, of GHG inventory practices as established by IPCC guidelines, and is also in accordance with EN ISO 9001:2015. To this effect, the QMS defines quality objectives, documents the process for the preparation of annual GHG inventory submissions, and provides for overarching functions including regular auditing of the system, treatment of non-conformities and management of competency.

The QMS is made up of an 'Operations and Quality Manual' (OQM), a series of Quality System Procedures (QSP) and Quality Operational Procedures (QOPs), together with supporting documentation such as process maps, forms and logs.

The Operations and Quality Manual establishes how the Climate Change Unit at MRA will plan, compile and submit the national GHG inventory and how QA/QC efforts will be implemented at every stage of the process. It sets out the quality policy of the Climate Change Unit:

"[…] the CCU will strive to ensure that:

- It prepares and submits the National GHG Inventory Report in a timely manner;
- It ensures that each report is as complete as possible in terms of data presented;
- It strives to maintain consistency in terms of operations and data submitted within each report;
- It operates in a way which allows comparability of data;
- It produces reports in the most accurate of manners;
- It upholds values of transparency across its operations; and,
- It ensures that ongoing improvement is implemented further to submission of each report."

The manual also defines roles and responsibilities and quality objectives. It provides the necessary guidance on such aspects as competency, management of knowledge, communication, and the administration of the QMS including with regards to control of documents, management reviews and auditing of the quality system. The OQM is supported by, and refers to, the procedures listed in the table below.

Table 6: List of System Procedures and Operational Procedures pertaining to the Quality Management System.

Quality Management System	
System Procedures	Operating Procedures
CCU-QSP-01 Document and Data Control Procedure	CCU-QOP-01 Organization of Work
CCU-QSP-02 Internal Auditing Procedure	CCU-QOP-02 Identification of Key Categories
CCU-QSP-03 Control & Treatment of Non-conformity and Risk	CCU-QOP-03 Methodology, Data collection and Estimation

CCU-QSP-05 Training and Competency Management Procedure	CCU-QOP-04 Completion of Proxy Table and Input of Data into the CRF Reporter
	CCU-QOP-05 Compilation of NIR and consistency procedure
	CCU-QOP-06 Approval from the Single National Entity and Submission
	CCU-QOP-07 EU and UNFCCC Reviews

Figure 14 is a schematic representation of how the QSPs and QOPs listed in Table 6**Error! Reference source not found.** fit within the overall context of the GHG inventory process. An important outcome of the development and adoption of a quality management system by the MRA was obtaining certification of the quality system to EN ISO 9001:2015. Certification was issued for the first time by the Malta Competition and Consumer Affairs Authority in January 2018 and has been successfully renewed since. The implementation of the quality system to the level expected under the certification is monitored through regular internal and external audits and biannual management review meetings chaired by the MRA's management.

The important role of peer reviews of Malta's greenhouse gas inventory submissions has already been referred to above. As a Member State of the European Union, Malta's greenhouse gas inventory data is subject to annual review so as to monitor Malta's greenhouse gas emission reduction or limitation pursuant to the Effort-sharing Decision. These reviews are undertaken by a team of expert reviewers from EU Member States under the auspices of the European Environment Agency and on behalf of the European Commission. A first Step review covers all data for sectors and categories falling within the scope of the Effort-sharing Decision; where significant issues are identified, a second step review is undertaken specifically on those issues. Apart from checks on the information submitted, these reviews may also result in technical corrections, with findings published in an official report.

Malta's greenhouse gas inventory submissions have also undergone individual reviews undertaken by expert review teams in accordance with review guidelines under Article 8 of the Kyoto Protocol. The outcome of such reviews, including detailed findings, are published by the UNFCCC Secretariat. Review reports actively feed into the internal evaluation of inventory submissions performed by the inventory team at the CAA and thus help guide the inventory team in preparing future submission and in identifying and prioritizing elements for further improvement.

The quality process does not stop here. The ongoing investment in enhancing the competency of inventory compilers complements the participation by the national inventory team in capacity building opportunities offered, in particular, through projects run by the European Commission and other projects contracted by the Inventory Agency. The use of IT tools to enhance efficiency of the inventory process, and other best practices, also feature prominently in ongoing projects. Further steps under consideration for possible future implementation include the identification of a pool of independent experts to support the inventory agency through expert advice on sector-specific matters and, or, to review annual inventories prior to submission, and means how to engage a wider range of stakeholders in the greenhouse gas inventory process, especially where it relates to improving accessibility of inventory data to policy-makers, academics and researchers and the general public.

Table 7: Capacity building support and knowledge sharing activities in recent years.

Capacity building support	Period
Post-review capacity building support under the 'European Commission Service contract for Annual review of Member States' greenhouse gas inventories under the Effort Sharing Decision'.	2017, 2018, 2019
'Malta National System and QA/QC Improvement', in-country visit and recommendations by inventory expert on behalf of the European Commission.	2017
Bilateral post ESD review support under the auspices of the European Commission: in-country support from Czech Republic on general inventory improvement by expert from Czechia.	2018
Bilateral post ESD review support under the auspices of the European Commission: in-country training from Greece on COPERT5.	2018
European Commission project 'Technical Support for capacity building in Member States to implement Forest Reference Levels and improvements of greenhouse gas inventories' (ICF Ltd. lead): task 1 on preparation of National Forestry Accounting Plan and determination of Forest Reference Level.	2018
Project 'Technical Support for Emission Inventories', contracted by MRA to Aether Ltd (UK).	2018 – 2022
Project 'Technical support on the emission framework for the agriculture sector in Malta', under Structural Reform Support Service (SRSS) programme of the European Commission (Aether Ltd, UK).	2019
European Commission project 'Technical Support for capacity building in Member States to implement Forest Reference Levels and improvements of greenhouse gas inventories' (ICF Ltd. lead): task 2 on assistance for the improvement of land-based reporting under the new LULUCF rules.	2019

As part of its capacity building efforts, the Inventory Agency has engaged external consultants (Aether Ltd., UK) to provide, among others, quality assurance of the inventory, in terms of its management system, sectoral compilation, and reporting (through the NIR). As a specific task, the consultants reviewed in detail the NIR, and provided expert feedback on the transparency of the NIR and assessed the completeness and quality of key reporting aspects in line with the IPCC and UNFCCC requirements. This activity has been prioritised in response to reviews (and recommendations) received by Malta during UNFCCC reviews and reviews pursuant to the EU Monitoring Mechanism Regulation (refer to Table 8). Work continues by the CAA to develop further the national system, its own internal systems, inventory capacity, methodologies and quality of reporting over the time period 2018-2022. Key to this objective will be the development of effective improvement planning. CAA will continue to work with experts both internally and externally in this regard.

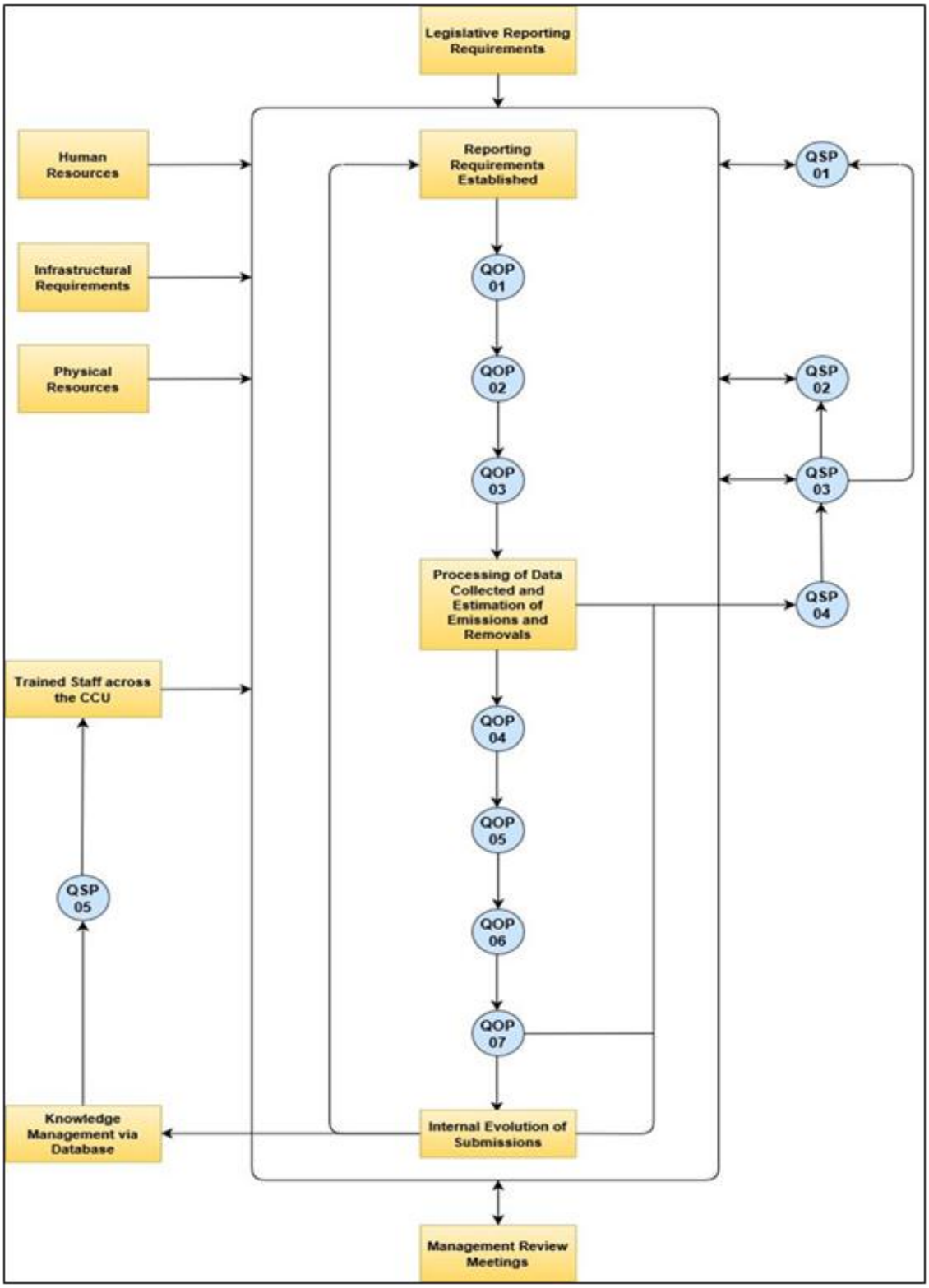

Figure 14: QMS Process Map.

Table 8: Expert Reviews of Malta's greenhouse gas inventory submissions.

Type of Review	Year of Review
Annual UNFCCC review (centralized).	2012 – 2013, 2015, 2017, 2019, 2021
Annual UNFCCC review (in-country).	2016

Trial review of the 2015 greenhouse gas inventory under the Effort Sharing Decision.	2015
Comprehensive review of national greenhouse gas inventory pursuant to Article 19(1) of the Monitoring Mechanism Regulation.	2016
Annual review of national greenhouse gas inventory data pursuant to Article 19(2) of the Monitoring Mechanism Regulation.	2017 – 2018, 2019, 2020
Independent expert review of the National Inventory Report forming part of the 2019 submission pursuant to the Monitoring Mechanism Regulation, under project 'Technical Support for Emission Inventories' contracted by MRA to Aether Ltd (UK).	2019

The outcome of the work discussed above is that the overall completeness and quality of reporting is high, and generally in adherence with the reporting guidelines. However, it is acknowledged that there may be a lack of sufficient information at the sector-specific level on QA/QC activities and planned improvements. In addition, the consideration and assessment of uncertainties is a priority weakness that will be addressed across coming submissions. MRA will look to develop its uncertainty assessment in collaboration with sectoral experts, inventory stakeholders and data providers.

CHAPTER 3 INFORMATION NECESSARY TO TRACK PROGRESS

3.1 NATIONAL CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS

As already mentioned in section 2.3, as of October 2024, the Malta Resources Authority has been replaced by the Climate Action Authority, established by virtue of the Climate Action Act, 2024, Chapter 643 (and references as Subsidiary legislation 643.04). The Climate Action Authority (CAA) has taken on all climate-related responsibilities previously undertaken by the MRA, including being the national GHG inventory agency of Malta.

This chapter provides a description of Malta's national circumstances. It explores how the national circumstances affect GHG emissions and removals, historically, presently and in the future. Detailed information and disaggregated indicators that describe these relationships are provided.

3.1.1 NATIONAL CIRCUMSTANCES

3.1.1.1 Government structure

Malta has had a relatively short history as a sovereign political entity, having gained independence from Britain in 1964, and becoming a Republic in 1974. In 2004, Malta acceded to full membership of the European Union (EU).

The country is a stable democracy with the main legislative body being the House of Representatives elected by universal suffrage for 5-year terms. Government is headed by the Prime Minister with a Cabinet of Ministers each of which is responsible for a Ministry with a specific portfolio. Departments within these Ministries and a number of Authorities and Agencies support the implementation of government policy.

In the current legislature, climate change policy falls under the portfolio of the Minister for the Environment, Energy and Public Cleanliness (MEEC). Nonetheless, the regulation of the six sectors reported under the IPCC (i.e., Energy, Transport, Industry, Agriculture, LULUCF and Waste) are governed by different ministries (namely the Ministry for Agriculture, Fisheries, food and animal rights (MAFA), Ministry for the Environment, Energy and Public Cleanliness (MEEC) and the Ministry for the Economy, Enterprise and Strategic Projects, highlighting the importance of cooperation between a number of ministries. Climate change has, as a theme, featured as an important element in Ministerial portfolios in recent administrations, and a degree of continued development in national climate policy can be noted.

Throughout 2020, the desire for a better environment was felt more than ever before. While Malta was fighting the COVID-19 pandemic, the level of economic activity witnessed a considerable drop with the only bright side being the improvement in environmental quality. The decrease in road transport and the rise in number of people working remotely, brought about a major improvement in air quality, clearly indicating that the road to a sustainable future requires a change in lifestyle, where economic growth integrates environmental principles and looks towards the creation of a climate neutral Malta by 2050. To reflect its willingness to adapt, in January 2020, the government had changed its ministerial portfolio to have a distinct ministry responsible solely on the environment, climate change and planning.

This was done to obtain a synergy between these vital sectors and to ensure exclusive attention and more focused work.

Despite the pandemic, there was a big impetus to keep the climate emergency a top priority. On a European level, Malta participated in discussions on action favouring more ambitious targets, which ultimately led to the European Union Council to establish targets that need to be reached by 2030. Locally, Malta declared that it would become a climate neutral state by 2050, which in return pushed for the completion of the national strategy that aims to tackle these targets. This national strategy, titled the Low Carbon Development Strategy, has been created according to the requirements of the UNFCCC, and was published towards the end of 2021. The measures proposed were characterised by lengthy discussions between ministers, to analyse the economic and social impact of every measure. This was done to ensure that the strategy does not solely focus on the reduction of GHG emissions, but also ensures that the changes required are viable from an economic and financial perspective and that their introduction does not lead to social exclusion. The LCDS is based on an analysis of the marginal abatement cost curve. It has been subject to consultations with various interested parties, such as academia, local and regional government, representatives of associations of commercial and industry sectors, and NGOs, and a wider, extensive public consultation. The completed strategy addresses, amongst others, transport, energy, waste, and agriculture sectors as the primary sources of GHG emissions.

3.1.1.2 Population

By the end of 2022, the population of the Maltese Islands stood at 542,051 (NSO, 2024)[1], which is more than double the population of a hundred years earlier (Figure 1.3). This produced a population density of around 1,721 persons per km2, one of the highest country population densities in the world (NSO, 2024)[2].

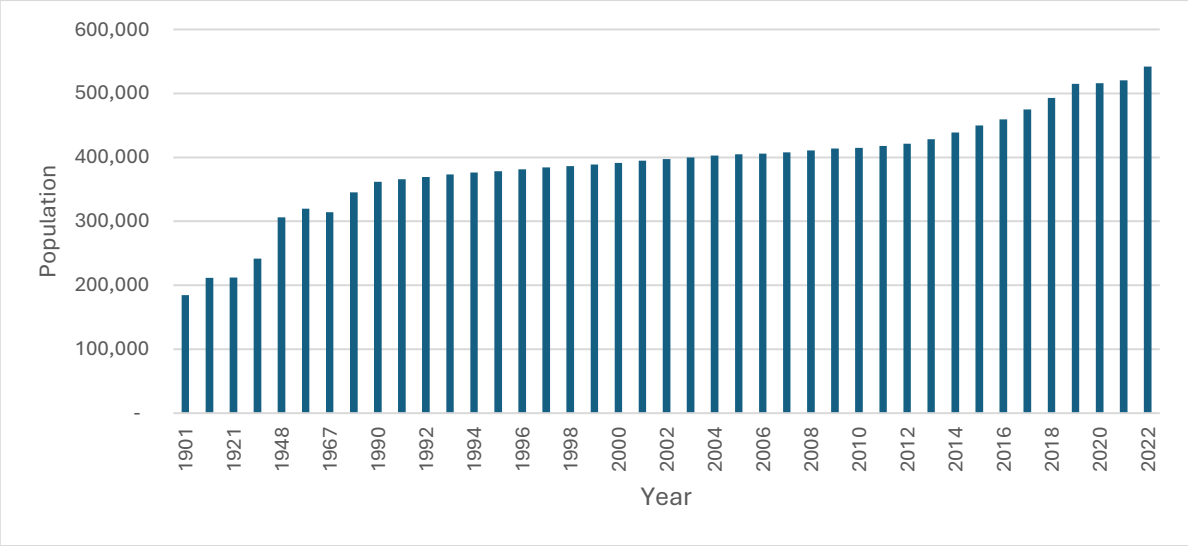

Figure 15: Population growth since 1901 (NSO, 2012; NSO, 2021; NSO 2024)

Distribution of the population across the islands that make up the Maltese archipelago varies. The largest concentration of the population is found in the relatively low-lying area around the harbours flanking the capital city of Valletta. The Northern Harbour district (the area to the west of Valletta) and the Southern Harbour district (the area lying to the east and south-east

[1] NSO News Release 124/2024
[2] NSO News Release 015/2024

of Valletta, also including the capital city) together form a population agglomeration that accounts for almost half of the total population of the country. At the other end of the scale, the islands of Gozo and Comino account for just 7.4% of the total population (NSO, 2024).

The population density for the Maltese Islands in 2022 stood at 1,721 per km2. The Northern Harbour district was the most densely populated district in 2022, at 7,019 resident population per km2. Conversely, Gozo and Comino were the least densely populated district at 585 resident population per km2 (NSO, 2024).

The population is projected to reach 609,000 by 2030 and increase further to 747,000 by 2050 (MFE, 2023)[3].

In 2022, persons aged between 30 and 49 years accounted for approximately one third of the population in both Malta and Gozo and Comino regions. Life expectancy at birth in 2022 was 82.3 years; 80.2 years for male and 84.4 years for females (NSO, 2024). Demographic projections indicate that Malta will be one of the fastest ageing countries in the European Union (MAA, 2022).

3.1.1.3 Geographic context

Malta is an archipelago made up of three inhabited islands, namely Malta, Gozo and Comino, and several small uninhabited islands (Cominotto, Filfla, St Paul's Islands) and islets situated close to the coastline of the main islands.

*The Maltese archipelago is situated in the middle of the Mediterranean Sea (***Figure 16***), approximately 90 kilometres to the south of Sicily, Italy, and 290 kilometres from the North African mainland. Towards the west, the Straits of Gibraltar are at a distance of almost 1,850 kilometres, while the Suez Canal is around 1,500 kilometres to the southeast.*

The total combined area of the Maltese islands (Figure 16) is 316 square kilometres, with a total shoreline of 271 kilometres. Topographically, the coastline facing the African mainland, is dominated by cliffs, with the land sloping down to a low-lying shoreline on the northern coast. The northern areas of Malta, and Gozo, are marked by low hills, with plains predominant towards the southern parts of the island of Malta. There are no mountains and no rivers; seasonal water courses may appear after heavy rainfall.

Being a small island state presents specific policy issues when dealing with climate change.

[3] 2024 Ageing Report, Ministry for Finance and Employment, November 2023

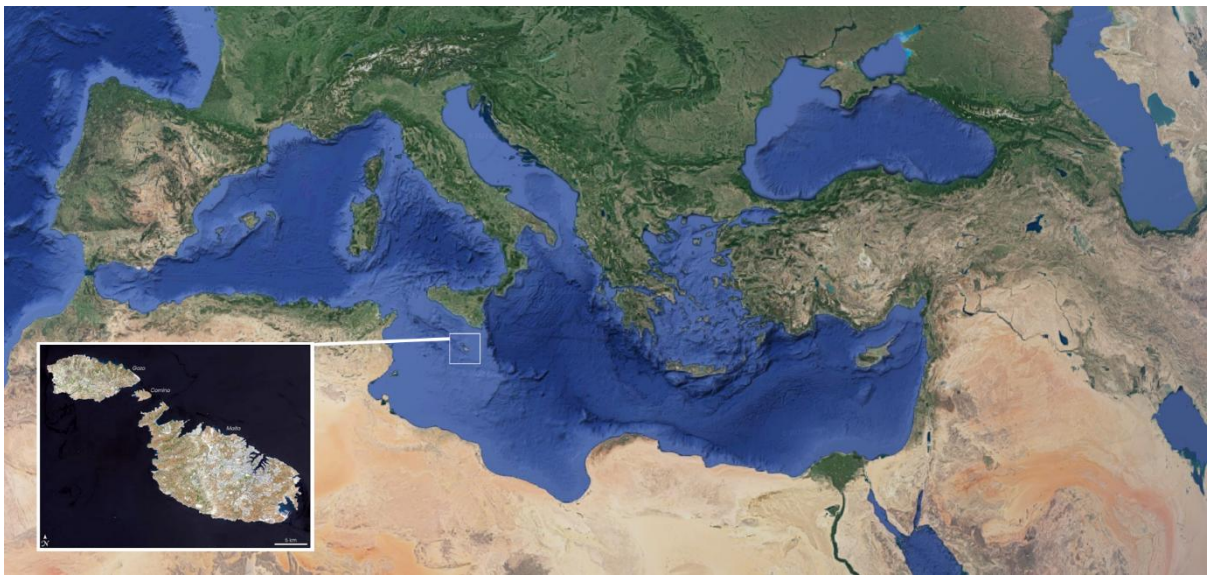

Figure 16: Map of the Mediterranean Sea and the Maltese islands showing the geographical location of Malta (adapted from Google Maps and NASA Earth Observatory).

Almost a third of the area of the country is urban, mainly of a residential nature, but also incorporating other developments such as the airport, ports, and industrial and commercial sites. Agricultural land accounts for approximately half of the land area with the rest being natural vegetated land. In the housing sector, there is a growing trend in favour of concentrating residential units in blocks of two units or more on the same site, shifting away from the more traditional terraced house construction practices earlier.

Forest coverage in Malta is very low, with the only remaining forest remnants occurring in localized pockets. The two main such areas are Buskett and Miżieb, both of which are the result of afforestation, Buskett going back as far as the presence of the Knights of St. John, and Miżieb at a much later stage. Maquis and garigue habitats are also present.

3.1.1.4 Natural Resources

Limestone is one of the few mineral resources that Malta can boast of, used principally by the local construction industry. It has been estimated that in 2006, 1.2% of Malta's total land area was taken up by the hard stone and soft-stone quarries where stone extraction takes place (NSO, 2011).

Water is a fundamental need; however, the sourcing of water is not an easy matter in a country where permanent above-ground water bodies do not exist and where rainfall is rather limited. Most of the naturally occurring freshwater is found in underground aquifers from where it can be extracted via pumping stations and boreholes. Until the late 1960's this was the only manner in which potable water for local consumption was produced. Following a period of a few years where distillation was utilised to a limited extent to complement groundwater extraction, the early 1980's saw the introduction of desalination of sea water (using Reverse Osmosis technology; in itself an energy intensive process, energy consumption estimated at 4.62 kWh/m^3 in 2011 (WSC, 2012)) which today accounts for more than half of the production of potable water in the country, through three desalination plants located along the coast of the island of Malta.

In 2022, the total annual potable water production in Malta was 35.5 million m^3 (WSC)[4] a substantial decrease compared to the peak of more than 50 million m^3 seen in 1992-93. In the meantime, a number of groundwater extracting pumping stations and boreholes have had to

[4] WSC, Water production

be shut down due mainly to nitrate contamination or chloride intrusion, putting an even greater onus on desalination plants. The desalinised water is stored in 24 reservoirs around the Maltese Islands, which have a total capacity of 400,000 m^3. The water distribution system in Malta a network of over 2200 km of pipes, pumps, reservoirs and valves, that lead to approximately 160,000 water service connections to homes, business, industries, hotels, schools and so on (WSC). The households sector accounts for the bulk of the demand for water, accounting for almost 70% of total billed consumption.

In an attempt to achieve good groundwater status in all groundwater bodies in the Maltese islands, the 'New Water' programme was launched with the aim of producing a capacity of 7 million m^3 of high-quality water suitable for crop irrigation, thus potentially addressing up to 35% of the current total water demand of the agriculture sector (WSC). New Water is created from treated wastewater which is filtered from bacteria, chemicals and any remaining pollutants.

The Maltese Islands being surrounded by sea, sea salt also deserves a mention in any discussion of local mineral resources. Sea salt continues to be produced using the age-old technique of evaporation of sea water in salt pans, of which a number may be found in coastal areas in various parts of Malta and Gozo.

3.1.1.7 Economic Profile

Historically, agriculture was a very important economic activity in Malta, though one can also note an important element of services-oriented activity, not least due to the presence of established British forces on the islands until the late 1970's, which necessitated a number of ancillary services. The service sector now serves as the mainstay of the country's economy, with manufacturing also contributing.

Apart from traditional activities in tourism, education, health, retailing and banking, the services industry has in recent decades expanded towards some higher value-added activities. These incorporate the financial services sector, more specialised forms of tourism, such as that associated with language schools and diving centres, maritime and aviation activity, information technology and gaming. Large scale industrial establishments are few, with the largest, and the most relevant from a greenhouse gas emissions perspective, being the electricity generation plants. The manufacturing sector has largely developed into high value areas, such as microelectronics and pharmaceuticals

Malta's economy has strong trade ties with the European Union. The trend in Gross Domestic Product (GDP) since 1990 has been relatively consistent in showing continued growth, except for 2009, where the trend was negative, recuperating again in 2010.

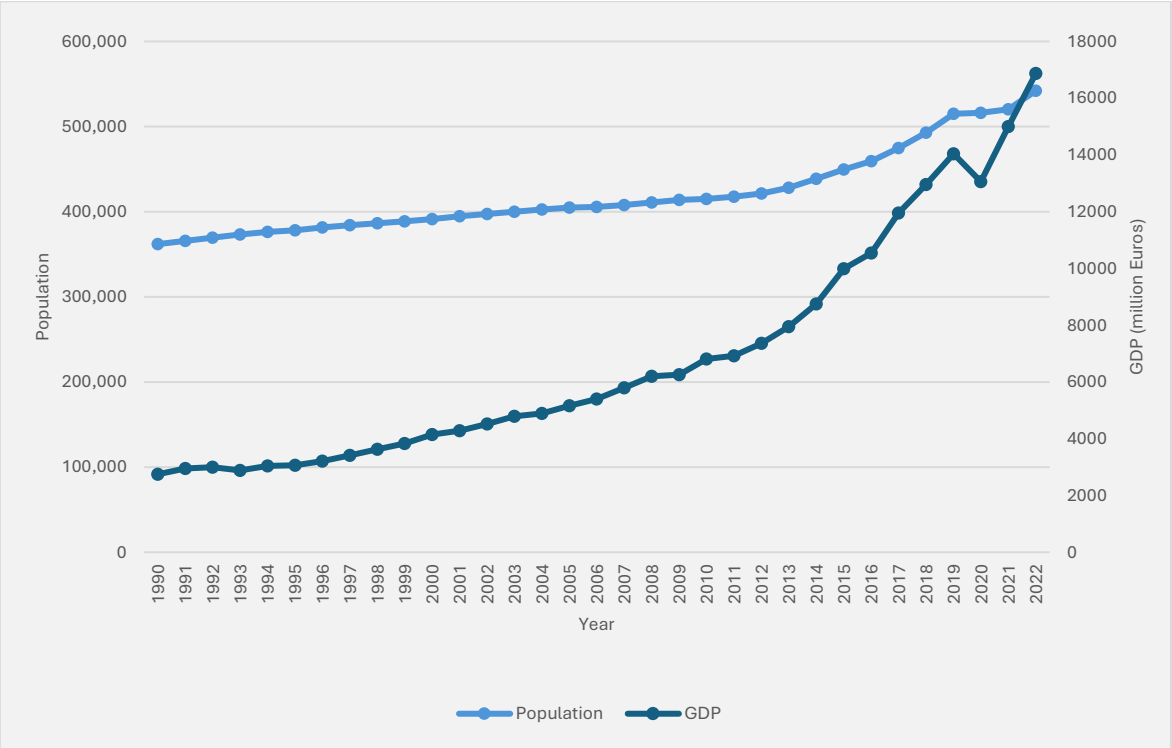

Figure 17: Population and GDP trends 1990 – 2022

(data adapted from EUROSTAT and the National Statistics Office websites, accessed October 2024).

Overall, Malta's GDP has grown from €2.749 billion in 1990 to €16.870 billion in 2022 (NSO, 2024)[5]. Per capita GDP, moreover, stood at around €36,800 in 2022 (Eurostat, 2024)[6], with this indicator also showing a steady increase over time.

[5] NSO News Release 036/2023
[6] Eurostat, 2024 Purchasing power adjusted GDP per capita DOI: 10.2908/sdg_10_10

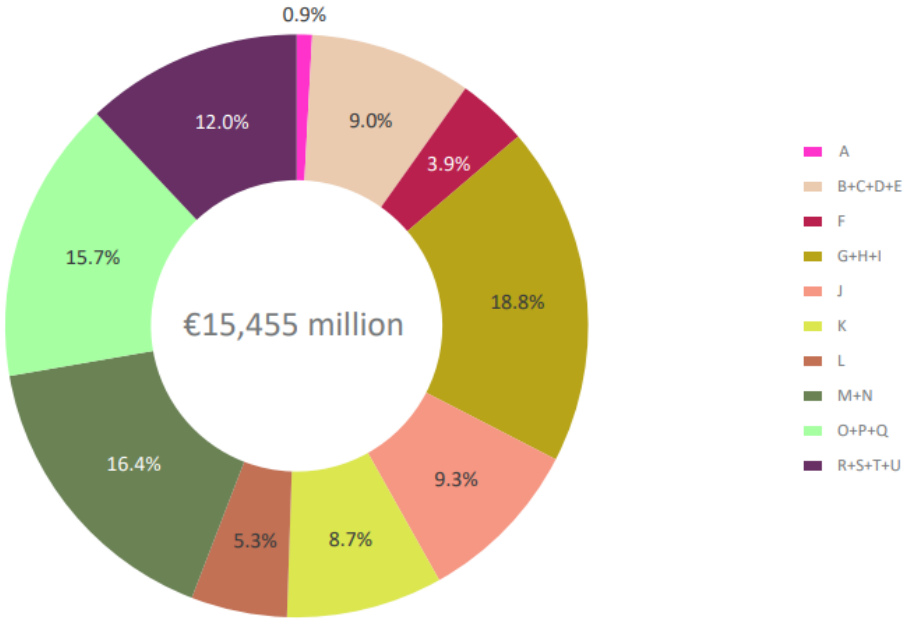

Figure 18: Percentage contribution of economic sectors (by NACE code7) to Gross Added Value for 2022 (NSO, 2024)8.

In 2022, Malta had a Gini Coefficient of 31.1 (Eurostat, 2024), making it the 12th most equal country in the world in terms of equivalised disposable income. Malta also has a high Human Development index of 0.915, 25th in the world (HDR UNDP, 2024)[9], this being an indicator that takes into account health and education outcomes as well as per capita income. Energy intensity level of primary energy (MJ/$2017 PPP GDP) in Malta was reported at 1.2 MJ/USD in 2022, according to the World Bank collection of development indicators, compiled from officially recognized sources.

3.1.1.8 Malta's Climate

The climate of the Maltese Islands can be described as typically Mediterranean, with hot, dry summers and relatively mild winters. The most common wind direction continues to be north-westerly (292.5° -337.5°, centred at 315°), followed by westerly (247.5° -292.5°, centred at 270°) and the easterly (67.5° -112.5°, centred at 90°) (NSO 2022). The National Statistics Office published a report *'The State of Climate 2022'* where is states that Malta's mean maximum ambient temperature has increased by 1.5°C since 1952, equivalent to a warming of 0.2°C per decade. This is due to an increase in the frequency of months that are much warmer than average. The report elaborates more in discussing the occurrence of dry years which as this is

[7] NACE Codes:
A: Agriculture, forestry and fishing;
B-E: Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities;
F: Construction;
G-I: Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities;
J: Information and communication;
K: Financial and insurance activities;
L: Real estate activities;
M-N: Professional, scientific and technical activities; administrative and support service activities;
O-Q: Public administration and defence; compulsory social security; education; human health and social work activities;
[8] Regional Statistics Malta 2024 Edition, NSO 2024
[9] Human Development Reports, United Nations Development Programme (2024)

very likely to be due to a combination of long-term natural variability and changes in regional circulation caused by increased greenhouse gas levels in the atmosphere.

The below refers to the national circumstances according to each sector.

3.1.1.9 Energy

Energy supply in Malta is largely dependent on imports, either in the form of fuels or as electricity through an interconnector with mainland Europe. Emissions relating to the latter are not within the scope of this inventory as they do not occur within Malta's national territory. Furthermore, there is a small share of energy derived from renewable sources, in particular the use of solar energy in photovoltaic systems and solar water heating; these sources do not contribute to the national greenhouse gas emissions inventory. Malta does not have indigenous fossil fuel sources.

Local electricity generation has seen several changes over the years. Until the early to mid-1990's, a single power plant, mainly fired by coal, met all local electricity demand. In subsequent years, a new plant was commissioned to improve Malta's generation capacity, while a switch from coal to oil-based generation was also undertaken. In recent years, further development of the country's generation capacity, by the setting up of additional power plants, the commissioning of an electricity interconnector with Italy and a shift to natural gas as the primary fossil fuel use for electricity generation, complemented by a smaller amount of diesel (also known as gas oil), has been undertaken. These changes have important implications for the historic trend of greenhouse gas emissions from this activity.

There is a close correlation between national circumstances and the trend in greenhouse gas emissions generated from the energy sector. Aspects such as population dynamics, the prevalent energy mix at any point in time, the technologies available and that are most appropriate for the local situation, among others, all have an impact.

Population and economic growth are key parameters that impact the demand for electricity and thus has a close correlation to GHG emissions from that activity. An increasing population over the years, coupled with increased tourism, represents an increase in demand for electricity, that must be sourced from the available sources. To the extent that such sources are limited to indigenous conventional, fossil fuel-based generation, than GHG emissions would be expected to increase. A growing share of renewable sources may counteract, to some extent, that trend. Alternative sourcing of electricity, such as through an interconnector, can also have a direct impact on national emissions, subject, however, to prevalent international circumstances that may have an impact on the viability of sourcing energy from outside the country.

Malta relies heavily on imported fossil fuels for its energy needs, including electricity generation. Historically, Malta depended on coal (up to the mid-1990s), heavy fuel oil and gasoil for its power generation. In recent years, Malta has been gradually shifting towards the use of natural gas as a cleaner alternative to heavy fuel oil and gas oil. The country has built an LNG regasification terminal, enabling the importation and use of LNG for power generation. An interconnector with Sicily provides another alternative for the sourcing of electricity, and an opportunity to also transfer electricity to the European grid. Malta's aim to introduce an additional second interconnector in the future, among other plans in this sector, would further help the country reach its energy demands as well as reduce its indigenous fossil fuel combustion.

Malta has also made use of renewable energy for some time, namely PVs and solar water heater. The country's climate, being sunny the majority of the year, with relatively long hours of sunshine especially in the summer period, makes it an obvious choice as a source of energy for Malta. The continuation of government grants and schemes to encourage the public and

private sectors in investing in these technologies has helped and will continue to help Malta benefit in its reduction of emissions targets.

Malta's industrial sector is small, in fact its contribution to the country's greenhouse gas emissions for 2020 amounted to around 3% of total energy emissions. These are largely manufacturing operations which mostly consume energy in the form of electricity. In this respect, investing in modern, more-efficient equipment and adopt new processes can help inhibit emissions.

Road mobility is largely dependent on diesel and petrol, with recent years also seeing the introduction of alternative fuels and energy sources such as biodiesel, LPG and electricity, albeit to a significantly lower level. Civil aviation is dominated by international flights with purely local aviation activities being limited (Malta has only one airport). Similarly, maritime activities are primarily international in nature, with national navigation activities mainly including ferry services between the Maltese islands, and between a number of towns around the main harbours, pleasure boating and fishing activities.

Electricity demands of local industry, commercial and residential sectors are largely met by the local power plants, the interconnector (in recent years) and a contribution from renewable sources. Own generation, besides renewables, is limited mainly to steam and heat generation systems in industry.

3.1.1.10 Transport

Access to the Maltese Islands from other countries, and vice versa, is limited to sea and air transport. This in itself has important implications also for Malta's economy, dependent as it is on these modes for the importation and export of materials and goods. Tourism, an important contributor to Malta's economy is similarly dependent on arrival and departure of travellers to and from the Maltese Islands either by air or sea. Aviation activities are centred around the sole international airport of Luqa, while two main harbours, the Grand Harbour and Marsaxlokk, provide the main entry points by sea.

Internal transport is mainly based on road transport, with rail systems non-existent. An extensive bus system services the two main islands; however private vehicle ownership and use remains high.

A scheduled ferry service provides the only year-round link between the islands of Malta and Gozo. Domestic aviation is limited mainly to intermittent trans-island services provided either by helicopter or light aircraft.

Despite improvements in emissions intensity, in 2022 transport related GHG emissions total 723.53 kt, accounting for about 32% of Malta's total GHG emissions.

National circumstances, including population growth, economic development measured by GDP, and the tourism industry, collectively impact greenhouse gas (GHG) emissions in road transportation.

Population growth directly affects the demand for road transportation services. As the population of a country increases, commuting intensifies. Commuting in Malta remains highly dependent on the use of private vehicles, leading to a higher number of vehicles on the roads, resulting in increased GHG emissions from road transport, especially to the extent that mobility remains largely dependent on vehicles that rely on fossil fuels.

Economic development, often measured by changes in GDP, is another crucial factor. As a country experiences economic growth, industrial activities expand, and the standard of living improves. Economic development leads to increased production, consumption, and trade, which in turn generates a higher demand for transportation services. In light of the data

presented in the NSO document[10], it is evident that the utilization of private vehicles in our country is high. The statistics for 2022 reveal that an overwhelming 19.5% of the total distance travelled was attributed to private cars. This significant figure emphasizes the dominant role private vehicles play in our transportation landscape.

In addition, the tourism industry also significantly influences the demand for road transportation. Malta heavily relies on tourism as a major contributor to their GDP. The influx of tourists requires an extensive transportation network to cater to their travel needs, both within cities and to tourist destinations. This includes airport transfers, sightseeing trips, and transportation between various attractions and accommodations.

Moreover, the tourism industry can affect the demand for road transportation by influencing individual travel behaviour. Tourists often prefer the flexibility and convenience of private transportation, such as rental cars or taxis, to explore destinations at their own pace. This preference for individual modes of transportation can further contribute to increased emissions in the road transportation sector.

Changes in the local climate also contribute to increased emissions, primarily due to higher evaporation rates and the impact on emissions of non-methane volatile organic compounds (NMVOCs; so-called precursor gases). Over the years, there has been a noticeable shift in temperature patterns. Since 1952, the mean maximum air temperature increased by 1.54 °C, while the mean minimum air temperature increased by 1.37 °C. The mean highest maximum air temperature increased by 1.20 °C and the mean lowest minimum air temperature increased by 1.67 °C. The local climatic conditions also mean that an increasingly higher share of vehicles in Malta are equipped with air-conditioning, thus a potential growing source of emissions of hydrofluorocarbons.

3.1.1.11 IPPU

Preliminary analysis of the industrial sectors in Malta shows the relatively low presence of industrial production of significant GHG sources. In fact, a number of production sub-sectors/categories/sub-categories listed in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories are considered to be not occurring. Thus, GHGs are mainly emitted from the use of products, rather than from production processes.

The main source of GHGs is the use of fluorinated gases (F-gases), mainly as refrigerants in refrigeration and air conditioning equipment. In terms of carbon dioxide equivalent, F-gases are the main contributor to the direct GHG emissions in this sector, especially due to their high GWPs.

The activity data used in the estimation of emissions of GHGs from this sector and, consequently, the emissions themselves, are driven by the increase in the population level and GDP growth. Especially, but not only, in the case of category Refrigeration and Air Conditioning, the increase in the mean maximum ambient temperature of Malta, referred to in section 3.1.1.8 above, is another driver.

Mineral Products

Since 1999, lime production activities no longer take place and any lime used in Malta is imported. However, in the past, lime production (quick lime) was commonplace in Malta. The lime produced was of the high calcium type. Up to 1994, two lime production plants were operational.

[10] NSO, 2021 - Transport Statistics, 2021. Reference year 2020 https://nso.gov.mt/wp-content/uploads/Transport-2021.pd

Soda ash is neither mined nor produced in Malta, but imported. Moreover, emissive uses of carbonates occur from soda ash (sodium carbonate, Na_2CO_3), as a raw material and in acid neutralisation (desulphurisation) in energy generation and in waste incineration. The data indicates that, locally, the desulphurisation process started in waste incineration in the year 2009, and, in energy generation, from 2012 onwards. Moreover, it should be pointed out that in 2017, an energy generation plant that does not make use of the technology utilising sodium bicarbonate, started operation.

It is the understanding of the Inventory Agency that locally there are no GHG-emitting glass production processes, but only shaping and colouring of glass. Finally, it should also be pointed out that since 1990, cement production has not occurred in Malta.

Chemical Industry

From the chemical production sub-categories included in category 2B of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Malta does not have any activity. Nonetheless, Malta imports calcium carbide for the production of acetylene. Whereas the production process used emits no greenhouse gases, the use of acetylene in metal welding and cutting is a source of CO2 emissions.

Metal Industry

Category 2C of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories covers a wide variety of metal and alloy production activities, none of which, however, occur in Malta.

Non-Energy Products from Fuel and Solvent Use

Lubricants are imported. The main function of lubricants is to minimise friction between moving surfaces. As lubricants are exposed to relatively high temperatures, oxidisation occurs which results in certain GHG emissions. This oxidisation is not considered as an energy use and, thus, the emissions from these lubricants are reported in this sector. However, emissions from lube oil used in two-stroke engines are included in the energy sector.

Paraffin is a product of crude oil fractioning, and is commonly used in the production of candles, surfactants, paper coatings and polish. In Malta, since no petroleum refining occurs, all paraffin is imported, possibly transformed and largely used locally. The main source of emission from paraffin comes from its combustion in the form of candles, tapers etc. This is particularly relevant in the Maltese context due to the use of candles in religious and other popular practices. Most other uses do not emit GHGs.

Asphalt road surfacing is composed of compacted aggregate and an asphalt binder. CO_2 and NMVOC emissions from both the production phase and the application phase of asphalt to road surfaces are reported.

Organic solvents and solvent-containing products used in Malta are imported. Solvents and related compounds include chemical cleaning substances used in a variety of industrial applications as well as household uses. All of these activities and applications make use of chemicals that contain significant amounts of NMVOCs. Emissions are produced through evaporation of the volatile chemicals when these products are exposed to air.

Imported urea is used in denoxification in energy generation, waste incineration and in selective catalytic reduction (SCR) in road transport. Urea was originally used in energy generation when part of the power station used to be operated using heavy fuel oil and gasoil as the fuels for the generation of electricity. During 2017, the plant was converted to natural gas and gasoil. Due to the greater utilisation of natural gas, the amount of urea used for

denoxification (of gasoil) had decreased. The denoxification process has been used in waste incineration in Malta since the year 2011, when the Marsa thermal treatment plant was upgraded with the installation of a deNOx facility which utilises urea in liquid form (AdBlue or ISO 22241 compliant fluid) to reduce NOx emissions. During this process of denoxification, CO_2 is released as a by-product. CO_2 is emitted from the use of urea in road transport only from vehicles equipped with SCR. Such technology is used only for diesel-engined vehicles.

Electronics Industry

The local electronics industry is relatively limited in scope. Most of the processes that have been identified as emissive are not carried out locally. Local manufacturing of electronics, as defined in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, generally does not occur in Malta. Only the final stages of semiconductor manufacture are performed in the semi-conductor manufacturing sub-sector that is present locally. Throughout the time-series, the use of HFC-23 and SF_6 are reported.

Product Uses as Substitutes for Ozone Depleting Substances (ODS)

Current areas of application for the products in subject include refrigeration and air conditioning equipment, foam blowing applications, fire protection equipment and metered dose inhalers. The F-gases consumed locally are imported.

The main source of emissions of F-gases, locally, is category Refrigeration and Air Conditioning (CRF 2.F.1), with emissions of hydrofluorocarbons (HFCs). Emissions of HFCs have increased from the early 2000s. However, importation of F-gases for local blowing of closed-cell foam has been interrupted based on legal quotas, while emissions of HFC-134a from imported closed-cell foam panels continue.

Other Product Manufacture and Use

Switchgear used locally in electricity generation plants and in the electricity distribution network (substations and distribution centres) makes use of sulphur hexafluoride (SF_6). Locally, this is the main use of SF_6. This sector is identified as being also the main contributor to local emissions of SF_6. SF_6 has unique properties that allow the optimised operation of electrical switchgear and electricity networks. However, while SF_6 possesses a unique combination of properties ideal for its uses, it has a potent greenhouse effect and to date no equivalent alternative gas has been identified. Very small quantities of SF_6 and PFC-218 (perfluoropropane, C_3F_8) are also used in Malta during hospital operations. Moreover, locally, medical grade N_2O is used for anaesthetic, analgesic use and veterinary use. Another use of N_2O is as a propellant in whipped cream preparations (in aerosol cans).

3.1.1.12 Agriculture

Based on the data from the last agriculture census conducted by the National Statistics Office, the total UAA in Malta in 2020 amounted to 10,730 hectares. A total of 3,252 hectares or 30.3 % of the entire UAA, were found to be situated in the Western, followed by the Northern and Gozo and Comino districts with 2,541 (23.7 %) and 2,449 hectares (22.8 %) respectively. Arable land accounted for 72.5 % of the total UAA, while permanent crops and kitchen gardens made up the remaining 8.9 and 18.6 % of the UAA respectively. Over the last 10 years, there has been a downward trend in arable land and permanent crops cultivation areas, while the area used for kitchen gardens has increased. The cultivation of forage crops (67.5 %) was predominant in the use of arable land. The total area designated for permanent crops in 2020 amounted to 953 hectares, of which 456 hectares were dedicated to vineyards and whose cultivation declined by 158 hectares when compared to 2010. Similarly, areas of fruit and berry plantations

decreased by an area of 143 hectares over the 10-year span. On the contrary, areas of olive plantations increased by 14 hectares.

In 2020, Malta had a total of 241 cattle farms with a cattle population of 14,447 heads of which, 5,996 were dairy cows. This figure represents a decline of 7.9 % in the cattle population from 15,688 heads in 2010. A decrease of 17.2 % was also recorded over the 10-year period in the number of cattle farms, from 291 farms in 2010 to 241 in 2020. Moreover, during 2020, the number of reared sheep stood at 16,177 heads. Although there was a decline of 11.8 % in the holdings engaged in this activity from 1,081 holdings in 2010 to 953 holdings in 2020, the sheep population increased by 36.3 % over this 10-year span. During 2022 farmers have had to cull many of their sheep due to a rise in forage prices following the Russia's invasion of Ukraine. The number of reared goats increased by 31.5 %, from 4,384 heads in 2010 to 5,764 in 2020, whereas the number of holdings in this activity declined by 15.5 %, from 595 holdings in 2010 to 503 in 2020. On a similar trend, the pig population stood at 40,090 in 2020, marking a decline of 43.2 % over 2010. Also, the number 8th National Communication, 2022 53 of pig farms in Malta declined by 29.5 % over the same 10-year period, from 132 farms in 2010 to 93 farms in 2020.

A total of one million poultry heads was recorded in 2020; of which, 696,010 (67.3 %) were broilers. This figure decreased by 17.7 % over that of 2010 when 846,143 heads were recorded. A similar decline of 27.9 % was also registered in the number of holdings in this agricultural activity, from 154 in 2010 to 111 in 2020. On the contrary, however, the number of laying hens increased by 12.6 % in the 10-year period under review, from 300,667 in 2010 to 338,516 in 2020. Notwithstanding this, the number of holdings engaged in the latter agricultural activity dropped by 27.1 %, from 652 in 2010 to 475 in 2020. A total of 7,326 breeding female rabbits were recorded as being reared in 2020.

Changes that took place in the agricultural sector over the 10-year period (2010-2020) have been a continuation of the trend for many years. These changes in livestock and land area have led to an overall drop in emissions that dropped by 33% since 1990. The effect of the treatment of cattle and poultry manure at the Sant' Antnin Treatment plant (STP), an implemented measure that is being considered in the WOM scenario, has also been affecting the emissions from manure management, despite the fact that less than 39,000t of manure are being treated, contrary to what was outlined in the proposed measure.

3.1.1.13 LULUCF

Forestry & vegetation

Within the Mediterranean region, Malta has one of the lowest levels of forest coverage (FAO, 2014), presumably a combined result of the country's small size, extraordinary high population density, and long history of human habitation, which have led to a large human footprint and extensive anthropization of the land. The only remaining forest remnants occur in localized pockets, with four particular copses of significant age. It is thought that, prior to being settled by humans, the Maltese Islands would have supported relatively extensive tracts of Mediterranean sclerophyll forest, dominated by species such as the Holm Oak (Quercus ilex) and Aleppo Pine (Pinus halepensis). Fossil evidence of this theory has been cited by several authors (e.g. Zammit Maempel, 1977, 1982; Pedley, 1980; Hunt, 1997). Once the Islands were settled, however, extensive deforestation took place to make space for farmland and habitation, and to provide timber as fuel. Meantime, grazing by domestic animals made it extremely difficult for young tree growth to survive, with these factors resulting in a near complete loss of Maltese forests. Typically, Quercus ilex forests would normally support an undergrowth of smaller tree species and shrubs of various dimensions, many of which are also characteristic of maquis assemblages, while coniferous woodlands would tend to lack a significant understorey. Maquis assemblages, which, in the Maltese Islands, typically occur in somewhat sheltered environments such as valley slopes and boulder screes, do not constitute woodlands in the strict sense of the term, but consist of smaller trees and tall shrubs; these

assemblages, which may occur naturally but also a result of secondary succession following deforestation and subsequent re-growth of woodlands (Cassar & Conrad, 2014).

When considering the total woodland area of Malta and the forest/woodland coverage under the category of Forest Land (according to Malta's national definition in the GHG National Inventory Document, following the IPCC guidelines), none of these woodland areas are utilised for logging (MEAIM, 2015). In Malta there is no relevant harvest commercialized for material use, and wood for material use is currently imported from other countries. Furthermore, Malta addresses the conservation of trees and woodland sites strictly through the Trees and Woodland Protection Regulations (Subsidiary Legislation 549.123). Additionally, Food and Agriculture Organisation of the United Nations Statistics (FAOSTAT) [11] information sourced from the Forestry Production and Trade indicate that the production quantity has never been produced in Malta.

Due to the small size of the Maltese islands, as well as privatisation of the agricultural land, the protection of certain lands, and significant urban development, the area for plantations and afforestation is as a result highly restrained. Noting the small-scale projects introduced within the Maltese islands the resultant removal rate in the woodlands/forest is very low, and the potential to further enhance the removal rate is limited in this case. More often, due to the inherent circumstances of Malta, projects are proposed and implemented in areas that are under some other type of use or within development areas to provide publicly accessible open spaces, or which involve the upgrade of existing, but run-down gardens, or on derelict sites, thus representing an increase in land-use change rather than new forested area.

Vegetation in Malta is considered as an area of high biodiversity importance protected under the Habitats Directive (Directive 92/43/ECC). As reported in the National Rural Development (RDP) Strategy 2007-2013 (MEAIM, 2009) the extensive permanent grass areas or pastures that are typical of most European countries are non-existent in Malta. This is mainly due to the prevailing semi-arid climate, geology of the island, relatively shallow depth of soil and small agricultural land parcels. The closest to such land is the 'xaghri', characterised by a variety of low aromatic shrubs. Effectively, in the past grazing was practiced on such land, as well as on steppe, and this resulted in further degradation of 'xaghri' or maquis areas as well as abandoned fields. With the transition from extensive goat and sheep herds to cattle in the 1950s, following outbreaks of Maltese fever, grazing eventually diminished and is now not practised, whilst the dairy industry has become mostly reliant on forage harvested as the main cereal crop (MEAIM, 2009).

The RDP 2014-2020 (MEAIM, 2015) reports that, Malta is notable in having no grassland area within the UAA, & thus no land which would qualify as classic High Nature Value farmland exists. The garigue & maquis, which are highly prioritised habitats in Malta, represent habitats of national & international importance for biodiversity, as signified by the designation of around 13.5% of the country as Natura 2000 sites. In recognition of its fragility in current conditions, there is a prohibition on the grazing of livestock on all areas of garrigue, although this habitat was probably subject to very low levels of grazing by sheep or goats in previous centuries. This is also indicated on the basis of Legal Notice 321 of 2011 (Nitrates Action Programme Regulations, as amended) which requires that animals are housed under roofed structures at all times, thus considers grazing as not taking place in Malta. Furthermore, the Trees and Woodland Protection Regulations (Legal Notice 12 of 2001) states that no person shall allow or attempt to allow animals to graze in any tree protection area or other protected area.

Agriculture land

Agriculture is the largest land user on the island (47% of total land surface). Other land use categories are natural areas (23%) and woodland at less than 1%. The majority of agricultural

[11] Source: FAOSTAT website https://www.fao.org/faostat/en/#data/FO)

holdings in Malta and Gozo are relatively small, where, around 75% of the agricultural holdings have a Utilised Agricultural Area (UAA) of less than 1 hectare each. Medium-sized agricultural holdings made up of around 25% of the total; such holdings comprise between 1 and 5 hectares of UAA. Around 200 are landless indoor livestock holdings which are likely to include some of Malta's largest farm businesses, along with some of the largest and more specialised horticultural farms and vineyards. Most small farms in Malta grow predominantly fruit and vegetables, fodder crops, with some permanent cropping (citrus, olives, vines) (MEAIM, 2015).

Agricultural landscape is one of very small parcels of land, frequently arranged in terraces, and surrounded by dry-stone ('rubble') walls along which grow a variety of wild flora. In the widest valleys, fields are somewhat larger & there is a notable occurrence of horticulture under plastic or glass – most commonly using polytunnels. Prickly pear and other shrubs frequently grow up along boundaries between cultivated surfaces, and landscape bears the marks of both historic and current water management systems, with rock-bounded channels to direct rainwater down, across slopes and valleys, as well as frequent top-structures of wells which were the traditional subterranean rainwater reservoirs. There is also evidence of partial land abandonment, where former terraces are breaking down slowly as the land has ceased to be actively farmed, and steppe vegetation may re-establish across the land surface if there is sufficient soil depth to encourage it.

Land use on Malta's farms is classified into 3 broad categories, according to the Rural Development Programme 2014-2020 (MEAIM, 2015):

- Arable land – accounts for the larger land-based farms which grow fruit and vegetables as well as having forage crops and/or fallow land;
- Permanent crops – cover citrus, olives, vines;
- Kitchen gardens – much smaller holdings that grow a wide range of horticultural crop types.

The average soil organic matter level in the sampled topsoils in Malta ranges from 0.4% to 2.3%, and just above the 2% soil organic carbon threshold, below which potentially serious decline in soil quality is expected to occur. The soils' suitability for agronomic purposes is limited by a number of factors, predominantly the unfavourable soil chemical status as a result of alkalinity and the calcareous nature of the soils, shallow depth to bedrock, low soil organic matter, high soil stoniness, and unfavourable water regime as a result of an impermeable surface crust. Soils with a carbonate and bicarbonate content greater than 25% occupy approximately 91% of the total country area. Very shallow soils (<25cm) and shallow soils (> 25cm and < 50cm) occupy 58% of the country's area. 40% of soils are estimated to contain more than 15% coarse fragments (MRAE, 2004).

Liming of agricultural soils is not applicable to Malta as soils have large calcium carbonate content (MRAE, 2004). Maltese soil types are classified as Leptosols, Vertisols, Calcisols, Luvisols, Cambisols, Regosols or Arensols (data from the MALSIS database sourced through (MEPA, 2006)). Of these, Calcisols occupy approximately 27% of total country area, whereas Luvizols and Leptosols are the most common groups. Calcisols are calcareous (lime-rich) soils with significant accumulation of secondary calcium carbonates, generally developed in dry areas. The Maltese soils are now relict soils since it has developed under different climatic conditions from the more recent one.

3.1.1.14 Waste

Malta's waste management sector is heavily influenced by its small geographical size, high population density, and the significant impact of tourism.

National circumstances relevant to the waste sector in Malta, is influenced by a higher population demand being both local population and tourism. With a population of over

500,000 residents and with the influx of tourists, these place additional pressure on the waste management system.

In fact, it is indicated that, "*on average, a tourist generates almost double the waste generated by a Maltese resident. While a Maltese resident living in a household generates an average of 0.68 kg of waste daily, a tourist residing in a hotel produces an average 1.25 kg of waste each day" EEA (2013)*.

Tourism, which reached 2.9 million inbound tourists in 2023 and has seen continuous increases over the year (NSO, 2024)[12], represents an additional burden on national efforts to deal with waste (and thus, on waste generated GHG emissions). As tourist number increase, waste generation is expected to increase.

Due to population growth, one can notice a rise in the solid waste disposal that is landfilled. This will also result to an increase in methane emissions generated from organic waste.

Moreover, to address these issues, Malta is to implement initiatives such as the Waste-to-Energy facility (WtE). The WtE will process waste in the most sustainable and resource-efficient way possible while also turning it into a resource. The facility will be treating the generated non-recyclable waste by diverting it away from landfill disposal and generating energy and heat. Therefore, the aim of the WtE facility is to reduce the amount of waste that is disposed in the landfill. The development of the WtE facility reflects Malta's commitment to improving waste management, reducing environmental impact, and moving towards a circular economy.

3.1.2 INSTITUTIONAL ARRANGEMENTS

3.1.2.1 Institutional arrangements for tracking progress

Malta, as an EU Member State, plays a role in the implementation of the European Union's NDC. As reported in the MPGS, each Party shall provide information on the institutional arrangements to track progress made in implementing and achieving its NDC. Therefore, these sections concerning specific arrangements at the EU level may include standardized text for the BTRs of both the EU and its Member States.

Institutional arrangements in the EU

The EU's Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action ('Governance Regulation')[13] establishes a governance mechanism and specific arrangements to track the progress of the Union and its Member States towards the implementation and achievement of the EU's climate and energy targets and commitments under the UNFCCC and the Paris Agreement. These arrangements include the monitoring of GHG emissions and removals, the reporting of policies and measures, projections of GHG emissions and removals and progress on adaptation to climate change.

Under the Governance Regulation, the EU has established a Union Inventory System to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the data reported by the EU and its Member States. This inventory system includes a quality assurance and quality control programme, procedures for setting emission estimates, and comprehensive reviews of national inventory data to enable the assessment of compliance towards climate goals.

[12] NSO News Release 025/2024

[13] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, http://data.europa.eu/eli/reg/2018/1999/oj.

Each EU Member State compiles its GHG inventory in accordance with the requirements of the Paris Agreement[14] and the relevant Intergovernmental Panel on Climate Change (IPCC) guidelines[15]. Inventory data on GHG emissions and removals, including information on methods, are submitted electronically using a reporting system managed by the European Environment Agency (EEA). The submitted data are subject to quality control procedures and feed into the compilation of the GHG inventory of the EU. Net GHG emissions, calculated from emissions and removals reported in the GHG inventory of the EU, are the key information used for tracking progress towards the EU NDC target of a -55% net emission reduction by 2030 compared to 1990. Given the scope of the EU NDC related to international aviation and navigation, a specific share of international aviation and navigation emissions as reported in the GHG inventory data is calculated based on the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES)[16]. Details on the methodology applied to identify GHG emissions from international aviation and navigation in the scope of the EU NDC, which are added to the national totals from the EU GHG inventory, are given in Annex 2 to this BTR.uUnder the Governance Regulation each Member State must report to the Commission biennially on the status of implementation of its integrated national energy and climate plans (NECPs). This process allows the Commission to ensure that the EU and the Member States remain on track to achieve the climate-neutrality objective and progress on adaptation. Under the Governance Regulation, Member States further operate national systems for policies and measures and projections and submit and report standardised information, which is subject to quality and completeness checks. Based on the submitted data, the EEA compiles projections of GHG emissions and removals for the EU. The EU-wide information is summarised annually in the Climate Action Progress Report[17] by the European Commission and in the 'Trends and projections' report by the EEA.[18] Both the Union and the national systems are subject to continuous improvements.

The national energy and climate plans (NECPs) were introduced by the Governance Regulation. For Member States, the NECP for 2021-2030 play a key role to enabling the tracking of progress towards the 2030 climate and energy targets. The update of the NECPs provides an opportunity for Member States to assess their progress, identify gaps and revise existing measures or plan new ones where needed.

Member States were due to submit their final updated NECPs, taking account of the Commission's assessment and recommendations, by 30 June 2024.

3.1.2.2 Institutional arrangements for implementation of the NDC

The EU and its Member States have set up a comprehensive system for the implementation of the EU climate change mitigation targets. The European Climate Law[19] sets the goal of climate neutrality by 2050 and the intermediate target of reducing net greenhouse gas emissions by

[14] Chapter II of the annex to decision 18/CMA.1, https://unfccc.int/documents/193408; and decision 5/CMA.3, https://unfccc.int/documents/460951.

[15] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/public/2006gl/; and on a voluntary basis: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

[16] European Commission, Joint Research Centre, Rózsai, M., Jaxa-Rozen, M., Salvucci, R., Sikora, P., Tattini, J. and Neuwahl, F., JRC-IDEES-2021: the Integrated Database of the European Energy System – Data update and technical documentation, Publications Office of the European Union, Luxembourg, 2024, https://publications.jrc.ec.europa.eu/repository/handle/JRC137809.

[17] Climate Action Progress Report 2024, https://climate.ec.europa.eu/document/download/d0671350-37f2-4bc4-88e8-088d0508fb03_en?filename=COM_2024_498_F1_REPORT_FROM_COMMISSION_EN_V4_P1_3729454.PDF

[18] Trends and Projections in Europe 2024, https://www.eea.europa.eu/en/analysis/publications/trends-and-projections-in-europe-2024

[19] Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), http://data.europa.eu/eli/reg/2021/1119/oj.

at least 55% by 2030 compared to 1990 levels. This target for 2030 corresponds to the target of the EU NDC.

To ensure that the EU and its Member States achieve their target, the 2030 Climate and Energy Framework was put in place. The main policies of this framework are the EU Emissions Trading System (EU ETS)[20], which caps GHG emissions in energy, industry, aviation and maritime transport; the LULUCF Regulation which includes national net removal targets for the LULUCF sector; and the Effort Sharing Regulation (ESR) which establishes national reduction targets for GHG emissions not covered by the EU ETS or the LULUCF Regulation i.e. domestic transport (excluding aviation), buildings, agriculture, small industry and waste. The implementation of the ESR is supported by additional sectoral policies and measures (details can be found in this BTR in the chapter on mitigation policies and measures). The legislative acts under the 2030 Climate and Energy Framework require the European Commission and the EU Member States to set up the institutional arrangements for implementing the specific policies and measures.

The revised EU ETS Directive increases the level of ambition in the existing system from 43% to 62% emissions reductions by 2030, compared to 2005 levels and extend the system to also apply to international maritime transport. A separate carbon pricing system will apply to fuel combustion in road transport and buildings and small-emitting sectors (ETS2) with a 42% emission reduction target compared to 2005 across the sectors covered. The amended Effort Sharing Regulation (ESR) increased, for the sectors that it covers, the EU-level GHG emission reduction target from 29% to 40% by 2030, compared to 2005, which translates in updated 2030 targets for each Member State. The new LULUCF Regulation sets an overall EU-level objective of 310 Mt CO_2 equivalent of net removals in the LULUCF sector in 2030.

The ESR sets national targets for the reduction of GHG emissions in the Member States by 2030. Member States are also subject to gradually decreasing annual emission limits for each year from 2021 to 2030. The annual progress towards the national targets under the Effort Sharing Legislation is assessed by comparing GHG emission levels from the sectors covered by the ESR with the relevant annual emission allocations under the legislation (AEAs). To achieve compliance under the ESR, Member States are permitted to use flexibility options to a certain extent.

Progress in the implementation of these policies and measures is monitored under the Governance Regulation. Relevant information which is reported regularly and archived at the EEA include GHG inventories, approximated GHG inventories for the previous year, information on policies and measures, projections, and progress towards the implementation of integrated National Energy and Climate Plans (NECP). This information helps the EU and its Member States to correct their course if progress towards the targets of the 2030 Climate and Energy Framework is behind schedule. As an example, the European Commission assesses the drafts of new or updated NECPs and provides recommendations for improved planning and implementation. In addition, the reported information is subject to quality checks, and the GHG inventories reported by EU Member States are subject to comprehensive reviews in 2025, 2027 and 2032.[21]

All EU legislation, including the legislation under the 2030 Climate and Energy Framework, is subject to a stakeholder engagement process. So-called 'better regulation tools' ensure that

[20] This refers to the ETS1, i.e. the Emission Trading System for stationary sources (Chapter III of the ETS Directive) and for aviation and maritime transport (chapter II of the ETS Directive). Note that the 'Emissions trading system for buildings, road transport and additional sectors' (ETS2), added in 2023 as Chapter IVa of the ETS Directive, forms an instrument under the Effort Sharing Regulation (ESR).

[21] Consolidated text (2023) of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, https://eur-lex.europa.eu/eli/reg/2018/1999/2023-11-20.

policy is based on evidence and the best available practice[22]. During the preparation of legislative proposals, the European Commission invites citizens, businesses and stakeholder organisations to provide their views on the subject of the new legislation. These comments are documented in a dedicated portal[23], and the European Commission reports on how it takes these comments into account in the development of the legislative proposals. Furthermore, the Governance Regulation sets requirements for Member States to ensure that the public is given early and effective opportunities to participate in the preparation of the NECPs.

3.2 DESCRIPTION OF THE NATIONALLY DETERMINED CONTRIBUTION

Under their updated NDC[24] the EU and its Member States, acting jointly, are committed to a legally binding target of a domestic reduction of net greenhouse gas emissions by at least 55% compared to 1990 by 2030. The term 'domestic' means without the use of international credits.

The NDC consists of a single-year target, and the target type is 'economy-wide absolute emission reduction'. The scope of the NDC covers the 27 Member States of the EU. Details on the EU NDC can be found in Table 9.

Table 9: Description of the NDC of the EU

Information	Description
Target and description	Economy-wide net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990. The term 'domestic' means without the use of international credits.
Target type	Economy-wide absolute emission reduction.
Target year	2030 (single-year target)
Base year	1990
Base year value	Net greenhouse gas emissions level in 1990: 4 700 168 kt CO2 eq.
Implementation period	2021-2030
Geographical scope	EU Member States (Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden) including EU outermost regions (Guadeloupe, French Guiana, Martinique, Mayotte, Reunion, Saint Martin (France), Canary Islands (Spain), Azores and Madeira (Portugal)).
Sectors	Sectors as contained in Annex I to decision 5/CMA.3: Energy, Industrial processes and product use, Agriculture, Land Use, Land Use Change and Forestry (LULUCF), Waste. International Aviation: Emissions from civil aviation activities as set out for 2030 in Annex I to the EU ETS Directive are included only in respect of CO2 emissions from flights subject to effective carbon pricing through the EU ETS. With respect to the geographical scope of the NDC these comprise emissions in 2024-26 from flights

[22] Decision-making process, https://ec.europa.eu/info/strategy/decision-making-process/how-decisions-are-made_en.
[23] Have your say – Public consultation and feedback, https://ec.europa.eu/info/law/better-regulation/have-your-say_en.
[24] The update of the nationally determined contribution of the European Union and its Member States, https://unfccc.int/sites/default/files/NDC/2023-10/ES-2023-10-17%20EU%20submission%20NDC%20update.pdf.

	between the EU Member States and departing flights to Norway, Iceland, Switzerland and the United Kingdom. International Navigation: Waterborne navigation is included in respect of CO2 , methane (CH_4) and nitrous oxide (N_2O) emissions from maritime transport voyages between the EU Member States.
Gases	Carbon dioxide (CO2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3)
LULUCF categories and pools	The included LULUCF categories and pools are as defined in decision 5/CMA.3.
Intention to use cooperative approaches	The EU's at least 55% net reduction target by 2030 is to be achieved through domestic measures only, without contribution from international credits. The EU will account and report for cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.
Any updates or clarifications of previously reported information, as applicable	The information on the NDC scope contains clarifications/further details compared to the information provided in the updated NDC of the EU.

Note: This table is identical to table 'Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates,' which has been submitted electronically together with this BTR. This table is also annexed to this BTR.

Source: Updated NDC of the EU[25]

3.3 INDICATORS, DEFINITIONS, METHODOLOGIES AND PROGRESS

3.3.1 INDICATORS

For the tracking of progress towards implementing and achieving the NDC of the EU, an indicator is used which has the same unit and metric as the NDC base year and target values. The chosen indicator is 'annual total net GHG emissions consistent with the scope of the NDC in CO2 eq'. Table provides more information on this indicator.

Table 10: Indicator for tracking progress

Information	Description
Selected indicator	Annual total net GHG emissions consistent with the scope of the NDC in CO2 eq.
Reference level and base year	The reference level is total net GHG emissions of the EU in the base year (1990). The reference level value for the EU is 4 700 168 kt CO2 eq.
Updates	This is the first time the reference level is reported, hence there are no updates. The value of the reference level may be updated in the future due to methodological improvements to the EU GHG inventory and to the determination of international aviation and navigation emissions in the NDC scope.
Relation to the NDC	The indicator is defined in the same unit and metric as the target of the NDC. Hence it can be used directly for tracking progress in implementing and achieving the NDC target.
Definitions	Definition of the indicator 'annual total net GHG emissions in CO2 eq': Total net GHG emissions correspond to the annual total of emissions and removals reported in CO2 equivalents in the latest GHG inventory of the EU. The totals comprise

[25] The update of the nationally determined contribution of the European Union and its Member States, https://unfccc.int/sites/default/files/NDC/2023-10/ES-2023-10-17%20EU%20submission%20NDC%20update.pdf.

	all sectors and gases listed in the table entitled 'Reporting format for the description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates'.

Note: *The information in this table is identical to the information in Common Tabular Format (CTF) tables 1 ('Description of selected indicators') and 2 ('Definitions needed to understand the NDC') and 2 ('Definitions needed to understand the NDC') , which were submitted electronically together with this BTR. These tables are also annexed to this BTR.*
Source: The reference level is based on the Annual European Union GHG inventory 1990-2022.

3.3.2 METHODOLOGIES AND ACCOUNTING APPROACH

The EU and its Member States use the following accounting approach for tracking progress towards the EU NDC: Annual GHG data from the national GHG inventory of the EU, complemented for international aviation and navigation with estimations from the Joint Research Centre's Integrated Database of the European Energy System15 . The total net GHG emissions are provided in the scope of the EU NDC and are compared to the economy-wide absolute emission reduction target as defined in the NDC. The EU will account for its cooperation with other Parties in a manner consistent with guidance adopted by the CMA.

As far as emissions and removals from the LULUCF sector are concerned, net emissions are used for tracking progress towards the 2030 target of the NDC based on all reported emissions and removals.

Details on methodologies and accounting approaches consistent with the accounting guidance16 under the Paris Agreement can be found in CTF table 3 ('Methodologies and accounting approaches'), which was submitted electronically together with this BTR. This table is also annexed to this BTR.

3.3.3 STRUCTURED SUMMARY – STATUS OF PROGRESS

An important purpose of the BTR is to demonstrate where the EU and its Member States stand in implementing their NDC, and which progress they have made towards achieving it. The most recent information on GHG emissions and removals in the scope of the NDC constitutes the key information for tracking this progress. Table 3 summarises the current status of progress.

Table 11: Summary of progress towards implementing and achieving the NDC

	Unit	Base year value	Values in the implementation period			Target level	Target year	Progress made towards the NDC
			2021	2022	2030			
Indicator: Total net GHG emissions consistent with the scope of the EU NDC	kt CO2 eq.	4 700 168	3 276 832	3 210 895	NA	2 115 076 (55% below base year level)	2030	The most recent level of the indicator is 31.7 % below the base year level.

NA: Not Applicable.

Note that an annual emissions balance consistent with chapter III.B (Application of corresponding adjustment) will be provided in a subsequent BTR upon finalization of relevant further guidance by the CMA, based on the annual information reported under Article 6.2.

Note: More detailed information can be found in CTF table 4 ('Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement'), which has been submitted electronically together with this BTR. This table is also annexed to this BTR.

Source: *The indicator values are based on the Annual European Union GHG inventory 1990-2022.*

Based on the GHG inventory data and data on international aviation and navigation for 2022, the EU and its Member States reduced net GHG emissions by 31.7 % compared to 1990. The EU and its Member States made progress towards implementing and achieving their NDC. The legal and institutional framework is in place to make further progress in the years ahead and to achieve the NDC target by 2030.

3.4 MITIGATION POLICIES AND MEASURES

This section outlines the policies and measures currently implemented or adopted in Malta that are expected to significantly impact GHG emissions. The following section outlines the key policies and measures for each sector; energy, transport, IPPU, agriculture, LULUCF and waste sectors.

3.4.1 ENERGY

This section provides a comprehensive summary of Malta's initiatives and strategies as outlined in the National Energy and Climate Plan (NECP). It highlights the country's commitment to achieving the European Union's 2030 renewable energy goals and its broader decarbonization objectives. The summary covers key focus areas, including renewable energy sources, energy efficiency in buildings, energy security, and specific measures to enhance sustainable practices in both the domestic and industrial sectors.

3.4.1.1 Renewable energy sources

Malta is committed to enhancing its role in meeting the European Union's 2030 renewable energy goals, especially that of reaching 25% renewable energy share by 2030. To do this, it plans to expand existing policies, create new initiatives, and explore innovative technologies. The government intends to make the most of local renewable resources and encourage private sector involvement. Malta's focus will include established technologies such as solar PV, biofuels, heat pumps, and bio-waste energy, along with investments in offshore wind and solar farms.

Solar PVs

Solar PV remains the most reliable renewable energy source in Malta. In 2021, there were 30,559 PV installations, with numbers rising to 32,015 in 2022 and 33,369 in 2023. In 2023, PV systems generated 309 GWh of energy, a 6.7% increase from 2022. By the end of 2023, Malta's total PV capacity exceeded 241 MWp, an 8.3% growth compared to the previous year.

To further boost solar PV energy generation, the government plans to continue offering PV schemes and feed-in tariffs to encourage installations by households and businesses. Support for solar PV systems under 40 kWp is regulated by Subsidiary Legislation 545.27, which provides operating aid and capital investment grants for households to help with new installations.

Existing schemes for PV system installations allow both residential and non-residential sectors to self-consume renewable electricity. Applicants can choose to sell all electricity generated (full export) or only surplus electricity (partial export) to the Distribution System Operator. If no support is applied for, PVs can be installed for self-consumption with surplus electricity sold at the market price. As residential PV installations grow in size, more electricity is being injected into the grid. The introduction of battery storage systems is expected to increase self-consumption in homes.

Malta's regulatory framework supports renewable self-consumption by ensuring no legal, financial, or technical barriers exist. Systems prioritizing self-consumption face no extra charges for selling excess renewable electricity to the grid. The government continues to promote self-consumption to help consumers reduce their electricity bills. The government is also committed to enhancing renewable energy use, including mandating solar panels on new buildings and streamlining permitting processes for renewable energy projects, particularly for PV systems.

A fast-track permitting system is in place for PV systems up to 16 Amps per phase. Larger systems require authorization and a grid connection study. Legislation now mandates solar panels on new residential and non-residential buildings that reach maximum height as set in local development plans. Buildings that are unsuitable for on-site installations may be required to contribute to a central renewable energy fund. The government is also focusing on utilizing public rooftops for renewable energy projects.

The inclusion of solar PV systems in new buildings is financially feasible and is reinforced by updated regulations, such as Technical Document F, which mandates PV panels in new or extensively renovated buildings from July 2024. This aligns with the goal to increase renewable energy adoption in Malta.

With regards to residential buildings, apartments are the most popular choice for new residential developments representing over 85% of the new dwelling approvals issued by the Planning Authority in recent years. This trend is projected to be sustained over the next decade in view of projected net immigration and population growth. This has a twofold effect: an increase in the depth of shadows cast on neighbouring buildings, and an increase in PV investor uncertainty, wary of possible overshadowing within the useful lifetime of the PV system. In view of these challenges, the Government of Malta has committed to introduce legislative instruments to oblige the installation of Solar Panels on New Buildings reaching maximum height limitations as per the established local plans. This initiative is part of a broader strategy to increase the use of renewable energy sources and ensure sustainable urban development. For buildings that may be shadowed or have design limitations, alternative measures such as mandatory contributions to a central renewable energy fund or investment in off-site renewable energy sources are being proposed.

When it comes to renewable energy use in the industrial sector, Malta's largest industrial land administrator, INDIS Malta Ltd., is promoting sustainability by exploring the installation of photovoltaic (PV) panels on its industrial roofs. It encourages businesses to adopt sustainable practices and renewable energy technologies in their construction projects. It also supports potential collaboration between the government and stakeholders to promote clean energy solutions within the industrial sector.

The government has also introduced a scheme to promote renewable energy adoption among voluntary organizations, offering fully funded PV systems. Two system configurations were available, providing options for 3.6kWp or 7.2kWp systems with full installation and commissioning.

To further encourage renewable energy use in public buildings, PV panels and batteries were installed in two local councils as pilot projects, completed in March 2023. These projects also included information screens to promote sustainability to the public.

In Malta, most renewable electricity is generated from PV panels, which means the electricity system can sometimes meet more than half of the demand during sunny hours. However, the system must be able to handle rapid changes in supply due to cloud cover. To address this, investments in utility-scale battery storage and grid interconnectors are planned to help stabilize the grid during periods of high variability in solar energy.

Battery Storage

In addition to two utility-scale Battery Energy Storage Systems, the government is supporting investments in smaller, distributed energy storage systems. Since 2021, households have been eligible for a scheme to install battery storage alongside their PV systems. This initiative aims to enhance consumers' ability to store excess renewable electricity generated by their PV systems for self-consumption rather than exporting it to the grid. By the end of 2023, 775 behind-the-meter battery storage systems had been installed, with a total capacity of 6.03 MWh.

Offshore Renewable Energy Generation

Malta is focusing on developing offshore floating renewable energy. This aligns with its climate neutrality commitment and the EU's TEN-E Regulation, aiming for 350 MW of offshore renewable energy by 2050. In 2021, the government enacted the Exclusive Economic Zone (EEZ) Act, enabling the designation of areas for offshore energy projects. A Preliminary Market Consultation (PMC) in 2022 gauged interest from investors for offshore renewable projects. Recently, Interconnect Malta has launched a preliminary qualification questionnaire for offshore floating wind farm project, to evaluate technical and financial capabilities. Candidates who are shortlisted will move on to the subsequent stages, leading to the selection of a developer who will be tasked with constructing, operating, and managing the wind farm.To regulate activities in Malta's EEZ, the government extended existing laws beyond territorial waters, ensuring a legal framework for operations in compliance with international conventions like UNCLOS. Given Malta's limited land area, the government is exploring the potential of its larger EEZ in surrounding waters.

In October 2024, Malta launched the National Policy for the Deployment of Offshore Renewable Energy, which provides a technology-neutral framework for offshore wind and solar projects. This policy promotes investment, research, and innovation in offshore renewable energy while enhancing energy security.

In the 2019 National Energy and Climate Plan (NECP), mature conventional technologies like onshore and fixed-bottom offshore wind turbines were found to face significant local challenges, including technical, social, and environmental limitations. For onshore wind, these challenges persist, and may have worsened, primarily due to the limited land available for such projects. Additionally, planning issues arise from the potential interference with airport safety, negative visual impact, proximity to densely populated areas, and effects on protected bird colonies and bats. Fixed-bottom offshore wind turbines also face restrictions due to limited suitable coastal and reef locations with depths less than 50m, along with substantial environmental and economic concerns.

Floating wind generation is emerging as the most suitable option for offshore renewable energy in the Maltese Islands. Technological advances in floating wind turbines now make it feasible to develop offshore projects further from the coast, offering benefits such as reduced environmental impact and minimal interference with other economic activities. These larger structures, designed to capture higher wind speeds, also lead to a lower Levelised Cost of Energy (LCOE).

As part of its Low Carbon Development Strategy (LCDS), the Maltese government is committed to advancing floating offshore wind energy. The country aims to reach 350MW of offshore renewable capacity by 2050, in line with a non-binding agreement under the TEN-E Regulation. To move this forward, the government launched a Preliminary Market Consultation (PMC) in May 2022 to engage stakeholders, align market capabilities with renewable energy goals, and ensure the LCDS targets are met through collaborative planning.

The PMC invited proposals for economic activities within Malta's Exclusive Economic Zone (EEZ), allowing international companies to suggest projects beyond Malta's territorial waters in

accordance with international law. The consultation garnered fifteen private-sector proposals, with a focus on developing offshore wind farms within Malta's continental shelf.

Renewable Energy Share in Heating & Cooling

The transition to renewable heating and cooling (RES-H&C) through heat pump technology is already well-established in Malta. Heat pumps, which are the predominant technology for spatial cooling, play a significant role in this transition. The current share of RES-H&C includes various technologies, such as heat generated by bio-digesters, solar water heaters, heat pump water heaters, air-to-air and air-to-water heat pumps, as well as biomass imports. The Long-Term Renovation Strategy (LTRS) for Malta, developed in line with the Energy Performance of Buildings Directive (EPBD), outlines a framework to improve the energy efficiency of buildings nationwide. The strategy is based on data from a representative sample of Malta's building stock and sets ambitious targets for renovating residential, commercial, and public buildings. Government grants and schemes aim to reduce energy demand in residential buildings, particularly for space heating, cooling, hot water, and lighting, excluding on-site renewables. They also provide incentives through energy efficiency packages for improvements such as roof insulation, heat pumps, solar water heaters, and high-efficiency glazing.

Renewable Water Heating Technologies

Due to Malta's high solar intensity, solar water heaters (SWH) are a viable renewable energy source, but limited roof space in multi-family buildings makes heat pump water heaters (HPWH) a more feasible alternative. The government has renewed the Solar Water Heater Grant Scheme, offering applicants up to 75% of the total eligible cost (max €1,400) and an additional €500 after five years for maintenance. The Heat Pump Water Heater scheme provides 50% of the HPWH cost, capped at €1,000 (increased from €700).

Air-to-Air Heat Pumps

Reversible air-to-air heat pump technology is well-established in Malta and is considered essential for thermal comfort, leading to a projected increase in their use without the need for additional policy intervention. Financial support is still being provided to the private and public sector to incentive the use of air-to-air heat pumps as part of Malta's strategy to improve the energy efficiency of buildings. The EU Commission's Delegated Regulation (EU) 2022/759, amending Directive (EU) 2018/2001, provides a methodology for calculating renewable energy used for cooling, including from heat pump technology. This methodology was applied to quantify the renewable energy contribution from cooling in Malta, and the results were incorporated into Malta's 2030 renewable energy share.

Other initiatives

Malta's first green bonds program, launched by the Water Services Corporation (WSC)in 2023, is one initiative that Malta has committed to. It highlights the Corporation's strong commitment to environmental sustainability and responsible finance. The bond, valued at €25 million with a ten-year term and a 4.25% interest rate, aligns with both the UN's Sustainable Development Goals and the EU's Green Deal. The funds raised will support eco-friendly initiatives, including the construction of an advanced reverse osmosis plant in Gozo, the development of solar farms for renewable energy, wastewater treatment upgrades, and enhancements to the water distribution network.

The Solar Farms Policy, introduced in 2017, aims to maximize the use of brownfield sites like car parks, industrial rooftops, disused quarries, and landfills for solar farm development. It outlines guidelines for the location of solar farms and includes environmental requirements for their development. Following the completion of the Appropriate Assessment and Strategic Environmental Assessment in April 2021, proposals for solar farms in or near Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) will be evaluated in detail on a case-by-case basis, considering these assessments. However, the financial viability of solar farms is challenged by high land costs and substantial grid connection fees due to increasing land scarcity. To overcome these issues, the government has identified potential clusters of sites, mainly quarries, that could benefit from shared grid upgrades. Funding from the Recovery and Resilience Plan (RRP) will support grid improvements, distribution services, and battery storage to enhance renewable energy integration into the electricity network.

3.4.1.2 Energy-efficiency in buildings

Following the introduction of minimum energy performance requirements in 2016 and the NZEB (Nearly Zero Energy Building) standards for private buildings in 2020, cost-optimality studies were conducted to assess the viability of further improvements in energy performance.

The findings revealed a gap between the current minimum energy performance requirements and the cost-optimal energy performance levels. The results of these studies led to the development of new minimum energy performance requirements, which have been subjected to public consultation. The studies included simulations of various building types such as dwellings, offices, hotels, schools, shops, restaurants, sports complexes, and homes for the elderly. Based on these findings, new cost-optimality studies proposed several policy measures that could enhance the energy performance of both new and existing buildings undergoing major renovations. These recommendations were incorporated into the new Technical Guidance Document F, which outlines the energy efficiency standards for buildings. The document focuses on calculating overall primary energy performance, accounting for energy used for heating, cooling, lighting, ventilation, and hot water, while considering any on-site renewable energy generation. It specifies the use of a national methodology for calculations and establishes performance benchmarks, including special considerations for buildings with significant solar energy potential. Energy performance is measured annually per square meter of the building's useful floor area.

Incentives for increased energy efficiency in buildings

In 2022, the Government of Malta introduced the "Irrinova Darek" pilot scheme, developed by the Building and Construction Authority (BCA), aimed at renovating properties and improving energy efficiency. Targeting the Grand Harbour Area, where building renovations are particularly challenging, the scheme required renovations to achieve energy efficiency levels 20% higher than NZEB (Nearly Zero Energy Building) standards, with a focus on making the buildings comparable to passive house standards. Renovations were allowed to be tailored to the specific site constraints, as long as technical eligibility criteria were met. The scheme offered a co-funding rate of 90% government funds and 10% private contribution, with a maximum grant of €15,000 per project. A total of 100 beneficiaries received financial assistance for renovating their private dwellings in the Harbour region.

The government of Malta is working on expanding its initiatives to improve energy efficiency in buildings by adopting a modular approach for classifying the schemes and their beneficiaries. These schemes are divided into two categories: domestic (residential) and commercial buildings, covering both new and existing structures. The schemes are further categorized into three main packages: financing, renewable energy, and energy efficiency.

The financing package is designed for buildings that meet Minimum Energy Performance Levels (MEPL). It includes financial incentives such as reduced stamp duty and preferential

loans for purchasing energy-efficient equipment and implementing energy-saving measures. Discussions are still ongoing within the government regarding the details of these schemes.

As part of its commitment to decarbonizing the building stock by 2050, the government is exploring additional ways to support investments that improve energy performance. This includes addressing the issue of longer payback periods for these capital investments, to ensure that the benefits outweigh the initial costs.

Currently, the government already supports a range of energy efficiency improvements, including roof insulation, higher-efficiency glazing, air-to-water heat pump water heaters, and solar water heaters. These measures aim to reduce energy consumption, cut emissions, and contribute to Malta's broader sustainability objectives.

Renovation of Private Sector Buildings Grant Scheme

Households

In 2022, a new grant scheme was introduced to support the renovation of private sector buildings, including both commercial and non-residential properties. The goal of this scheme is to encourage investment in building renovations that improve energy efficiency, reduce energy demand, and lower carbon emissions through retrofitting. The scheme specifically targets the renovation of 40,605 square meters of private sector buildings, with an aim to achieve a minimum 30% reduction in primary energy demand (PED) within these buildings by 31st December 2025.

The Government of Malta runs information campaigns aimed at promoting energy conservation, which are complemented by a free service offered by the Energy and Water Agency. This service involves technical personnel visiting households, discussing energy usage, and providing tailored energy-saving advice. Since 2022, this professional guidance has also been extended to micro-SMEs, helping them optimize energy and water usage in their businesses.

In 2022, the Government relaunched a roof insulation and double-glazing scheme for households to support residential renovations. Funded through national funds, the scheme was available to private individuals and organizations that are not engaged in economic activities. Beneficiaries could receive grants covering up to 50% of eligible costs, with a maximum grant of €1,000.

Additionally, the 2024 Double-Glazing Scheme specifically targets Birzebbugia residents, offering support to households in replacing old or inefficient external apertures with those that provide better sound insulation. The scheme promotes the installation of features like acoustic seals, noise reduction glass, and non-metallic frames, with an emphasis on hinged systems to maximize noise reduction.

Both the Roof Insulation (retrofitting) and Double Glazing (retrofitting) schemes are administered by the Regulator for Energy and Water Services. These initiatives aim to reduce energy consumption in the domestic sector, with funding provided through national funds for private individuals and organizations that are not carrying out an economic activity.

Industry and Services Sectors

The "Promotion of Energy Audits Scheme for SMEs" is an important initiative designed to help small and medium-sized enterprises (SMEs) assess their energy consumption. Under this scheme, grants of up to €5,000 are available to all eligible SMEs.

For large enterprises, Regulation 10 of SL 545.33 of 2021 mandates the completion of energy audits to specified quality standards and at regular intervals. Guidance notes are provided to

help these enterprises meet the statutory requirements for energy audits. The Government's goal is to improve the quality of energy audits performed by large enterprises, building on lessons learned from previous cycles. The next round of energy audit reports for non-SMEs is expected by the end of 2027.

Malta Enterprise offers a range of investment schemes to encourage businesses to invest in and improve their operations. One of these initiatives is the MicroInvest Scheme 2024, which provides a tax credit based on a percentage of eligible expenditure. This scheme encourages businesses to invest in various areas, including salary increases, premises upgrades, machinery, technology, eco-friendly commercial vehicles, and certification costs. Investments in premises and eco-friendly solutions can also contribute to reducing energy consumption.

3.4.1.3 Energy Security

Gas Security of Supply

As of mid-2024, the European Commission is revising the composition of Regional Risk Groups under the Gas Security of Supply Regulation, reducing the number of groups to four. Malta will join the LNG Group and the North-African Group due to planned connections with Sicily. These changes will affect future updates of risk assessments, preventive action plans, and emergency plans.

Malta's National Risk Assessment (NRA) was updated in 2023, considering risks such as the loss of the Delimara gas facility during peak demand, which would significantly impact electricity supply, as natural gas is solely used for power generation. The assessment also highlighted the need for a second interconnector and utility-scale battery storage to mitigate disruptions. It emphasized the importance of LNG imports and the operational capability of gas facilities, including ensuring Delimara Power Station's resilience against threats.

The updated NRA added new risks, including geopolitical issues (e.g., the Ukraine conflict) and the prolonged loss of the electricity interconnector with Italy. The Preventive Action Plan outlines measures to address these risks, such as improving security, energy efficiency, and diversifying energy sources. These measures include physical security, energy efficiency, renewable energy promotion, and infrastructure projects like the hydrogen-ready gas pipeline and the second electricity interconnector. Malta's energy system preparedness focuses on maintaining alternative power generation capabilities, securing long-term supply contracts, and conducting routine emergency testing. The overall goal is to reduce fossil fuel reliance and enhance system resilience as Malta transitions to a decarbonized energy system.

The Emergency Plan outlines three crisis levels for gas supply disruptions: early warning, alert, and emergency. It defines the roles and responsibilities of key actors, including the Ministry responsible for energy, natural gas providers, the electricity distribution system operator, regulators, civil protection, and the Critical Infrastructure Protection Directorate (CIPD). The Plan specifies actions to mitigate the impact on the electricity sector and establishes mechanisms for coordination and information exchange between the gas and electricity sectors. It also covers both the escalation process to an emergency and the de-escalation back to normal operations.

Gas and Electricity demand reduction measures

Malta's isolated position whereby it is not interconnected to the trans-European gas network, it cannot contribute to the EU's gas demand reduction efforts or provide solidarity by sharing natural gas with other Member States. Malta uses natural gas solely for electricity generation, with LNG imported and stored in a floating storage unit (FSU). Since Malta is not connected to the EU gas network, it does not have the capacity to reduce gas demand for others.

However, Malta is committed to reducing electricity and gas consumption within its own system and has implemented measures, such as switching to alternative fuels like gasoil during EU gas alerts. Malta has also introduced additional measures in line with the EU's voluntary gas demand reduction goals, as outlined in the 'Save Gas for a Safe Winter' communication.

Additional information regarding National Objectives and Targets related to the Energy sector, including Renewable Energy, Energy Efficiency, Energy Security, Internal Energy Market, and Research, Innovation, and Competitiveness, can be found in the NECP[26]. Table 12 and Table 13 indicate the relevant section and page for each thematic area.

Table 12: Cross-Reference of Relevant Topics to Sections in Malta's NECP Document-Energy (National Objectives and Targets)

Thematic Area	Section	Page
National Objectives and Targets on Renewable Energy	2.1.2	73
Including: Circumstances affecting renewable energy deployment, Solar Photovoltaics, Wind Energy, Grid Stability considerations, Heating and Cooling, RES in Transport, Electricity, Heating and cooling.		
National Objectives and Targets on Energy Efficiency	2.2	88
Including : Circumstances affecting energy consumption, Energy consumption in transportation, households, buildings and services. Indicative Energy efficiency contribution to achieving Union target, Energy savings, Energy poverty sub-target.		
National Objectives and Targets on Energy Security	2.3	100
Internal Energy Market	2.4	107
Including: Electricity interconnectivity (2.4.1), Energy Transmission Infrastructure (2.4.2), Market Intergration (2.4.3), Energy Poverty (2.4.4).		
National Objectives and Targets on Research, Innovation and competitiveness.	2.5	126

Table 13: Cross-Reference of Relevant Topics to Sections in Malta's NECP Document-Energy (Policies and Measures)

Thematic Area	Section	Page
Policies and Measures on Renewable Energy	3.1.2	138
Including: Share of RES in Electricity, Battery storage, Biogas, Offshore Renewable Energy generation, Renewable shares in heating and cooling.		
Policies and messures related to Energy Efficiency	3.2	173
Including : Industry and services, Buildings, Buildings and households		
Policies and measures related to Energy Security	3.3	192
Polices and measures related to Internal Energy Market	3.4	211

[26] NECP Submissions: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

3.4.2 TRANSPORT

This section provides a detailed summary of the policies and measures outlined in Malta's National Energy and Climate Plan (NECP) to achieve low-emission mobility. These initiatives aim to promote sustainable and efficient transportation systems while reducing greenhouse gas emissions across various sectors. The policies emphasize the electrification of vehicles, a shift towards alternative means of transportation, and enhancements in infrastructure to support active transport and alternative fuels.

At the end of this section, a table is provided summarizing the key policies and measures, along with references to the specific sections in the NECP[27] document where further details can be found.

3.4.2.1 Summary of policies and measures to achieve low emission mobility domestically

Malta is currently updating its National Transport Master Plan (TMP) to extend through 2030, aligning it with the 2050 National Transport Strategy (NTS). This revision is crucial as Malta experiences significant post-pandemic recovery, economic growth, and rising transportation demands. The TMP aims to address current and future transportation needs while balancing economic development with environmental sustainability, public health, and climate change considerations.

The updated plan will evaluate all transport modes, enhancing inter-modality for both freight and passenger transport. A new National Transport Model (NTM) will be developed to reflect current and projected economic and social scenarios, aiding in policy formulation and integrated transport analysis. The model will be an update of the 2025 National Transport Model and will be used for the testing and appraisal of transport scenarios and provision of transport forecasts to refine the National Transport Strategy and develop the updated Transport Master Plan for Malta. The model will assist the Government's work by producing outputs for more detailed local or project models as input into the engineering design process, economic and financial analysis, environmental assessment, and for monitoring of current and future projects.

Additionally, Malta's Air Quality Plan (AQP) acknowledges the transport sector's role in air pollution and outlines measures to promote sustainable transportation. These include encouraging reduced private vehicle use and increasing reliance on environmentally friendly public transport. The AQP also aims to transition to cleaner fuels for vehicles. As part of its National Energy and Climate Plan (NECP), Malta has implemented measures to promote low-emission mobility and electric vehicle uptake, which will be further strengthened leading up to 2030.

Policies aimed at decarbonizing the transport sector can be categorized into four main areas. The first category focuses on the Electrification of Transport, which encompasses several initiatives, including the rollout of publicly accessible EV charging points, legislative obligations and incentives for private charging pillars, and the electrification of the public sector vehicle fleet. Additionally, this category includes the work plan of the Cleaner Vehicle Commission, assessments of vehicle-to-grid systems, grant schemes to support electrification in services and industry sectors, a green mobility scheme, and a scrappage program for older vehicles.

The second category emphasizes a Modal Shift Towards Alternative and Active Transport. This includes investments in landing infrastructure, improved maritime transport connectivity, and initiatives like the Free Grand Harbour Ferry Service and the National Free Public & School

[27] NECP Submissions: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

Transport Service. Furthermore, it promotes active mobility through the National Cycling Strategy.

The third category focuses on Alternative Fuels, which includes the promotion of biofuels and auto gas as viable options to reduce carbon emissions in transportation.

Finally, the fourth category encompasses a range of Other Policies designed to support sustainable transport. This includes Sustainable Urban Mobility Plans (SUMP), studies on low emissions zones, the development of real-time journey planners, remote working initiatives, smart parking systems in Valletta, urban transport logistics improvements, the Sustainable Multimodal Intelligent Transport Hubs project, an Integrated Transport Management System (ITMS) platform, real-time public transport journey planners, enhancements to road infrastructure networks, and shore-to-ship projects. Each of these categories encompasses a range of specific initiatives and strategies that contribute to the overall goal of decarbonizing Malta's transport sector. The following sections will provide detailed insights into each category.

Electrification of Transport

Electrification of vehicles is a key priority for the EU to achieve a 55% reduction in climate emissions by 2030, and Malta has adopted this strategy as part of its Low Carbon Development Strategy (LCDS). The Maltese government is committed to reducing greenhouse gas emissions from the transport sector through various measures aimed at electrifying the vehicle fleet.

The transition towards the electrification of vehicles in Malta is supported by several additional policies and measures:

- Roll-out of EV publicly accessible charging points
- Legislative obligations and incentives for private charging pillars
- Electrification of Public Sector Vehicle Fleet
- Work Plan of Cleaner Vehicles Commission
- Assessment of the vehicle-to-grid systems

Key initiatives include the allocation of €50.3 million from the Recovery and Resilience Fund for grants aimed at promoting electric vehicle (EV) adoption, with a target of introducing 5,600 EVs by 2030. Additionally, a generous grant scheme is already in place to incentivize the purchase of electric vehicles by private individuals, voluntary organizations, and businesses. The grant offers up to €8,000, further supported by a scrappage scheme that encourages replacing older vehicles with EVs. Malta has committed to an ambitious goal of decreasing emissions within the transport sector, aiming for the electrification of an equivalent of 65,000 vehicles by 2030. Furthermore, legislative requirements for charging infrastructure in new buildings, along with the electrification of government vehicle fleets, will help accelerate the shift to electric vehicles. In addition, ongoing shore-to-ship projects aim to reduce emissions from maritime operations at the Grand Harbour and Malta Freeport Terminal.

Modal shift towards alternative means of transportation

Malta has introduced several progressive schemes to promote public transport over the past five years. In 2018, free public transport was introduced for youths (16-20 years old), people with disabilities, and pensioners. By the end of 2022, free transport was extended to all 'Tal-Linja' cardholders, significantly increasing passenger numbers. In 2023, the total number of public transport trips is expected to surpass 67 million, a 37% increase from 2022. The government has allocated €46.7 million to subsidize the service. Additionally, free school transport is offered to over 33,000 students. To complement these efforts, the government is enhancing ferry infrastructure to reduce private vehicle use and transport emissions. Projects

include improved quay structures and new pedestrian lifts, funded by both national and European funds.

Malta faces significant challenges with its inland transport system due to increased use of private cars, causing congestion and negatively impacting the economy, environment, and residents' quality of life. Given Malta's small size and traffic issues, relying on private cars is unsustainable. Despite improvements in public transport, many still prefer private vehicles. To address this, Malta aims to enhance intermodal transport, particularly by utilizing underused waterborne transport. New marine connections between Malta and Gozo, especially in densely populated areas, could reduce emissions, save time, and improve economic efficiency. A new ferry landing site is being constructed in Buġibba to provide safer, more reliable ferry services, offering an attractive alternative to road transport. The ultimate goal is to establish quick, clean ferry services, with studies indicating strong demand for such alternatives.

To complement traditional ferry services, a fast-ferry link between Malta and Gozo was introduced, offering a faster and more efficient commute between the islands. The service has been well-received by both locals and tourists, with 627,493 passengers using the service in its first year (June 2021–July 2022). In 2023, the service transported 693,361 passengers. Additionally, in 2023, the government launched a free ferry service within the Grand Harbour to integrate different transportation modes and reduce road congestion. This service, aimed at reducing reliance on private vehicles and promoting active mobility, and contributes to a reduction in air pollution, ease parking strain, and improve the overall efficiency of public transport.

Active Transport

The National Cycling Strategy, launched for public consultation in November 2023, aims to promote cycling as a sustainable transport mode in Malta by improving road safety and integrating bicycles and pedelecs. It emphasizes the need for cycle parking, infrastructure, and pedelec charging in new developments. The strategy aligns with the government's €35 million investment by 2029 to build a network of clean urban transport infrastructure, fostering a multimodal shift. Ongoing projects like the Msida and Pietà coast works, along with the Connections for Safer Active Mobility (CSAM) Project, enhance active mobility. Grants for pedelecs and e-bikes further support this vision, aiming to make Malta a walking and cycling nation.

Alternative Fuels and Roads Infrastructure Network Improvements.

In 2022, the Ministry for Transport, Infrastructure and Capital Projects sought support from the European Commission's DG Reform to assess the potential deployment of hydrogen in Malta's transport sector. The study provided a situation analysis of hydrogen use across road, maritime, and aviation, examined best practices, and evaluated financial, economic, and technical feasibility. While some options appeared feasible, they depend on uncertainties such as hydrogen-ready pipeline implementation and green hydrogen availability. Spatial constraints, including land use and proximity risks, present unique challenges for Malta. Although hydrogen mobility is currently absent, the report serves as a valuable reference for future planning and infrastructure development.

Malta has undertaken significant upgrades to its road infrastructure network, focusing on reducing congestion, improving traffic flow, and enhancing safety and sustainability. These efforts include modernizing major intersections, developing new cycling and pedestrian facilities, and addressing traffic bottlenecks at strategic locations. Additionally, substantial investments have been made to create greener, more accessible public spaces and to

encourage active mobility. Together, these initiatives aim to support Malta's transport demands while promoting environmental and social benefits.

Other Policies & Measures

In addition to the measures outlined, a series of complementary policies and initiatives further underpin the Government's commitment to enhancing sustainable and efficient mobility across Malta and Gozo. These include initiatives such as: the Sustainable Urban Mobility Plans (SUMP), the Low Emission Zone Study, the development of a real-time journey planner, the Smart Parking System for Valletta, urban transport and logistics strategies, the Sustainable Multimodal Intelligent Transport Hubs (SMITHs) Project, the Integrated Transport Management System (ITMS) Platform, and ongoing studies on a permanent link between Malta and Gozo.

As highlighted at the beginning of this section, a table is provided below summarizing the key policies and measures discussed. This table also includes references to the corresponding sections in the NECP[28] document where further details on each topic can be found.

Table 14: Cross-Reference of Relevant Topics to Sections in Malta's NECP Document-Transport.

Section 3.1.3.ii of Malta's NECP.		Page
- Electrification of vehicles:		156
	Roll-out of EV Publicly accessible charging points	157
	Legislative obligations and incentives for private charging	158
	Electrification of Public Sector Vehicle Fleet	158
	Electrification of vehicles in the services and industry sectors	158
	Assessment of the Vehicle to Grid systems	159
	Scrappage Scheme	159
	Shore-to-ship projects	160
- Modal shift towards alternative means of transportation:		161
	National Free Public & School Transport Service	161
	Improved maritime transport connectivity	162
	Fast passenger ferry link between Malta and Gozo	163
	Free Grand Harbour Ferry Service	163
- Active Transport		164
- Alternative fuels		165
- Roads Infrastructure Network Improvements		165
- Other Policies & Measures:		168
	Sustainable Urban Mobility Plans (SUMP)	168
	Low Emission Zone Study	169
	Development of a real-time journey planner	169
	Smart Parking System for Valletta	169
	Urban transport and urban logistics	170
	Sustainable Multimodal Intelligent Transport Hubs Project	170
	Integrated Transport Management System (ITMS) Platform	171
	Permanent Link between Malta and Gozo	171

[28] NECP Submissions: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

3.4.2.3 Res-Transport

Malta currently imports all biofuels, including biodiesel and HVO, for road transport, as there is no local production. Bioethanol is not used due to technical challenges posed by the hot climate, which increases the vapour pressure of petrol-bioethanol blends, potentially leading to harmful emissions.

In line with Directive 2009/28/EC, all Member States were required to meet a 10% share of RES in transport in 2020. Malta achieved a share of 10.71%, exceeding the sectoral transport target. The calculation methodology for the sectoral RES-transport target for 2030 was revised through Directive (EU) 2018/2001. RES consumption in the transport sector in 2022 reached 148 GWh, which based on the revised methodology translates to 10.5% RES share in transport. The lack of an on-road mass transport system, such as rail, largely limits the electrification options in Malta. Malta requires that biofuels placed on the market fulfil the necessary sustainability criteria and comply with EU directives and local legislation. In order to achieve an increasing penetration of biofuels in the transport sector, Legal Notice 68/2011 was published in 2011. This introduced a 'substitution obligation' for biofuels, by which importers and wholesalers of automotive fuels are obliged to place on the market a minimum biofuel content as a percentage of the total energy content of fossil diesel and petrol. This was amended by Legal Notice 336 of 2021, which sets a minimum biofuel content of 14% in 2030 and includes a sub-target for advanced biofuels. Fuel suppliers are obliged to blend biofuels in conventional automotive fuels, taking into account the possibility of double counting biofuels listed in Annex IX of Directive (EU) 2018/2001.

The RES-T share is expected to be predominantly met by an increase in biofuel consumption, achieved through the extension of the present substitution obligation on importers of road diesel and petrol, which is currently targeting only fuels used for road transport.

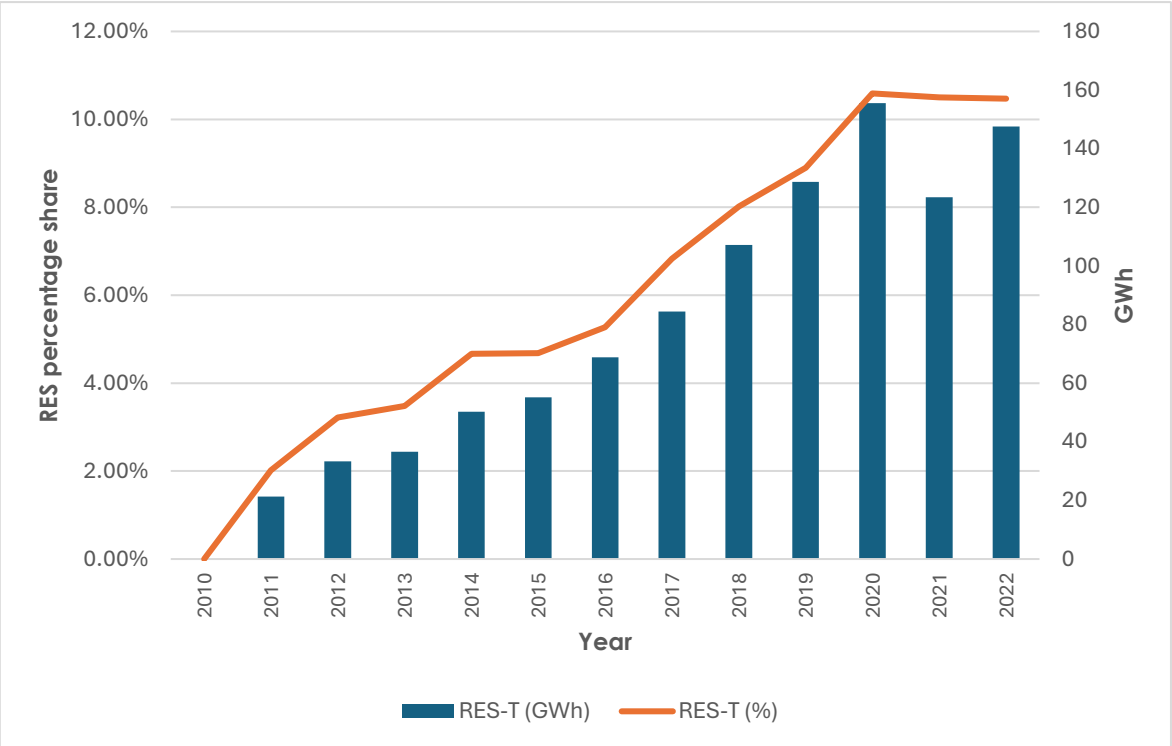

Figure 19: Renewable energy consumption in transport and RES-T development between 2010 and 2022. Source: Eurostat, SHARES Tool.

Further details regarding renewables in the transport sector can be found in Malta's NECP, specifically in Section 2.1.2 and on pages 77 and 81.

3.4.2.4 Energy efficiency in Transport

In terms of energy efficiency in the transport sector, Malta is actively pursuing a transition towards greener mobility solutions. The government has implemented a range of measures to enhance energy efficiency, including the promotion of electric vehicles (EVs) and plug-in hybrids through generous grant schemes. These schemes, supported by Malta's Recovery and Resilience Plan, aim to introduce 5,600 EVs into the private sector, with grants of up to €9,000 available when combined with the scrappage of older vehicles.

Efforts to enhance energy efficiency extend to the public sector, with the integration of 250 EVs into government fleets and the adoption of Green Public Procurement policies to facilitate the electrification of operations.

The Government has also invested in fully electric equipment within its Cleansing and Maintenance Division, acquiring 57 electric cleaning machines by mid-2023. This initiative aligns with Malta's vision for green transport investment, significantly reducing noise pollution, fuel consumption, and CO2 emissions while maintaining operational efficiency. Plans are in place to continue expanding the use of electric equipment and vehicles within the division.

Additionally, investments in sustainable transport infrastructure, coupled with policies encouraging remote work and alternative commuting options, aim to minimize fuel consumption and emissions while alleviating traffic congestion. Through these comprehensive strategies, Malta is demonstrating its commitment to achieving energy efficiency and sustainability in the transport sector.

3.4.3 IPPU

The main contributor to the GHG emissions from this sector is the refrigeration and air conditioning category. The measure that is expected to curb emissions from the IPPU sector and, more specifically, from the refrigeration and air conditioning category, is the implementation of Regulation (EU) 2024/573[29] - known as the F-gas Regulation. The implementation of this Regulation is expected to have a considerable positive influence on the manner and the extent to which fluorinated gases are used in the future.

In general, the F-gas Regulation is intended to reduce hydrofluorocarbons (HFCs) through a quota system on the amounts that importers and producers may place on the EU market, leading to a phase out in the EU in 2050; impose strict rules to prevent emissions; facilitate better monitoring and cap EU production of HFCs. The prohibitions listed in this Regulation aim to transition the market towards the utilisation of F-gases with lower global warming potentials, while setting end-dates for the placing on the market of gases with high global warming potential. The F-gas Regulation also sets out minimum qualification requirements for technical personnel involved in the handling of F-gases (e.g. for technicians involved in the servicing of refrigeration and air-conditioning equipment). The F-gas Regulation has been implemented locally by Legal Notice 143 of 2018[30]. It is envisaged that national authorities will continue to improve effectiveness in the enforcement of the requirements under the F-gas Regulation including the promotion of recovery, recycling, reclamation and destruction of F-gases from containers, products and equipment prior to their disposal.

[29] Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202400573

[30] Fluorinated Greenhouse Gases (Implementing) Regulations (Subsidiary Legislation 427.94): http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=12826&l=1

3.4.4 AGRICULTURE

3.4.4.1 National Agriculture Policy for the Maltese Islands (2018 – 2028)

An Agricultural Policy for the Maltese Islands, which brings together the EU requirements to have a Waste Management Plan as well as a Waste prevention Plan, was published in 2018, covering until the year 2028. The policy is intended to provide direction to all relevant stakeholders ranging from public entities to private entities involved in the agricultural scene who intend to invest or diversify their business. An overarching objective for this Agricultural Policy was identified and agreed between government entities, representatives of the private sector and the farming community. The policy is designed to target competitiveness of active farmers and livestock breeders, facilitating entry of young farmers, sustainable farming activities through adaptation of geo-climatic conditions and ensuring genuine management of farmland.

The policy presents a total of seventy policy measures organised in four sets of operational objectives, namely economic objectives, social regeneration, resources and governance. One can also find a set of actions, relevant to climate change mitigation, which were approved in the Climate Change adaptation Strategy (2012), and which were set to be implemented by the Directorate of Agriculture. While these policies and actions are very relevant to Malta's circumstances and should contribute towards the mitigation of GHG emissions from the agriculture sector, such contributions cannot be accounted for or included in the projections, given that no tangible information is available.

3.4.4.3 Malta's Action Plan for Organic Food (2023 – 2030)

Malta's Action Plan for Organic Food has been issued and is in line with the national focus on food security and the European Green Deal's sustainability objectives. The plan aims to enhance the quality and availability of local organic food from both farming and aquaculture, supporting producers' sustainable income and expanding the organic sector. Aligned with the EU's 'Farm to Fork' Strategy, the plan sets a goal for Malta to increase its organic cultivated area from 0.6% in 2023 to 5% by 2030, contributing to the EU target of 25% organic agricultural land. The plan is structured on three pillars: developing a supportive ecosystem for producers, strengthening government capabilities and infrastructure, and stimulating the organic market to increase demand and create new sales channels. This effort is part of a broader National Food Strategy to support organic production and consumption in Malta.

3.4.4.4 Agricultural Waste Management Plan for the Maltese Islands

The Agriculture Waste Management Plan for the Maltese Islands (AWMP) was drawn up to address the management practices of cattle manure and pig slurry. It proposes the development of a national system for manure management which will address a number of market failures, including the insufficient availability of cultivated land where manure can be applied, the vulnerability of the entire territory to nitrates contamination and the practical difficulties faced in terms of appropriate manure management by the typically small and fragmented farm holdings in Malta.

The Sant'Antnin Sewage Treatment Plant (STP) started its operations in 2016. The plant, which has a capacity of 76,000 tonnes per year, includes an anaerobic digester and a bulky waste plant able to handle a further 47,000 tonnes per year, while its waste transfer station can handle 11,800 tonnes per year. This plant processes organic waste and then uses bacteria to produce methane gas, which is used as fuel to produce heat and electricity. The first step in this process is mixing the organic waste with water to convert it into a pulp which is then fed to the digesters within the Anaerobic Digestion Plant. This breaks down the pulp through bio-

kinetic processes taking place within the digestors to produce a 'digestate'. For more detailed information about the STP refer to section 3.4.6.6. of the Waste sector.

In terms of manure treatment, only liquid manure produced in cattle farms (35 kt/annum) and dry manure from layer/poultry and broilers farms (4 kt/annum) are treated (an estimated 80 kt/a surplus is projected to require treatment in the future; however, this will not take place in the Mechanical Biological Treatment Plant (MBT)) 2,069 tonnes are sent to the MBT, which is able to process either mixed municipal waste or, ideally, source-separated bio-waste in a series of mechanical and biological treatment steps. The input received by the MBT is:

- Landfilled (35,155 tonnes);
- Further treated in the anaerobic digester (17,420 tonnes); or
- Sent to the Material Recovery Facility (MRF) which treats recyclable waste like plastic and carton.

3.4.4.5 Nitrates Action Programme (2011)

The Nitrates Directive (Council of the European Communities, 1991) has the general purpose of "reducing water pollution caused or induced by nitrates from agricultural sources and preventing further such pollution" (Art.1). A threshold nitrate concentration of 50 mg/l is set as the maximum permissible level, and the Directive limits the application of livestock manure to land to a maximum of 170 kg N/ha/yr, approximately as specified in Table 8 below.

Table 15: Nitrates Action Plan approximate application rates of different manures to comply with 170kgN/ha.

Livestock	Nitrogen content in manure	Maximum rate of manure to be applied (tons/ha)
Cattle	0.56%	30
Pig	0.81%	21
Layer	1.52%	11
Broiler	2.62%	6
Rabbit	0.83%	20
Sheep	0.90%	19

This Malta Nitrates Action Programme (NAP) contains the second Action Programme for Malta pursuant to the Nitrates Directive, basically addresses the protection of waters against pollution caused by nitrates from agricultural sources.

A key milestone in the implementation of the Nitrates Directive was the development of a Code of Good Agriculture Practice for Malta (CoGAP). The CoGAP was adopted in 2004 and covers all aspects of agricultural production. The CoGAP includes measures that directly address the implementation of the Nitrates Directive and it is these measures that constituted the first Nitrates Action Programme for the period from 2004 to 2007 (the first reporting cycle for Malta following EU accession).

The implementation and monitoring of the Nitrates Action Programme took effect upon accession of Malta to the EU through Cross Compliance Controls and it is still ongoing. Cross-compliance checks were carried out on all land based and livestock farmers selected in the Risk Sample, that were eligible under the control provisions established in the Nitrates Action Programme Regulations (S.L. 504.108) which transposes the Nitrates Directive and provides the legal framework in the setting up of a Nitrates Database amongst other things.

To implement the requirements of the Nitrates Directive, the NAP (LN 321 of 2011), requires that:

- All holdings greater than 0.5 of a tumolo prepare a fertiliser plan in accordance with the requirements of the regulations;
- Storage facilities for livestock manure must have a capacity of 5 months production of manure and must be leak proof and connected to a cesspit that must also be leak proof and have a capacity for 15 days of urine and washings;
- Livestock manure can only be spread on fields between 16th March and 14th October if dry matter is at least 30% in accordance with the requirements of the regulations;
- Livestock manure is stored on fields subject to the provisions of the regulations;
- Land application of slurry is not permitted;
- For holdings greater than 1 hectare of continuous agricultural land a Nutrient Management Plan must be formulated in accordance with the requirements of the regulations;
- Farmers must keep farm records;
- Fertiliser users must be registered and trained;
- The drawing up of a National Nitrates Database by the responsible Government entity.

Even though the NAP requires farmers to report their Fertiliser Plan, no data is available to understand how much fertilizer is being applied to soils or how much is projected to be applied in the future, and thus the projections presented in this report cannot incorporate the contributions of measures emanating from the NAP. Nonetheless, it is taken as a general rule that after the implementation of the Nitrates Directive, the application of swine slurry to soils was revised. In fact, it is assumed that the rate of swine slurry application decreased to 5% from 10%. Moreover, due to the recent setting up of the Farm Advisory Services, the Agriculture Department under the Ministry for Agriculture, Fisheries and Animal Rights, is planning on undertaking a study (or survey) to collect and analyse all the information that has been and is being reported in the Fertiliser Plans.

3.4.4.6 Common Agriculture Policy (2022)

The Common Agricultural Policy (CAP) Strategic Plan for Malta, under the Multi-Annual Financial Framework 2021-2027, is a cornerstone of EU funding for the agricultural sector, with a total budget of approximately €166 million. This plan is a continuation and evolution of the support provided by previous CAP measures, including direct payments and schemes, and is designed to complement other EU-funded interventions and investments.

Aligned with the new European Policies and Regulations for this period, the CAP Strategic Plan for Malta is dedicated to achieving three overarching objectives: fostering a smart, competitive, resilient, and diversified agricultural sector to ensure long-term food security; bolstering environmental protection and climate action to meet the Union's environmental and climate commitments, including those under the Paris Agreement; and strengthening the socio-economic fabric of rural areas.

The CAP Strategic Plan, endorsed by the European Commission in December 2022, will utilize resources primarily from the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD). These funds will target the agricultural sector's needs, focusing on environmental and climate objectives, new technologies and digitization, fair income for farmers and workers, improved rural conditions, and enhanced farm resilience. Additional commitments will support organic farming, animal welfare, the apiculture sector, eco-schemes, sustainable agricultural practices, and young farmers, contributing to national green targets in harmony with the European Green Deal, Farm to Fork Strategy, and Biodiversity Strategy.

Under Pillar 1, direct payment schemes such as eco-schemes will reward farmers for adopting environmentally beneficial practices. These include dedicating land parcels for biodiversity, using certified disease-resistant planting materials, and implementing Integrated Pest Management (IMP) to reduce pesticide use.

Pillar 2 focuses on rural development, with environmental and climate-related management commitments. It supports the conservation of indigenous species, the mechanical control of weeds in vineyards and orchards, the maintenance of non-productive trees, the introduction of bee boxes, and the implementation of soil management plans. These interventions aim to enhance biodiversity, soil health, and carbon sequestration, thereby mitigating climate change. The organic farming scheme under Pillar 2 offers payments to farmers transitioning to or maintaining organic farming practices, which are known to reduce greenhouse gas emissions and promote soil carbon storage. Investment schemes, such as on-farm productive investments, encourage modernization and environmental performance improvements, with a substantial budget allocated for a wide range of interventions. Knowledge exchange programs will disseminate information on sustainable practices, resource efficiency, and environmental protection. Off-farm productive investments support projects beneficial to agriculture, including farm waste treatment and the distribution of New Water, with significant funding allocated for these initiatives.

Lastly, the conservation and sustainable use of genetic resources investment supports actions like establishing a local gene bank, ensuring the preservation and sustainable utilization of Malta's unique plant and animal species.

3.4.5 LULUCF

3.4.5.1 Commitments and targets to LULUCF Regulation 2018/841

Regulation (EU) 2018/841, also referred to as the LULUCF Regulation, requires Member States to comply with the commitments for the period from 2021 to 2025 and target for 2030 as set out in Article 4. For the period 2021 to 2025, Malta must demonstrate compliance with the 'no-debit rule' which means that the Member State accounted emissions do not exceed accounted removals. In terms of the 2030 target, Malta must ensure that, the sum of its GHG emissions and removals reported for the year 2030, which is determined in its GHG inventory submission in 2032, compared to the average of its GHG inventory data for the years 2016, 2017 and 2018, does not exceed the target of -2 kt of CO2 eq. This national effort must contribute to the 2030 Union target for net greenhouse gas removals of 310 million tonnes of CO2 equivalent. Moreover, Malta must ensure that the sum of the differences between its GHG emissions and removals and the average value for its GHG inventory data for the years 2021, 2022 and 2023, as determined in submission of 2032, for each year in the period from 2026 to 2029, does not exceed the budget set for 2026 to 2029.

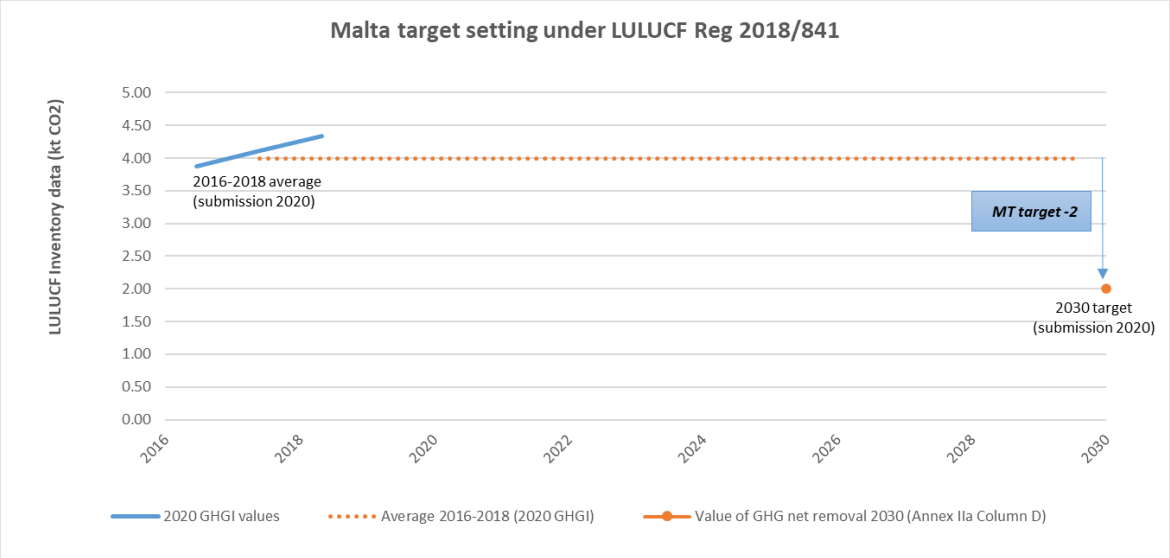

Figure 20: Malta Target setting under LULUCF Reg 2018/841

For Malta, the commitments involve managing its limited land resources to maximize their carbon sink potential. The country's initiatives include afforestation projects, sustainable urban planning that incorporates green spaces, and the conservation of natural areas that can act as carbon reservoirs. Malta also focuses on improving soil health through better agricultural practices, which can enhance the soil's ability to store carbon. These efforts are part of a broader strategy to create a more resilient and sustainable land use sector that can contribute to climate change mitigation and adaptation.

In view of inherent national circumstances including the high population density of the islands and the limited land availability, and to a certain extent the local climatic conditions (such as limited rainfall coupled with extensive dry periods), the potential for further reduction of CO2 emissions or enhancement of the removals through carbon sequestration is envisaged to remain minimal. The area encompassing woodlands in the Maltese Islands is significantly small and, furthermore, these residual woodland areas are now protected by legislation. Data indicates that the potential abatement in this sector is small compared to other sectors. The National Forestry Accounting Plan (NFAP) 2019[31] reported on Malta's planned levels of afforestation and estimated the likely levels of sequestration achieved by new and existing forests stands. The total sequestration potential of Malta was estimated to be 0.0376 kt CO2 (or 37.6 tonnes CO2) for commitment period 1 (2021-2025) and 0.0479 kt CO2 (or 47.9 tonnes CO2) for commitment period 2 (2026-2030), which is a significantly limited contribution in the context of overall national net removals.

Notwithstanding, Malta is channelling significant investment into creating green spaces and ecosystem restoration in bolstering and strengthening the islands' ecology as well as improve accessibility to green spaces for Malta's population. In 2023 Malta created a new agency 'Project Green' tasked with the upkeep of national parks and other public spaces. Over a period of 7 years Malta will invest €700 million for the creation, maintenance and invigoration of parks, gardens and other green infrastructure. Although the minor positive impact on CO2 sequestration from these afforestation projects, it will likely lead for these not be accounted towards the LULUCF targets due to methodological constraints (such as the applicable definition of forests under the LULUCF GHG Inventory reporting). Nonetheless, it is indisputable that these projects will be contributing to a healthier lifestyle, increased well-being and a more

[31] Malta Resources Authority (2019), National Forestry Accounting Plan Containing Malta's Forest Reference Level. Available at: https://cdr.eionet.europa.eu/mt/eu/mmr/lulucf/envxif3ca/Revised_NFAP_V1.pdf

sustainable environment also by means of climate change mitigation and by creating or increasing natural carbon sinks.

3.4.5.2 LULUCF Policies and Measures

Considering the limitations of the Maltese Islands due to its high population density of the Maltese Islands and the limited land availability, and to a certain extent the local climatic conditions (such as limited rainfall), the potential to mitigate emissions and maintain or increase the removals is, as a result, highly restrained. The potential of LULUCF activities aimed to mitigate climate change and enhance or preserve the sinks include;

- Afforestation projects and Forest Management of existing woodlands
- Sustainable activity and management of land, and management of existing woodlands.

The success of afforestation projects which can further enhance the sinks, and as a result potentially lead also to the reduction in GHG emissions, are based on the following factors: the geographic specificities of the Maltese islands need to be taken into account in order to implement the measures; the limiting factors in implementing LULUCF measures to further enhance and safeguard the sector; limited land availability; lack of water; lack of rainfall; and, high population density. Moreover, safeguarding the existing woodlands through sustainable forest management is of equal importance to preserve and maintain the limited remnants and corpses of woodlands which remain today. Action in this sector is thus primarily targeted towards enhancing tree coverage on the Maltese Islands and safeguarding the integrity of the existing, albeit limited, forested areas by good and sustainable management.

Ta' Qali National Park

The proposed national park in Ta' Qali, will see a tract of land which will be transformed into an open space in an investment of €20 million. The land previously housed an abandoned concrete factory that was demolished by the Planning Authority enforcement section. The park is set to spread over 45 hectares (450,000sqm). The existing national park is previsied to double in size, with 80,000 new trees being planted.

Inwadar national park

A site between Żonqor Point in Marsascala and Xgħajra would see the proposed site being planted with around 40-50,000 indigenous trees in Inwadar national park in the south of Malta. The €20 million afforestation project in Inwadar aims to create an area of woodland covering around 315,000 square metres of land.

3.4.6 WASTE

The below section highlights Malta's strategies and plans for policies and measures for the waste sector as outlined in the 2024 National Energy and Climate Plan (NECP).

3.4.6.1 Waste Management Plan 2021 -2030

Malta has adopted a ten-year waste management plan as mandated under the EU's waste framework directive. It aims for Malta's achievement of the waste targets including to divert waste away from landfill. The plan's strategic objectives are to:

- Maximise the resource value in waste through different management options

- Innovate by designing waste prevention initiatives to lower Malta's per capita generation rate
- Reform the collection system to increase economies of scale, harmonise collection practices and modernise the collection fleet
- Build the necessary waste management facilities to treat recyclable, organic and residual waste to achieve Malta's targets
- Study the feasibility of an enhanced producer responsibility framework to complement Malta's transition to a circular economy and reflect further on the true cost of waste management
- Promote further the involvement of the private sector in waste management

3.4.6.2 Long-Term Waste Management Plan

The Plan was developed with the input from a Strategic Environmental Assessment (SEA) and public consultations. The SEA highlighted the environmental benefits of reducing waste and improving management techniques. It recommended promoting markets for recycled materials, reducing the use of disposable bags, and encouraging private sector involvement. The plan includes monitoring measures for various environmental aspects such as air quality, biodiversity, soil integrity, greenhouse gas emissions, cultural heritage, energy consumption, water resources, public health, landscape, transport, and resource management. These measures are essential to assess the plan's effectiveness and to mitigate any negative impacts from infrastructure development and waste processing activities.

The SEA concluded that full implementation of the WMP would maximize environmental benefits, which would be greater than those achieved through partial implementation or no change at all. The final WMP incorporates feedback from the public and experts.

The consensus among respondents was the need for a more extended strategic timeframe, advocating for a vision stretching to 2050 rather than the initial proposal ending in 2025. This extension aims to facilitate detailed planning across short, medium, and long-term goals. Stakeholders also emphasized the importance of integrating future projections for waste generation into the Strategy to ensure its relevance and effectiveness in the coming years. The principles of a circular economy were widely supported, particularly in the construction and building sectors, to significantly reduce resource use and waste. The management of construction and demolition waste was a focal point, with a push for promoting recycling and re-use, alongside the establishment of storage depots to decrease reliance on backfilling practices. The consultation responses highlighted a need for the 2020-2025 Strategy to align with the National Strategy for the Environment's long-term vision, with clear deadlines for achieving specific objectives within this period. The introduction of Key Performance Indicators at the action plan stage was agreed upon to ensure the Strategy's measures are effectively implemented. Lastly, the Strategy's flexibility was evident in its readiness to review and potentially amend certain measures, such as the standardization of building apertures, in response to concerns about design and energy performance.

3.4.6.3 Single-Use Plastic Products Strategy for Malta (2021-2030)[32]

The Single-Use Plastic Products Strategy for Malta is part of the EC's initiative to advance towards a Circular Economy. This strategy aims to help Malta transition to a more sustainable economy by closing the loop of product lifecycles, reducing environmental and health impacts from plastic pollution, and minimizing litter and single-use plastic consumption. It also

[32] Ministry for the Environment, Energy and Public Cleanliness (n.d), Single Use Plastic Products Strategy for Malta 2021-2030, Available at: https://era.org.mt/wp-content/uploads/2021/12/SingleUse-Plastics-Strategy.pdf

focuses on improving the collection and recycling of single-use plastic waste. The strategy emphasises the importance of stakeholder engagement, education, and awareness campaigns to ensure that the public understands the benefits of reducing single-use plastics and to foster a shift in behaviour. The main objectives of the strategy are to reduce the consumption of single-use plastic products and to enhance the quality and quantity of single-use plastic waste that is collected for recycling. The ultimate goal is to protect the environment and human health from the detrimental effects of plastic pollution.

3.4.6.4 Construction and Demolition Waste Strategy for Malta[33]

The Public consultation for the Construction and Demolition Waste Strategy collected a total of 25 responses from general public as well as various entities such as NGO's, private companies and government entities.

In the consultation regarding Malta's strategy for Construction & Demolition (C&D) Waste Management, stakeholders acknowledged the critical role of site management and project administration in minimizing the impact of development sites on neighbourhoods. The strategy was praised for its inclusion of stakeholder discussions, training, and standards necessary for fostering positive change. However, there was recognition of past shortcomings, as the repetition of proposals from the previous Waste Management Plan (2014-2020) in the current draft strategy indicated a historical failure to address issues comprehensively. The Ministry and the Environment and Resources Authority (ERA) were urged to demonstrate a firm commitment to the strategy's implementation and to foster industry-wide cooperation to meet the established targets.

Clarity was sought on how the 2020-2025 Strategy aligns with the National Strategy for the Environment's long-term vision extending to 2050, with the expectation that the short-term strategy would serve as a vehicle to achieve the long-term objectives within specific deadlines. Emphasis was placed on the need for the strategy to focus on the reduction and reuse of construction waste, suggesting that incentives be created for the reuse and recycling of stone to prevent wasteful practices.

The challenges of achieving recycling targets were acknowledged, given the large quantities of waste generated, but it was noted that Malta has achieved an average of 18% recycling rate for CDW. This consultation revealed a consensus on the necessity of effective waste management strategy implementation, active stakeholder engagement, and the development of incentives to advance recycling and reuse within the industry.

3.4.6.5 Towards a Circular Economy 2020-2030[34]

The Ministry for the Environment, Energy and Public Cleanliness (MEEC) published Malta's strategy with respect to the vision for the circular economy[35] until 2030. The circular economy necessitates a complete re-evaluation of product lifecycle processes, from design and manufacturing to repair, maintenance, and ultimately, the collection and recycling or reuse of materials. Waste at the end of a product's life is no longer viewed as merely disposable, but rather as a valuable resource that can be reintegrated into the production of new products. The priorities outlined in this strategy include:

[33] Ministry for the Environment, Energy and Public Cleanliness (n.d.), Construction and Demolition Waste Strategy for Malta (2021-2030), Available at: https://era.org.mt/wpcontent/uploads/2021/10/Construction-and-Demolition-Waste-Strategy-for-Malta-2021-2030-ManagingConstruction-Demolition.pdf

[34] Ministry for the Environment, Sustainable Development and Climate Change (2021), Towards a Circular Economy 2020-2030. Available at: https://www.cemalta.gov.mt/wp-content/uploads/2021/09/email-versionfin.pdf

[35] Ministry for the Environment, Sustainable Development and Climate Change (2021), Towards a Circular Economy 2020-2030. Available at: https://www.cemalta.gov.mt/wp-content/uploads/2021/09/email-version-fin..pdf

1. Implementing policies and infrastructure upgrades to bolster the segregation of waste at the source, ensuring it is directed to high-quality treatment facilities. These measures aim to minimise waste mismanagement, such as exporting, landfilling, or incineration, by enforcing regulations that guarantee consistent access to particular waste streams, exemplified by bottle deposit programs.
2. Enacting regulations that mandate product designs conducive to reuse and repair, thereby prolonging their lifespan. These regulations also support end-of-life product management strategies that favour recycling.
3. Establishing regulations that recognise and capitalise on the economic worth of resources contained within products, or that achieve attainable recovery rates through technical means.
4. Introducing policies that stimulate the demand for recycled materials or foster the creation of markets for secondary raw materials.

Malta's strategy for embracing a circular economy by 2030, calls for a shift in how products are designed, manufactured, and recycled. The strategy prioritizes the transformation of waste into a valuable resource for new production, rather than seeing it as disposable. Key initiatives include enhancing waste segregation and treatment, enforcing design regulations to increase product longevity and recyclability, recognizing the economic value of resources for recovery, and stimulating markets for recycled materials. These measures aim to minimize waste mismanagement and create a sustainable, resource-efficient economy.

3.4.6.6 Water Management

The biggest challenge in the Maltese water sector is the scarcity of natural freshwater. Malta has the lowest freshwater availability per capita in the EU. Even if these natural water resources are used sustainably, they are still not enough to meet national demand and therefore the production of alternative (non- conventional) water resources is a necessity. In view of this, Malta has developed a water management framework based on the conjunctive use of water demand management and water supply augmentation measures.

At present, the provision of water services accounts for approximately 6% of the total national electricity demand. This is mainly used for water production, particularly due to the use of sea-water desalination plants which account for around 65% of the total production of potable water. Malta is well-aware of the interdependency between energy and water and that the provision of the two has to be considered in a holistic and economic manner if sustainability is to be achieved. In this regard, the Water Services Corporation, the Government owned water utility company, is carrying out projects in the primary water network and the wastewater treatment plant to improve system efficiency and reduce the electricity consumed per unit of water delivered. These measures are estimated to result in an investment of circa €38.6 million.

Following a significant upgrade supported by EU funds, the Sant'Antnin Sewage Treatment Plant (STP) has increased its wastewater treatment capacity by an additional 600 cubic meters per hour. The €7.5 million refurbishment included replacing outdated aeration systems with robust, stainless-steel parts, and installing advanced magnetic bearing turbo-compressors. These advancements have elevated the efficiency of wastewater treatment at the facility through cutting-edge technology, aligning with the Corporation's commitment to bolstering its environmental sustainability[36]. Also underway is a retrofit of the 500,000 p.e. Malta South

[36] Water Services Corporation (2024), Sant'Antnin Sewage Treatment Plant (STP) is now treating an additional 600 cubic metres of wastewater per hour, following the completion of a major EU co-funded upgrade of the plant. Available at: https://www.linkedin.com/feed/update/urn:li:activity:7236377054126997505/

wastewater treatment plant with the same energy efficient turbocompressors, estimated to reduce the annual aeration energy requirement by over 2.5 GWh, 2026 onwards.

The national water and wastewater utility has invested in PV farms covering its infrastructure with an installed 3.45 MW peak generating over 5.5 GWh per annum of renewable energy exported to the grid. A Green Bond funded extension of this project will be increasing the output to a 7,24 MW peak by the end of 2025, corresponding to a projected generation of 11 GWh. This figure translates to 7% of the utility's present total energy demand.

Water Demand Management (water efficiency) also leads to energy savings as it results in lower volumes of water moving in the urban water cycle. At national/regional level, distribution network leakage identification and control is the most effective measure to optimise the effective use of water. Leakage management in Malta resulted in a reduction of around 40% of municipal water demand over a 15-year period. Demand management measures are also important at the level of the user. Domestic water consumption in Malta stands at around 17 million m3 p.a. which amounts to an average daily consumption per person of around 110 litres.

Recognizing the importance of this issue, the Energy and Water Agency launched a comprehensive national campaign aimed at increasing public awareness about the optimized and efficient utilization of water resources, with the goal of fostering a change in the public's water conservation habits. To engage with a broad audience, the agency employed a multifaceted communication strategy that included creating a targeted campaign, advertising through traditional media channels, educating via alternative media platforms, and hosting a variety of events to raise awareness among the general public. The Energy and Water Agency also carries out household visits, including in vulnerable households, where technical personnel are tasked with helping residents understand energy and water usage and provide tailored energy conservation tips. Such households are also provided with water saving kits which provide all the necessary information on water conservation (also as part of the aforementioned campaign). To date, around 88,325 water saving kits have been distributed.

3.5 SUMMARY OF GREENHOUSE GAS EMISSIONS AND REMOVALS

Malta submitted its most recent National Inventory Report covering the period from1990 and 2022 to the UNFCCC in September 2024, as a separate report.

Chapter 2 of Malta's First Biennial Transparency Report (BTR) provides a summary of the main trends as outlines in the 2024 NIR, titled 'Malta's National Inventory of Greenhouse Gas Emissions and Removals'.

3.6 PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS

The projections for all sectors under the With Existing Measures (WEM) scenario, outlined below, are based on the 2024 NECP. In certain cases, the With Policy Measures (WPM) scenario is also provided for the IPPU and Waste sectors.

3.6.1 MACROECONOMIC PARAMETERS AND PROJECTIONS FOR NATIONAL TOTALS.

3.6.1.1 Macroeconomic forecasts (GDP and population growth)

The macro-economic projections were prepared by the Economic Policy Department (EPD) within the Ministry of Finance and Employment. Such forecasts include the typical macro-economic indicators issued by government for internal planning. They are based on the EPD's own methodology and set of assumptions and have been developed using a Structural Annualised Econometric Model for Malta (SAMM). The model's main purpose is to perform policy simulations at a detailed sectorial level. The output indicators include Gross Domestic Product (GDP), Gross Value Added (GVA) by NACE[37] code (Statistical Classification of Economic Activities in the European Community), disposable income, and employment rates. These figures provide the basis for governmental economic policy formation, analysis and decision-making processes and are therefore used by various ministries in all modelling exercises, including those relating to the development of the NECP.

Driving the macroeconomic indicators and projections, economic growth and a consequent increase in demand for labour have led to a high net inward migration, resulting in a rapid increase in population in recent years. Figure 21 shows the increase in population together with the corresponding yearly percentage increase, as per data published by the National Statistics Office (NSO)[38] and projections by the Ministry for Finance. Demographic and employment projections were based on trends in age groups established by Eurostat projections and recent trends in employment by economic activity type. From 2019 to 2023, population increased by 7%, initially projected to increase to 550,356[39] in 2023 by the Ministry for Finance, amounting to an average growth rate of 2.2% each year. Actual population numbers for 2023, as published by the NSO, were equal to 563,443, exceeding the Ministry for Finance's projections by more than 10,000 inhabitants. This surge in population is particularly noteworthy when considering the projections set forth in the 2019 NECP, which estimated that Malta's population would reach 554,772 by the year 2030.

Population growth is projected to continue increasing with an average rate of 1.5% between 2023 and 2030, reaching 610,244 and 670,787 by 2030 and 2040, respectively. Projections for population under a policy change scenario assumes a slower growth than accustomed, same level of historical productivity, an increase in labour productivity in line with the Ageing Working Group (AWG) projections, an average unemployment rate of 3%, and a less labour-intensive economy. This naturally translates into an increased number of households over the projected period. The source of historical data for number of households is the EU-SILC Survey (Survey for Income and Living Conditions) while the projected data takes into account historical trends as well as projected population growth. A mean unemployment rate of 3% was applied consistently over the projection horizon.

[37] NACE, from the Frenc term *"**N**omenclature statistique des **A**ctivités économiques dans la **C**ommunauté **E**uropéenne"*)
[38] NSO (2023), Census of Population and Housing 2021: Final Report: Population, migration and other social characteristics (Volume 1). Available at: https://nso.gov.mt/themes_publications/census-of-population-and-housing-2021-final-report-population-migration-and-other-social-characteristics-volume-1/
[39] Population figures retrieved from the Ministry for Finance and Employment

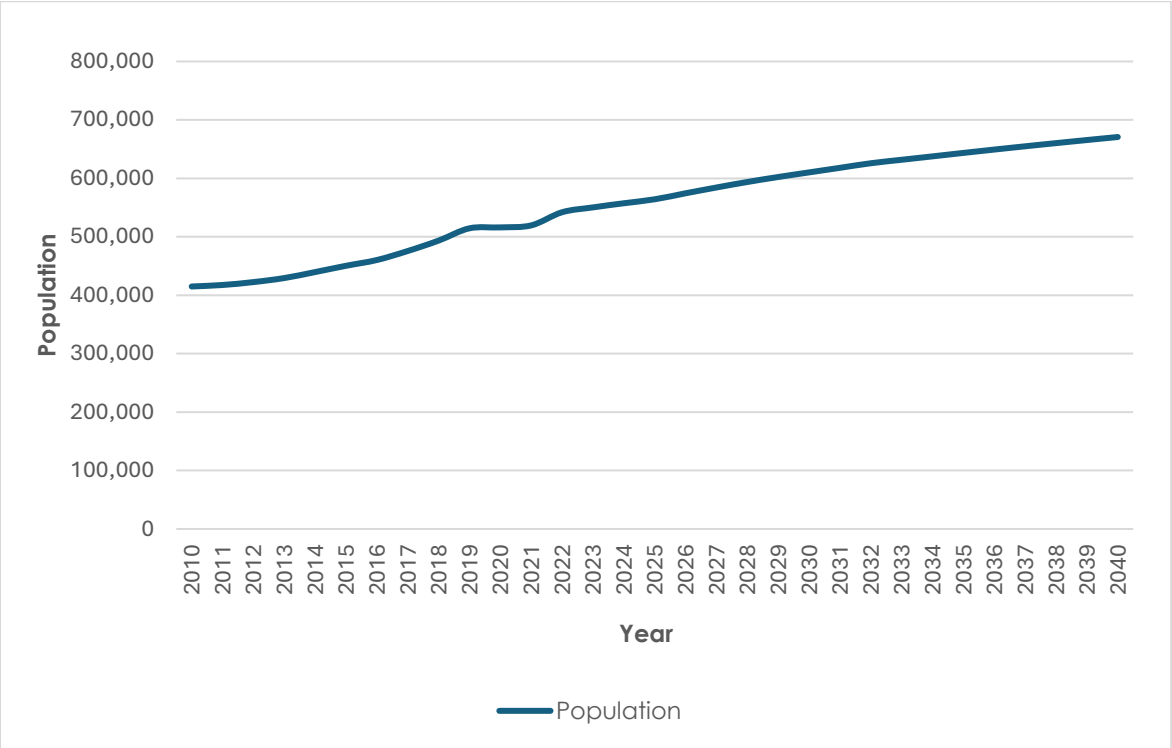

Figure 21: Population trends and growth rate in Malta. Source: Ministry for Finance and Employment.

Table 16: Total population and number of households. Source: Projected population and occupancy rate for households as per Ministry for Finance and Employment projections.

	2030	2040
Population	610,244	670,787
Number of households	264,175	298,128

Table shows the projected average GDP growth rate and the average GDP per capita up to 2040. The largest contributor to the decline in GDP in 2020 was clearly the pandemic, which led to a decline in net exports, primarily due to a decrease in foreign demand, restriction on travel-related activities and disruptions to the global supply chains[40]. Looking ahead, real GDP growth is projected to stabilise at around 3%. The GDP per capita is projected to maintain a steadily increasing trend, exceeding €30,000, (based on 2015 prices) per capita by 2030.

Table 17: Projected average GDP growth in five-year periods, %. Source: Ministry for Finance and Employment.

5-year period	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040
Average GDP growth (%)	3.6	5.7	3.1	3.0	3.0
Average GDP per capita (€2015)	23,845	26,405	28,810	31,327	34,766

The tourism sector is also projected to experience a steady growth in the number of inbound tourists. In 2023, tourism in Malta reached pre-pandemic levels, and within the first two quarters

[40] Ministry for Finance and Employment (2021), State of the Maltese Economy – Submission to the National Post-Covid Strategy Steering Committee. Available at: https://economicpolicy.gov.mt/wp- content/uploads/2024/03/State-Of-Maltese-Economy-V2.pdf

of 2024, the number of tourist arrivals increased by more than 23.4% when compared to the same period in 2023[41].

3.6.1.2 Projections of national totals

This section presents the projections for greenhouse gas (GHG) emissions in Malta, providing an overview of the expected national totals over the coming years. Table shows the emission projections split by sector and by gas for the period 2023-2030. Figure 22 outlines the projected emissions by sector, illustrating the contribution of various sectors to the overall emissions trajectory. The second figure (Figure 23) presents the projections by gas, highlighting the anticipated trends in the emission of different GHGs.

Table 18: Emissions projections by sector and by gas for the 'with existing measures' scenario.

	2023	2024	2025	2026	2027	2028	2029	2030
Energy								
Total (in kt of CO_2 Eq.)	1802.51	1823.51	1852.77	1786.56	1774.96	1555.95	1512.35	1479.84
CO_2 (in kt)	1792.88	1813.79	1842.97	1776.81	1765.22	1546.42	1502.90	1470.48
CH_4 (in kt)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
N_2O (in kt)	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02
IPPU	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	208.99	207.94	206.00	204.03	202.07	200.25	198.41	197.88
CO_2 (in kt)	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
CH_4 (in kt)	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
N_2O (in kt)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
F-gases (in kt of CO_2 Eq.)	202.75	201.70	199.74	197.77	195.81	193.98	192.13	191.60
Agriculture	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	86.62	83.51	81.49	82.26	77.66	78.13	78.82	77.59
CO_2 (in kt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CH_4 (in kt)	1.69	1.65	1.65	1.68	1.64	1.66	1.67	1.64
N_2O (in kt)	0.15	0.14	0.13	0.13	0.12	0.12	0.12	0.12
LULUCF	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	0.93	3.37	2.31	2.35	3.29	2.57	2.95	3.16
CO_2 (in kt)	0.38	2.83	1.78	1.82	2.76	2.04	2.41	2.61
CH_4 (in kt)	NA	NA	NA	NA	NA	NA	NA	NA
N_2O (in kt)	NA	NA	NA	NA	NA	NA	NA	NA
Waste	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total (in kt of CO_2 Eq.)	188.14	187.98	182.52	177.60	176.85	176.77	174.21	166.75
CO_2 (in kt)	0.25	0.25	0.97	0.97	0.98	0.97	0.97	0.97
CH_4 (in kt)	6.46	6.46	6.29	6.14	6.14	6.14	6.05	5.78
N_2O (in kt)	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01

[41] NSO (2024), Inbound Tourism: June 2024. Available at: https://nso.gov.mt/inbound-tourism-june-2024/

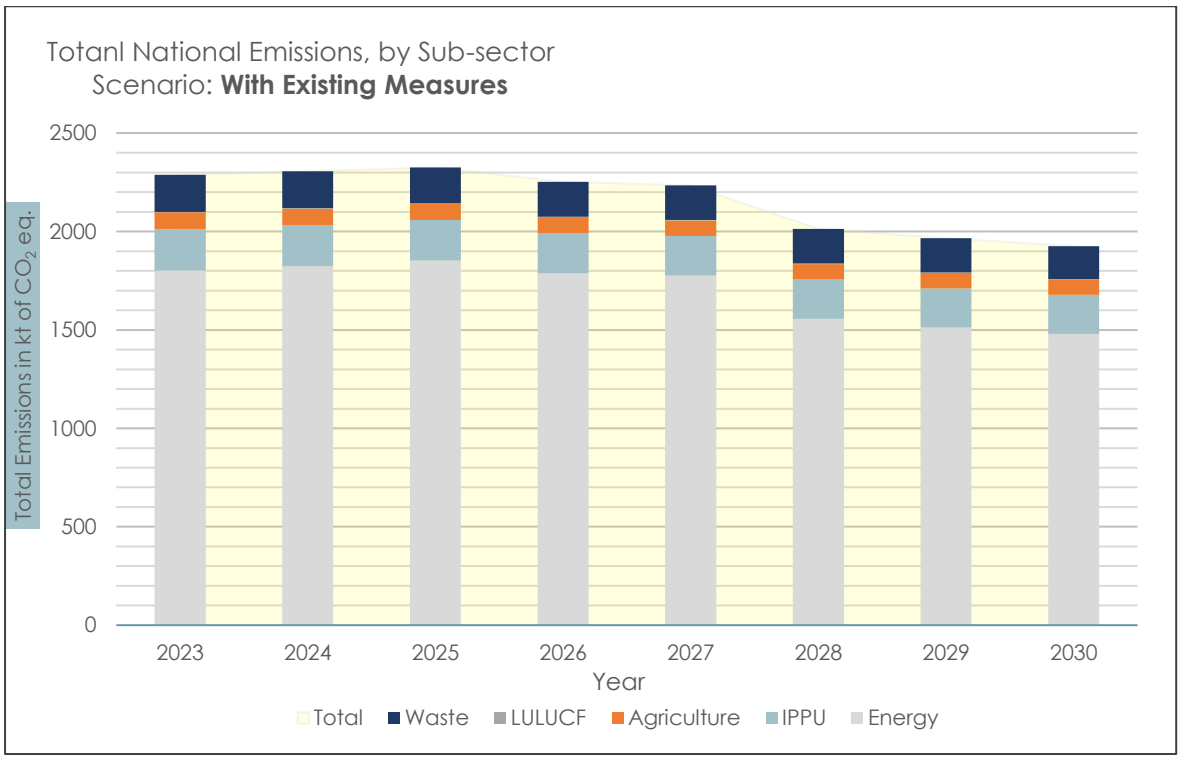

Figure 22: Projections of total National Emissions by Sub-sector. With Existing Measures Scenario.

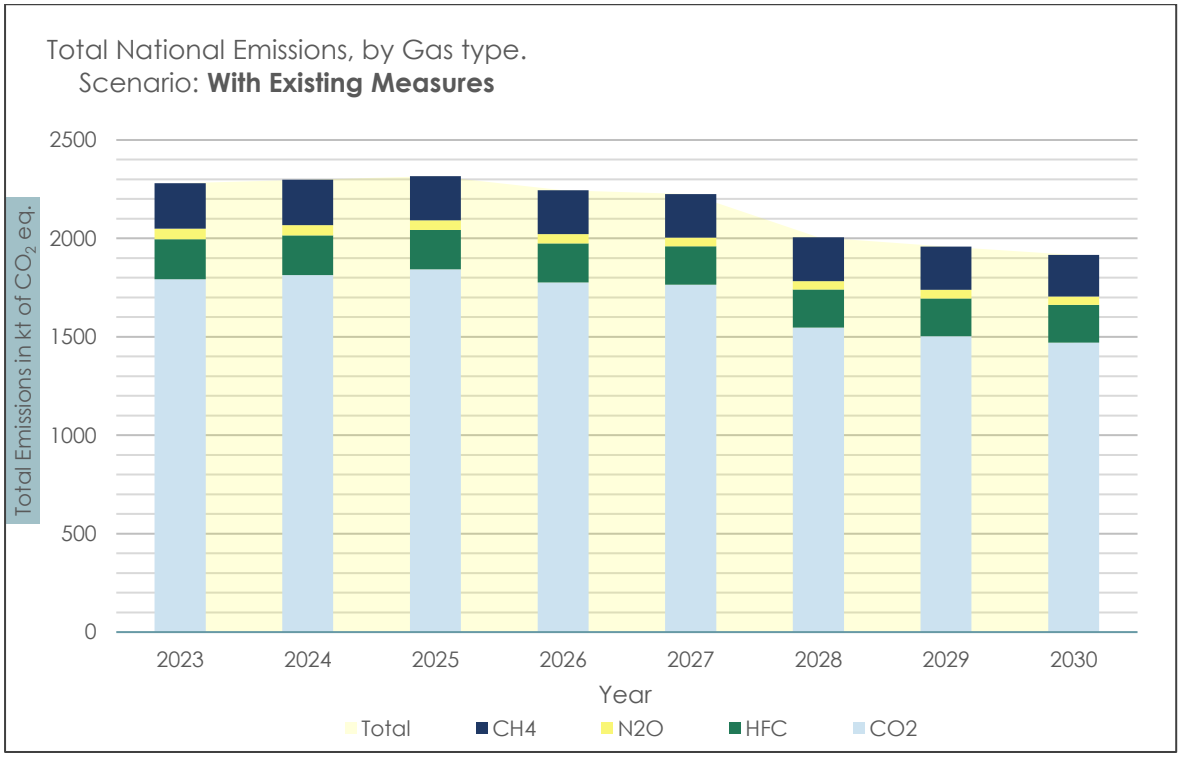

Figure 23: Projections of total National Emissions by gas type. With Existing Measures Scenario.

3.6.2 ENERGY

3.6.2.1 Sectoral changes expected to impact the energy system and GHG emissions

Residential Sector

The residential sector's energy consumption has been primarily driven by population growth and the increasing number of households. In 2021, there were 215,691 households, with an average occupancy rate of 2.41 inhabitants per household, which is projected to decrease slightly in the coming decades. Electricity consumption per household is expected to increase by 5.2% between 2022 and 2030, and overall energy consumption is expected to rise by 3.0%, with the number of households increasing by 17%. This growth is expected to lead to a higher electrification rate, including an increase in the use of air-to-air heat pumps, with the share of households using heat pumps expected to reach 93% by 2030 and 98% by 2040. The number of heat pumps per household is also projected to rise.

Projections indicate that the consumption of Liquified Petroleum Gas (LPG), gasoil, and biomass for space heating and cooking in households is expected to decrease by 9.8% by 2030. Additionally, support for installing solar water heaters and heat pump water heaters in the residential sector is expected to continue, with an estimated 3,200 new units to be installed between 2024 and 2030. This includes 2,278 solar water heaters and 916 heat pump water heaters. Final energy consumption in the residential sector is projected to reach 1,396 GWh by 2030. The main contributors to energy consumption will be appliances, lighting, and water heating. In a "With Existing Measures" (WEM) scenario, electricity consumption per household is projected to increase by 23.2% by 2030, largely due to continued electrification and higher disposable incomes, which typically lead to increased use of electric devices like white goods and air-to-air heat pumps.

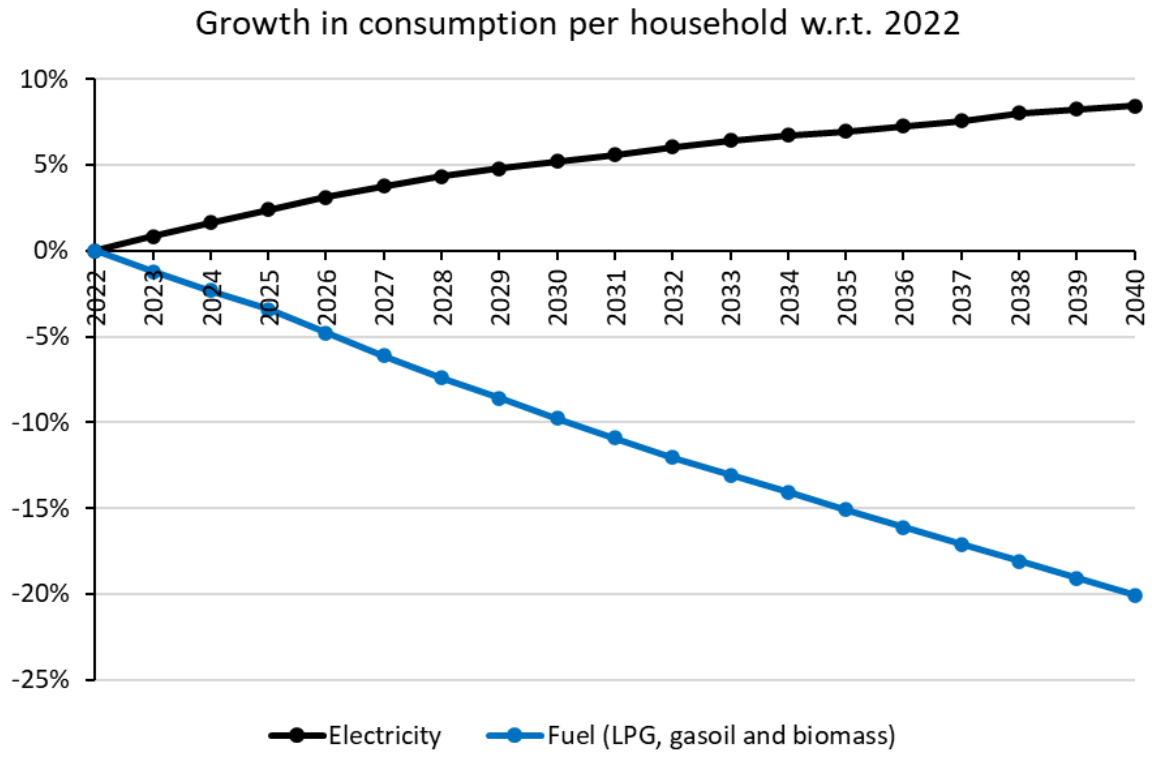

Figure 24: Growth in electricity and fuel (LPG, gasoil, and biomass) consumption per household with respect to 2022. Source: The Energy and Water Agency.

Non - Residential Sector

The gross value added (GVA) generated in Malta in 2019 stood at €11.5 billion (€2015), while that in 2022 increased to €12.9 billion (€2015), representing an overall higher GVA generation by 12% when comparing the two years. The largest sector currently contributing to the GVA is by far the services sector. Based on macroeconomic projections, this sector is expected to remain the most significant in terms of GVA, maintaining a share of around 88% of the total GVA up to 2040.

By 2040, Malta's gross value added (GVA) is projected to reach approximately €22 billion (€2015), with an annual growth rate of 3%. This growth will likely require additional floor space for expanding businesses, more employees, and increased healthcare and elderly care facilities to accommodate population growth. Energy consumption in the services sector, particularly in hospitality, healthcare, and offices, is expected to rise, with the tourism and hospitality sector remaining the largest energy consumer. The industrial sector will also see growth but with a slight decrease in its share of total GVA. Additionally, energy consumption for water supply and wastewater management will increase due to Malta's reliance on reverse osmosis for desalination.

Given the assumption that the projected economic growth results in a corresponding expansion in physical terms, in the "With Existing Measures" scenario the energy consumption required to sustain economic activities is reasonably expected to increase (Figure 25: Electricity Consumption in the residential and economic sectors (excluding transport) with central scenario assumptions.

Table 19: Final energy consumption in economic sectors (excluding transport) in 2030

Sector	Final energy consumption in 2030 (GWh)
Services	1,669
Industry	1,013
Agriculture, Forestry and Fishing	190

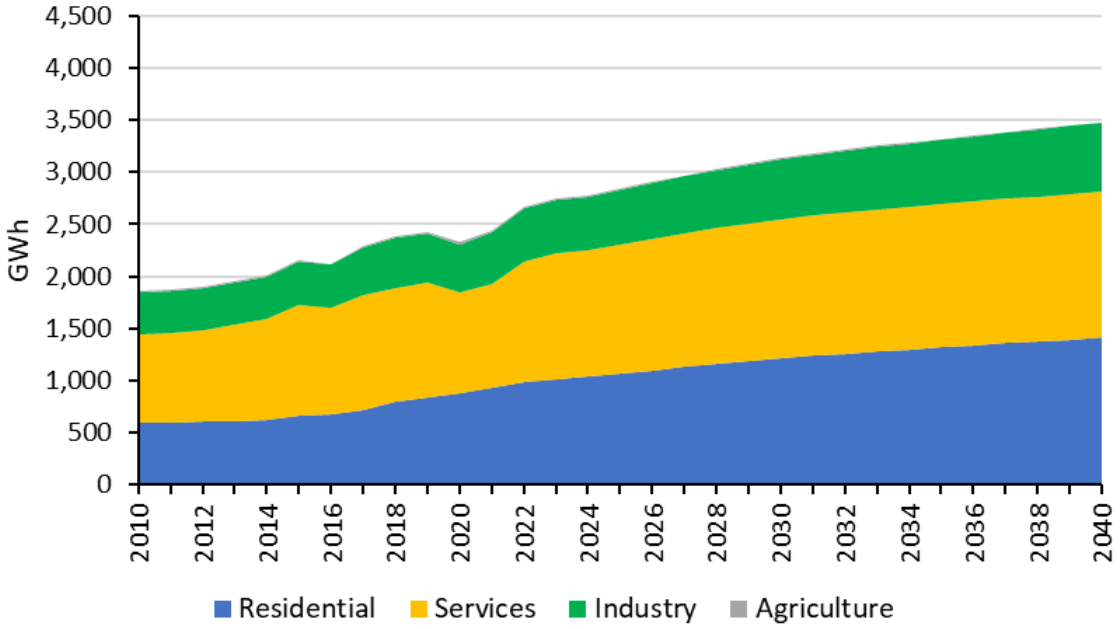

Figure 25: Electricity Consumption in the residential and economic sectors (excluding transport) with central scenario assumptions.

Between 2017 and 2021, the industrial sector, encompassing manufacturing, quarrying, and construction, consistently contributed approximately 12% to the total Gross Value Added (GVA). While GVA in this sector is expected to continue rising, its relative contribution is projected to decrease moderately, reaching around 10% by 2040. In 2018, the manufacturing sector was responsible for about 89% of the energy consumption in the industrial sector, with quarrying and construction accounting for 11%. However, between 2019 and 2022, the quarrying and construction sector saw a significant rise in fuel consumption, leading to a reduction in the manufacturing sector's share of energy use, which dropped to 74% in 2022. This share is anticipated to fall further to 72% by 2030. The energy intensity of the manufacturing sector is expected to continue its downward trend, from 678 kWh per thousand euros (2015) in 2021 to 588 kWh per thousand euros (2015) in 2030.

In Malta, the water supply, sewage, and wastewater management are heavily reliant on energy due to the country's dependence on reverse osmosis for desalination. As an island nation, Malta lacks access to alternative water sources typically found on mainland areas, such as rivers and lakes. Energy is also needed for wastewater treatment, groundwater pumping, distribution, and the production of new water. While the demand for potable water and the volume of wastewater requiring treatment are expected to rise, the increase in electricity demand for these processes is decoupling from both population and economic growth. It is projected that the electricity consumption for producing and distributing water and treating wastewater will grow by about 23%, from 159 GWh in 2022 to 196 GWh in 2030, with roughly 8% of this consumption allocated to the production of new water.

3.6.2.2 Energy Sector Projections

The projections in the WEM scenario indicate that Malta's GHG emissions are influenced by energy demand and usage in the power generation, transport (road and domestic navigation), industry, and buildings sectors. Therefore, emission reductions are largely dependent on the electricity supply sources (Figure 26).

A number of existing measures are expected to impact GHG emissions in the energy sector, including the following:

- For power generation, the key measures include the commissioning of the second interconnector, but also increased solar PV installations, increased battery storage, and energy efficiency initiatives within industry and services, amongst others. Emissions from Malta's Combined Cycle Gas Turbine (CCGT) plants will initially rise in order to accommodate increasing electricity demand but will be offset by the second interconnector and RES, leading to a significant decrease in emissions.
- GHG emissions from buildings are projected to have reduced energy use through new legislation on building fabric and high-efficiency technologies. Malta's industry, lacking carbon-intensive industries, will benefit from efficiency improvements in SMEs.

Projected emissions in the transport sector are expected to decline as a result of the electrification shift, supported by policy measures that encourage EV uptake and the expansion of the necessary charging infrastructure.

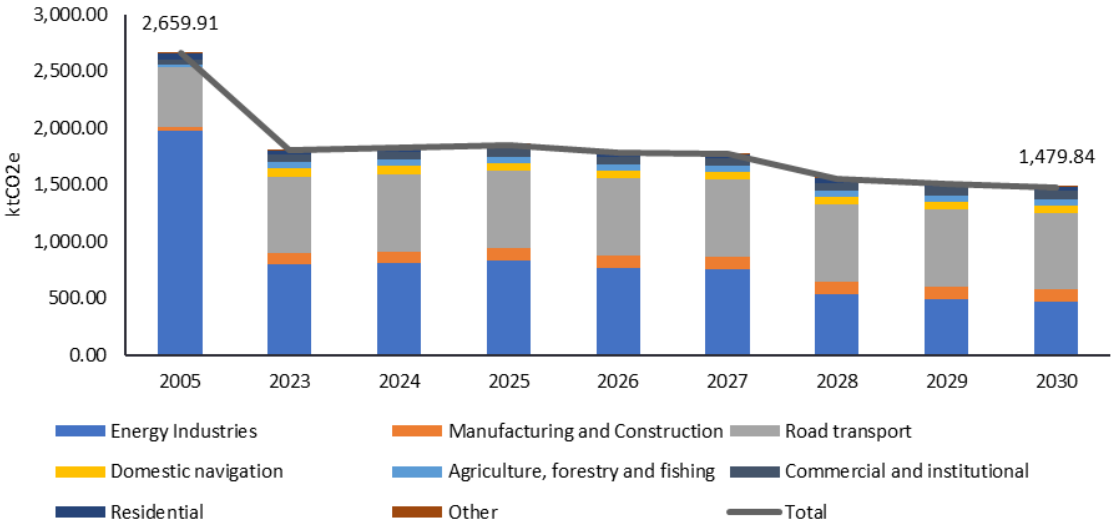

Figure 26: Total emissions from the energy sector (WEM scenario).

Further information related to the current situation and projections on renewable energy, energy efficiency, energy security, and the internal energy market can be found in the National Energy and Climate Plan (NECP[42]). The table below indicates the corresponding sections and pages.

Table 20: Cross-Reference of Relevant Topics to Sections in Malta's NECP Document-Energy

Thematic Area	Section	Page
Current situation and projections (WEM) on:	4	226
- Renewable Energy (Decarbonisation)	4.2.2	279
-On Energy Efficiency	4.3	285
-On energy Security	4.4	290
-On Internal Energy Market	4.5	295

[42] NECP Submissions: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

3.6.3 TRANSPORT

This section provides a summary of the projections related to the transport sector in Malta. For more detailed information, please refer to Chapter 4 of the recently published National Energy and Climate Plan (NECP).[43]

Transport emissions in Malta primarily originate from road transport activities, which encompass both private and public transport, as well as domestic navigation, including public transport ferries and private recreational boating. Unlike other EU Member States, Malta does not have a railway system, making these modes of transport particularly significant contributors to the national emissions profile.

Regarding domestic aviation, Malta has a single airport serving the Maltese Islands. Consequently, emissions from this sector are limited to the operation of helicopters, flight schools and private flying for leisure and recreative purposes. Given the minimal scale of these activities, emissions from domestic aviation are not factored into the projections, as their contribution remains negligible, accounting for less than 0.05% of total transport emissions in 2023. Furthermore, it should be noted that emissions from domestic aviation activities are not expected to increase in significance compared to historic trends due the limited domestic aviation capacity.

In 2022, transport accounted for approximately 43% of Malta's total energy consumption (Figure 27), with road transport contributing to the majority of this share. International aviation was the second largest contributor, making up 33% of the transportation sector's energy use. This higher reliance on aviation can be attributed to Malta's dependence on tourism and the lack of alternative travel options for its citizens, given the absence of a fixed link to mainland Europe. When compared to the EU average, where international aviation accounts for only 11% of the transportation sector's energy consumption, Malta's figure is substantially higher. This discrepancy underscores the challenges Malta faces in implementing energy efficiency measures to reduce the transport sector's consumption. Road transport in Malta still remains heavily dependent on private vehicle use despite the several initiatives taken up by Government to promote alternative means of transport and active mobility.

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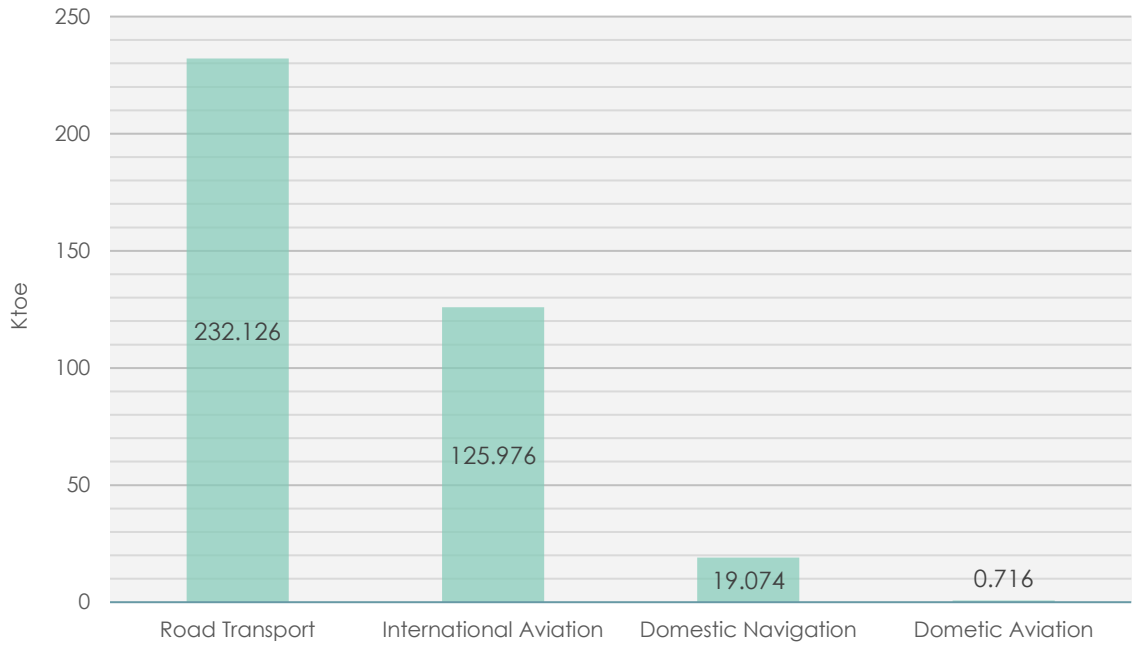


Figure 27: Final Energy consumption by Transport mode (including international aviation & navigation)

Transport emissions, encompassing road transportation activities and domestic navigation, represent a significant component of national greenhouse gas emissions. The figure below presents detailed projections, illustrating expected trends in transport-related emissions over the coming years.

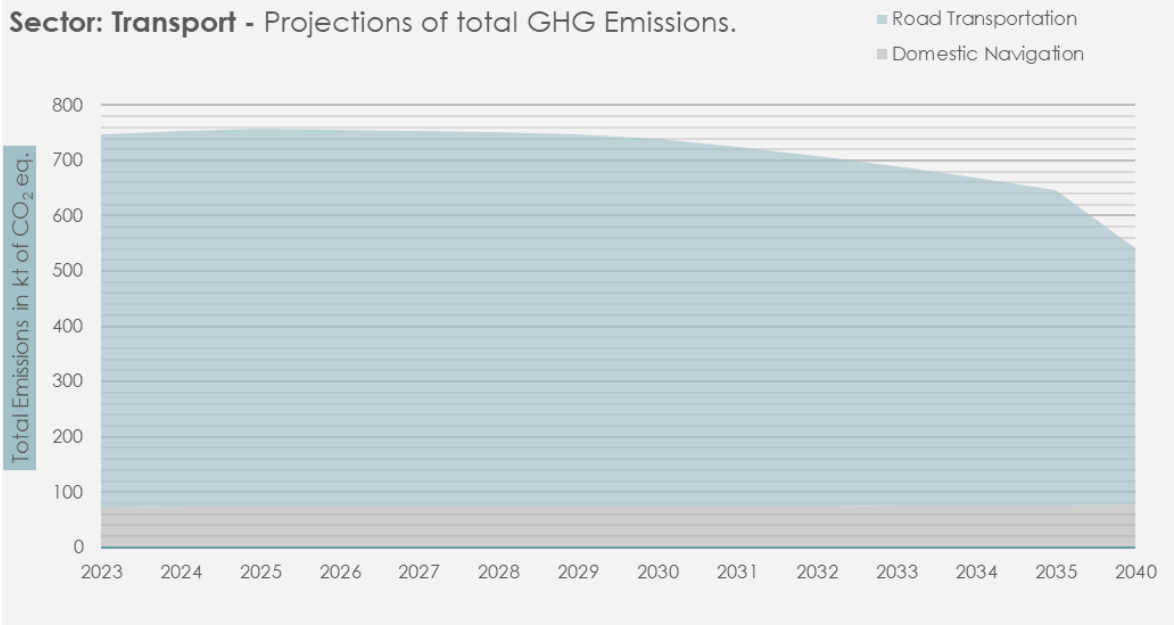


Figure 28: Projections of Total Emissions for category 1.A.3-Transport (excluding domestic aviation). Scenario: WEM.

Road Transportation

The number of road vehicles and vehicle-kilometres in Malta is expected to rise due to economic and population growth, although average fuel consumption and emissions per vehicle will decrease gradually as manufacturers meet EU CO2 targets. The adoption of electric vehicles (EVs) will be slow due to the high proportion of second-hand imports. In 2019, the road transport sector's energy consumption was 2632 GWh, but it declined during the COVID-19 pandemic to 2172 GWh in 2020, before returning to pre-pandemic levels by 2022. Projections for 2030 include 65,000 EVs, with further electrification efforts and transport measures in place. The impact of increased EVs on electricity demand will be managed through night-time charging incentives, and the sale of new internal combustion engine vehicles may be banned by 2035 under EU legislation.

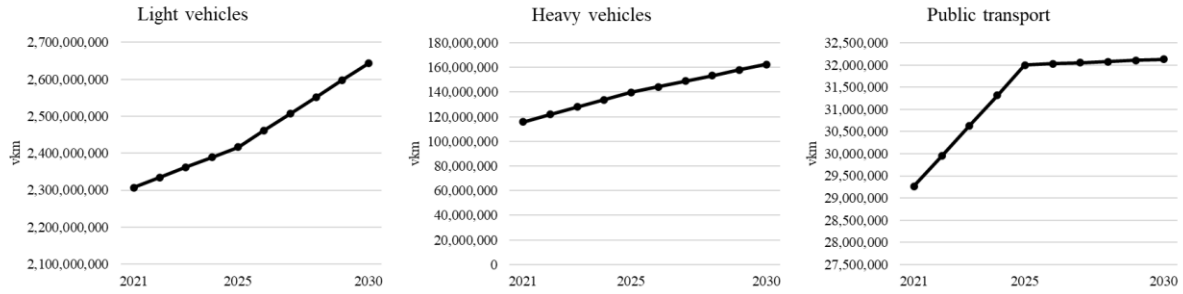


Figure 29: Annual vkm indicators from the National Transport Model with 'Business-As-Usual' Scenario. Source: MEEC.

The electrification of the heavy-commercial vehicle fleet in Malta is guided by EU Regulation 2019/1242, which mandates CO2 emission reductions of 15% by 2025 and 30% by 2030. It is expected that Malta's fleet will align with broader EU market trends.

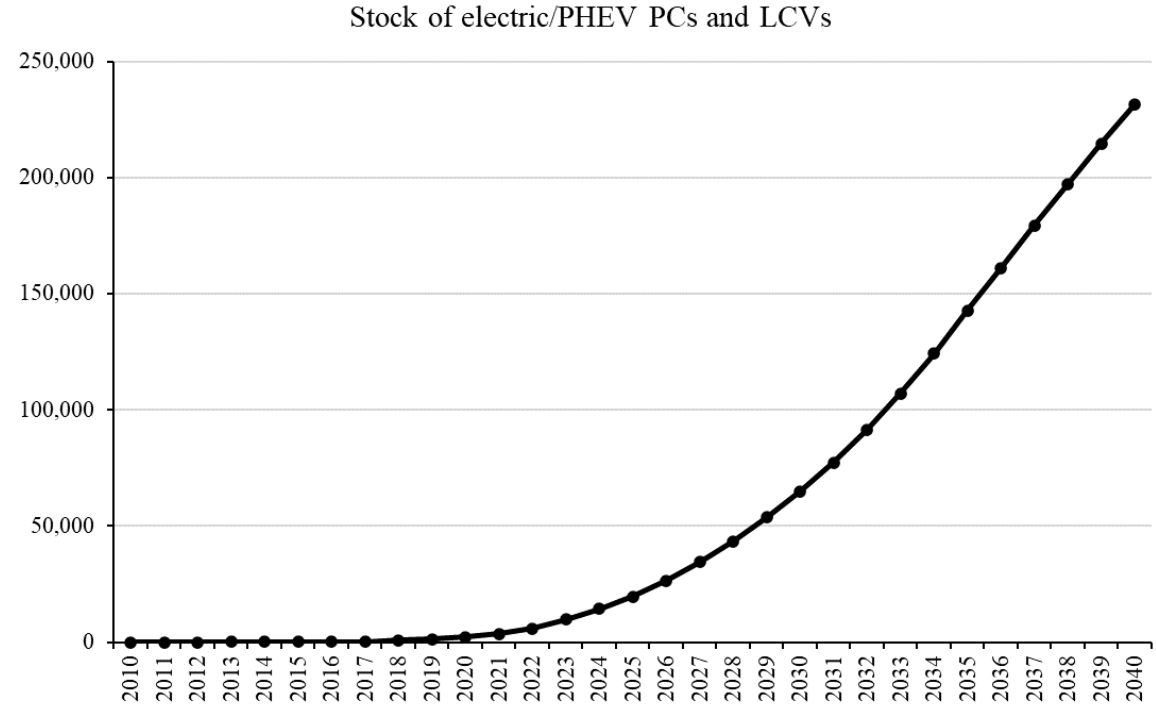


Figure 30: Stock of electric and plug-in hybrid passenger cars and light commercial vehicles under a 'Business-As-Usual' scenario in the NTM. Source: MEEC.

3.6.4 IPPU

The WEM scenario of the 2024 NECP projections includes emissions from all of the IPPU sector.

In the estimates of projected emissions from category 2F1 Refrigeration and Air Conditioning for the WEM scenario of the 2024 NECP projections, the effect of the prohibitions in the latest F-gas Regulation (Regulation (EU) 2024/573) was modelled. This was done using the *F-gases Forecast model*. The *F-gases Forecast model* is used to estimate F-gases emissions, measured in tCO_2eq, for Malta for the 2022 to 2050 period.

The *F-gases Forecast model* estimates projected emissions of F-gases from the following types of equipment:

- domestic air conditioning split units,
- domestic air conditioning VRF units,
- commercial refrigeration furniture units,
- commercial heat pumps and chillers,
- domestic refrigeration,
- domestic deep freeze,
- road transport air conditioning and
- refrigerated vans.

The drivers of the *F-gases Forecast model* are:

- population and GDP growth projections (Source: "Annex II: Population and GDP growth" of "Recommended parameters for reporting on GHG projections in 2025" issued by the EUROPEAN COMMISSION DIRECTORATE-GENERAL CLIMATE ACTION, Directorate A - Strategy, Analysis and Planning, CLIMA.A.2 - Foresight, Economic Analysis & Modelling);
- projection elasticity parameters and initial stock and import values;
- the charge per unit for the different equipment types;
- the leakage rates from existing stock;
- end-of-life emissions, which are assumed to be equal to 100% throughout the time series;
- the composition of the refrigerants to be used in new units was adjusted to meet the GWP reduction requirements specified in the prohibitions in Regulation (EU) 2024/573;
- where refrigerants with a GWP in line with the prohibitions listed in Regulation (EU) 2024/573 are not yet commercially available, refrigerants having a GWP according to the specifications in the same Regulation were assumed to be used; and
- similarly, for vehicles, the GWP was set according to the respective Euro classification.

Projected trends of GHG emissions from categories other than 2F1 Refrigeration and Air Conditioning were calculated as follows. The information in the 2021, 2022, 2023 and 2024 NIR and the 1990-2021 time series (from the 2024 inventory) were used to understand the drivers for the trends. Using this knowledge, the trend for each category/sub-category was projected individually. It should be pointed out that this is a manual process that does not consider overall statistical information, which is generally more appropriate for emissions inventories considering the small datasets being dealt with. No measures were taken into consideration in the projected trends of GHG emissions from categories other than 2F1.

Table 21: Projected emissions in $ktCO_2eq$. for sector IPPU, by gas (WEM)

	Gas	1990	2005	2020	2025	2030	2035	2040
IPPU	CO_2	5.14	3.67	4.45	4.80	4.80	4.80	4.80
	CH_4	NO	NO	NO	NE	NE	NE	NE
	N_2O	2.35	2.18	2.15	1.45	1.48	1.51	1.53
	HFCs	NO	34.15	206.56	199.37	191.22	178.62	106.63
	PFCs	NO	NO	0.000001	0.000001	0.000001	0.000001	0.000001
	SF_6	0.01	1.61	0.41	0.37	0.37	0.37	0.37

Total	**7.50**	**41.62**	**213.58**	**206.00**	**197.88**	**185.30**	**113.33**

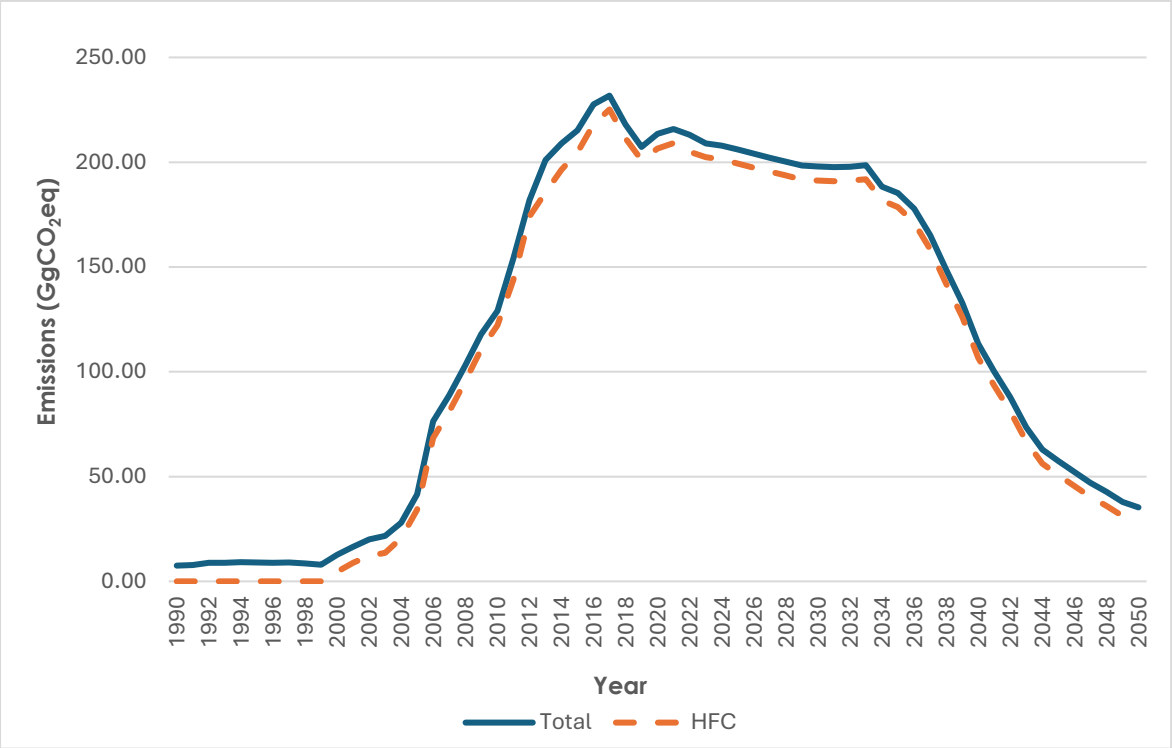


Figure 31: Projected WEM scenario for sector IPPU

The total emissions estimated using the *F-gases Forecast model* stabilise downwards by 2033. The stability in emissions until that point is the result of offsetting effects of economic growth and stricter limits on the GWP of gases used. Subsequently, the imposition of stricter limits on GWP are projected to dominate the levels of emissions.

3.6.5 AGRICULTURE

The model and projections for the agriculture sector have been developed in alignment with the national inventory system by integrating the model within the inventory's workbook itself. The values from the national inventory are taken into the model, processed and projections are then developed based on the base year chosen. The projections update whenever the historic data is updated, hence producing a more realistic projection with every submission which is based on actual historic data rather than past projections.

A number of quality assurance and quality control checks have been implemented in the worksheets and model of the agriculture sector which tackle calculations for both the National GHG inventory Report and the PAMS and Projections Report. Such quality checks have been integrated through a full automation of the agricultural sector workbooks to reduce human error, data analysis checks, model performance checks to ensure that numbers projected are correct, and full transparency of the model calculations.

The WEM scenario for agriculture (Figure 32) is based on the 'Manure and Slurry Management' measure. Projections for the period up to 2030 show that all livestock waste will be transported to newly established Animal Waste Treatment Plants, where the liquid part of the waste (80%) will undergo treatment to be converted into reusable water. The solid part of the waste (20%) will be transformed into bio-fertilizer. As a result, animal waste will no longer be spread directly on fields. Instead, an amount equivalent to the 20% solid fraction of all animal waste will be

used as organic nitrogen on the soil. Consequently, the contribution of animal nitrogen to soil will effectively be zero kilograms of nitrogen per year by 2030.

In this scenario, it is anticipated that the solid fraction equivalent (the 20%) will be allocated to the stream of Organic N applied to soils, rather than to the stream of Animal manure N applied to soils.

The liquid fraction, which accounts for the other 80% and would typically be considered part of the waste sector, will be processed into new water. Therefore, this fraction will no longer be associated with either the waste or the agriculture sector.

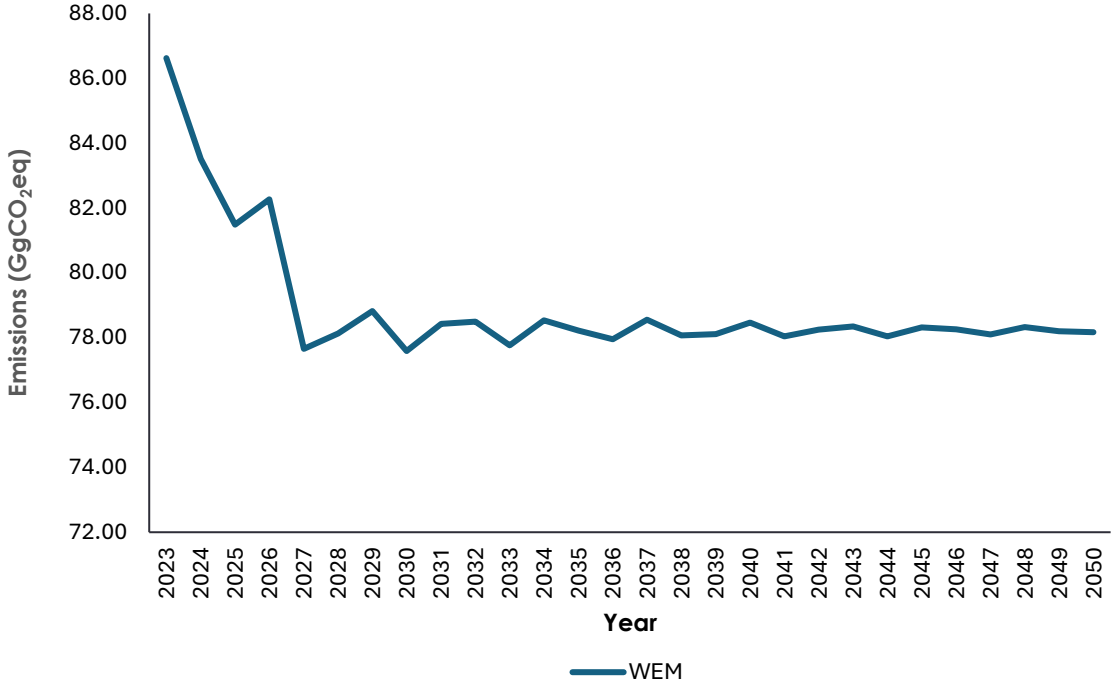


Figure 32: Agriculture GHG Emissions, WEM scenario. Source: CAA.

Measures for the Agriculture sector

Use animal and agricultural waste and residues as a resource

This need will be addressed through the off-farm infrastructure intervention, which will contribute towards the complete disconnection of farm waste from the sewage network through concrete measures aimed at achieving compliance with the Urban Waste Water Treatment Directive (UWWTD). Support shall ensure that farm waste is treated as a resource by transforming it as a fertiliser to be reintroduced as an input in agricultural value chains.

Reduce use of chemical N-fertilizers and other inputs with similarly high carbon footprint

Malta's Action Plan for Organic Food[44] is based on a vision that offers consumers high quality local organic food from farming and aquaculture, whilst driving sustainable income for Maltese and Gozitan producers. This will result in the diversification of local organic production, more access to organic produce in retail stores and markets to meet rising domestic demand and strengthen ecosystem around the organic food sector in Malta. The National Action Plan

[44] Ministry for Agriculture, Fisheries and Animal Rights (2023), Malta's Action Plan for Organic Food 2023-2030. Available at: https://agriculture.gov.mt/wp-content/uploads/2023/11/organicActionPlan.pdf

for Organic Food also focuses on promoting organic food production for public health, climate change mitigation and biodiversity protection aims.

In line with the European Commission's 'Farm to Fork' Strategy, the EU has set a target of 25% of its agricultural land being organic by 2030 while also substantially increasing organic aquaculture by the same year. Malta's share of organic production should reach 5% of total cultivated area by 2030, up from 0.6% of organic agricultural land in 2023. This target is also in cohesion with the National Food Strategy that is currently being developed for Malta and other national strategies that support organic production and consumption. The planned measures are listed below.

- Providing tailored financial support for organic farming conversion and maintenance.
- Incentivising landowners to lease out agricultural land for organic farming.
- Driving organic farming in protected horticulture.
- Supporting on-farm productive investments; organic farm start-ups; and off-farm processing of organic products.
- Providing for training, mentoring, and advisory services in organic farming.
- Facilitating access to plant protection products for organic farming.
- Encouraging operators to shift to organic production and certification through aid schemes for organic aquaculture.
- Facilitating the permitting process for operators in organic aquaculture.
- Strengthening the role of the Ambassador for Organic and Sustainable Food.
- Assessing the organisational capacity, capability and infrastructure needs of the responsible authorities.
- Promoting the set-up of an organic forum and website.
- Investing in advisory, knowledge and information systems for the organic sector.
- Establishing dedicated data initiatives to collect, analyse, and disseminate data on the organic food sector.
- Organising and engaging in promotional activities to increase awareness and demand for organic food, including low-trophic and organic aqua-cultured food.
- Assessing the feasibility of designating 'biodistricts' and 'biotrails' through pilot projects.
- Developing channels for the direct selling of organic food.
- Facilitating access to local organic products by the HoReCa industry.
- Promoting the set-up of organic producers' organisations.

Assess the feasibility of Methane-inhibiting vaccines

From a policy perspective Malta is very much in favour of a methane-inhibiting vaccine. Nonetheless understanding of the effectiveness and viability of this vaccine is still ongoing. Malta will continue to monitor such developments including from a financial feasibility point of view.

Manure and slurry management

Departing from what was until a while ago common practice, the Maltese government is committed to implement a plan for the complete disconnection of livestock manure from the sewage network. This plan, notified to the Commission on August 5, 2022, outlines the construction of three slurry treatment facilities—two on the main island of Malta and one on Gozo. These facilities will process farm slurry into solid and liquid fractions, with the solid fraction being treated for use as a soil enhancer or for other products, and the liquid fraction treated according to Directive 91/271/EEC and Regulation (EU) 2020/741.

Until the plan is fully implemented, a short-term solution has been employed, directing farmers to deliver slurry to the Sant'Antnin Facility Treatment Plant (STP) for pre-treatment. This has led to a significant increase in the amount of slurry treated at STP, with figures for 2023 showing a fourfold increase compared to 2022. The full implementation of this temporary measure began

in June 2023, with the quantities of slurry delivered to STP indicating a positive trend towards managing the issue. The government is now progressing with the long-term solution, identifying sites for the waste plants and drafting the tender for their construction. Concurrently, Malta is actively working to address an infringement proceeding by the EU Commission (No. 2016/2142), with the aim of remedying the situation without further delay. The commitment to comply with the UWWTD by the end of 2026 underscores the government's dedication to environmental stewardship and sustainable agricultural practices.

Aquaponics and vertical farming

The Government remains committed to evaluating the economic viability of aquaponics and vertical farming, considering both cost-effectiveness and the potential impact on the rural landscape. While these innovative technologies have demonstrated agronomic and environmental superiority over traditional farming methods—yielding higher productivity and sustainability—they raise concerns when developed on agricultural land due to their effect on the rural aesthetic and potential land uptake. It is crucial for relevant authorities to conduct thorough assessments to determine whether such systems should be permitted in agricultural areas or if alternative locations would be more appropriate.

Aquaponics and vertical farming, which merge aquaculture and hydroponics, are resource-efficient solutions ideal for densely populated regions with limited land availability. They conserve water through closed-loop systems, reduce the need for synthetic fertilizers and pesticides, and minimize transportation emissions by enabling local food production. These systems are particularly advantageous in urban and industrial areas, where they align with the "farm-to-table" concept and pose minimal visual impact on the infrastructure.

However, the introduction of these systems into rural areas can disrupt the traditional landscape, introducing structures that may not blend with the natural environment. The Agriculture Directorate supports the advancement of these technologies but emphasizes the need for congruent policy directions. Infrastructure related to aquaponics and vertical farming should be financially incentivized only if developed on agricultural land in rural areas, while being regulated by planning policies to ensure harmony with the landscape.

The Self-sufficient Integrated Multi-Trophic AquaPonic project (SIMTAP) exemplifies the government's initiative to promote sustainable food production systems that reduce resource consumption and environmental impact. This project aligns with Measure 1.106 of the Electoral Manifesto, which advocates for public-private partnerships in innovative agricultural systems like aquaponics and hydroponics, including those aimed at export markets. However it must be noted that careful planning and policy development are necessary to ensure that these technologies are integrated sensitively into the landscape, whether in rural or urban settings, to support Malta's sustainable agriculture and food production goals.

In addition to these initiatives, the Government recognizes the potential of integrating solar panels into greenhouse operations, distinguishing them from large-scale solar farms. Solar panels on greenhouses serve a dual purpose: energy production and supporting sustainable agriculture. They offer a seamless integration into the agricultural landscape, leveraging solar power to enhance crop growth and improve farm economics. The unique combination of energy production and agronomic benefits makes solar panels on greenhouses a distinct and valuable investment opportunity. Investments in Agrivoltaics should focus on agronomic production, with energy generation as a by-product.

Modification of ruminant diets

The proposed measure aims to address enteric methane emissions in Malta's dairy sector through various strategies, including i) enhancing the digestibility of forage, ii) optimizing the

fat content in cattle diets and iii) exploring the use of nitrate as a feed additive. However, Malta's reliance on imported feeds presents challenges in implementing these dietary changes due to issues of availability and cost. The high cost of feed is already a significant burden for local livestock farmers, and further increases could threaten the sector's viability.

Concerning the use of nitrate as a feed additive, Malta, along with other Member States, is actively working to mitigate nitrate pollution from agricultural sources through national Nitrates Action Programs. In Malta, the application of nitrates is regulated by a fertiliser plan, which is a scientifically approved model that dictates the permissible amount of manure based on the nitrogen concentration for different livestock species. Introducing nitrate additives in feed complicates the monitoring of nitrogen levels in manure and poses a risk of groundwater contamination.

Locally, the sole supplier of dairy cattle feed in Malta has been working to optimize the fat content in cattle diets, which affects milk quality. However, it is unclear whether this optimization has led to reduced enteric emissions. Any studies or trials conducted should involve the relevant Competent Authorities, including the agriculture directorate responsible for monitoring nitrogen applications, as well as the animal health and welfare departments to ensure no detrimental effects on livestock.

Malta is exploring alternative ruminant diets that could balance production performance with progress in reducing methane emissions, aligning with the EU's drive to lower methane gases. To support this goal, Malta is undertaking a nationwide trial to supplement the entire dairy cow herd's feed with methane-inhibiting additives. This initiative aims to achieve significant reductions in emissions and enhance the climate-friendliness of Maltese milk, contributing to the long-term sustainability of the dairy sector.

3.6.6 LULUCF

The LULUCF model was developed to construct projections related to the LULUCF sector to analyse the variations between the projected emissions and removals within the sector, as well as development of related scenarios. The projections are developed based on the information available associated with land and forest related measures which are in place on a national scale, that could affect the sequestration rates from the land-uses. The model illustrates a series of projections which can be analysed, based on available national information. Historic data is acquired from the data presented in latest GHG Inventory report. The model can analyse the following series of projections: the 'Without Measures' (WOM) projections, 'With Expected Measures' (WEM) projection and the Sensitivity Scenario.

The LULUCF sector projections model was developed through the assistance of experts from the International Institute for Applied Systems Analysis (IIASA). The model works in a spreadsheet and aims to develop projections of LULUCF emissions and removals. The sheet also allows for the analysis and construction of various scenario-based projections. The model works by taking into account changes in activity rates or emission factors that the user specifies to develop projection estimates. All projections that are reported in the model are based on the general equation (1) for calculating emission projections as proposed in: GHG Projection Guidelines. Part A: General Guidance. CLIMA.A.3/SER/2010/0004. Emissions and removals are estimated by multiplying the activity rate with the associated emission factor, thereby assuming a linear relationship between the intensity of an activity and the resulting emission. Emission factors and activity rates can be changed over time in the model but only the linear relationship between activity and emission rates is currently implemented.

Moreover, a Forest Land category projections model was developed, to be attribute to the overall LULUCF sector projections model. The Forest Land projections model was developed through the assistance provided from the ICF during a capacity building workshop. It is

designed to model the growth in biomass (developed also on excel spreadsheet), using parameters and forest areas.

The LULUCF models and projections are aligned with the national inventory system by means of the model, incorporating data from the national inventory workbook into the projections model workbook. Values from the national inventory are utilised to develop projections based on the year of the projection.

QA/QC checks in the LULUCF model were implemented within the model workbook. The quality checks were developed by means of equations and automated checks in the workbook, thus, to allow for the comparison of future activity rates with historical reporting, checking for internal consistency issues within a scenario, as well as to compare the outcome between scenarios.

The growth in the level of sequestration of carbon in the LULUCF sector is not expected to be major. This is mainly due to the fact that the national afforestation projects implemented do not cover an extensive large tract of land, and when comparing the extent of the area of these plantations to the other categories in the LULUCF sector, the level of sequestration from these projects is as a result quite minimal.

Revised changes in the land use areas transition matrix led to changes in the future area trends in the categories of the LULUCF, which are reflected in the chart. The only measures which are still considered are afforestation projects (also indicated in the NECP). Whilst the policy direction in the years to come is to further augment afforestation projects to enhance the sequestration potential to its maximum, the scale of such projects and the scale of removals would still be very limited in view of the geographical limitations of our islands. The below illustrated the WEM scenario for LULUCF sector.

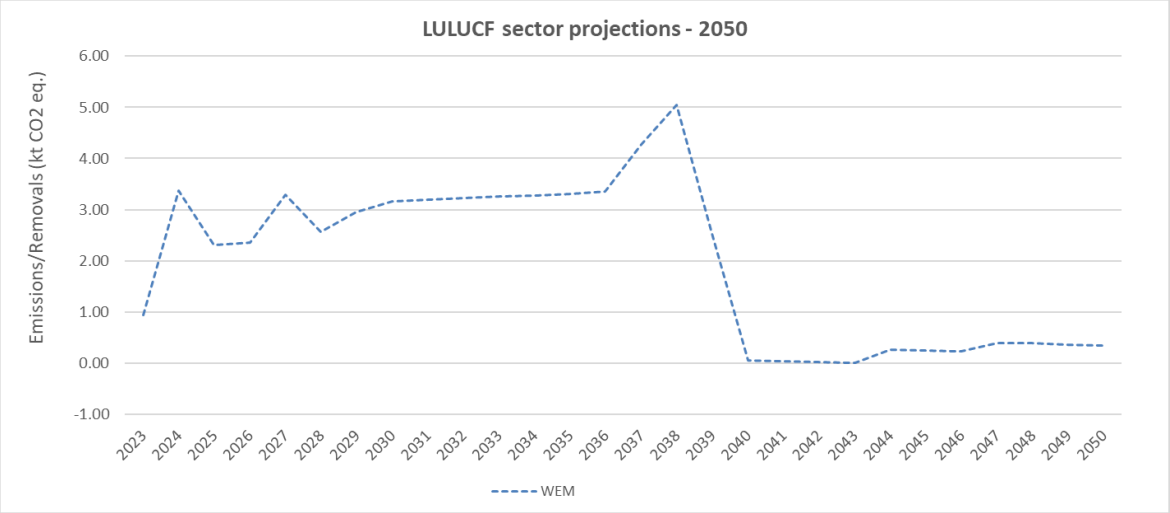


Figure 33: LULUCF sector projected WEM scenario.

Table 22: Projected GHG emissions for the LULUCF sector.

	Unit	2025	2030	2035	2040	2045	2050
WEM	Gg CO2 eq.	2.31	3.16	3.31	0.06	0.25	0.34

The below indicates the impact of the implementation of the national afforestation projects, as a means to quantify the mitigation impact of the estimates from such projects indicated in section 3.4.5.2.

Table 23: Mitigation impact of LULUCF policies and measures

Name of policy or measure	GHG affected	Estimate of mitigation impact, by gas (kt CO2 eq.)					
		2025	2030	2035	2040	2045	2050
Afforestation project in location of Ta' Qali	CO2	-0.007	-0.019	-0.031	-0.061	-0.108	-0.138
Afforestation project in location of Inwadar	CO2	-	-0.008	-0.015	-0.023	-0.051	-0.086

3.6.7 WASTE

The waste sector contributed around 13% to total ESR emissions in 2022. The emissions generated are primarily through landfilling of waste.

GHG emissions from the waste sector up to the year 2050 are projected using the waste model. This model serves as a tool to estimate GHG emissions under the WEM scenario. These estimates are based on data provided by a range of sources, which is then processed into emissions figures using inventory models that align with the IPCC 2006 guidelines. The conversion methodologies employed are consistent with those detailed in the annual National GHG inventory reports.

As part of the efforts to be taken in this sector Malta has embarked on the following projects and initiatives aimed at diverting waste away from landfills. By year end 2030, these measures will reap emission abatement potential. These key measures are included in the WEM scenario of the waste model, which include the introduction of key policy measures and waste-related initiatives such as;

- the mandatory separation of organic and recyclable waste from households and commercial outlets,
- adjustments to the waste collection schedule to increase the frequency of organic waste pickup and decrease the frequency for mixed unsorted waste,
- the introduction of differentiated Gate Fees of the waste management facilities, and
- the implementation of a Beverage Container Refund Scheme (BCRS).

These measures are part of a broader strategy that includes awareness campaigns, improvements in data collection and management, and financing measures, complemented by the planned infrastructure such as the Waste-to-Energy (WtE) and Organic Processing Plant (OPP) facilities, as well as educational campaigns.

The Water Services Corporation (WSC) is dedicated to ensuring that all wastewater is treated before being discharged into the sea. To this end, several key measures are in the pipeline. These include the phased upgrading of the Malta North urban wastewater treatment plant, the commissioning of a retrofit for the Sant Antnin urban wastewater treatment plant, and the disconnection of farmyard waste from the wastewater collection network, an initiative that is the responsibility of the Malta Agriculture and Fisheries Agency (MAFA). These measures are collectively aimed at achieving the goal of improved wastewater treatment.

The most beneficial measures aimed at diverting waste from landfills are explained in more detail below.

High Bio-Waste Capture

The investment in the construction of an Organic Processing Plant (OPP) aimed at diverting waste away from landfills, will be treating organic waste mainly collected from household and

commercial entities all over the Maltese Islands. Biowaste plays a key role in sustainable waste management. The project therefore aims at improving waste management in Malta by reducing the amount of biodegradable waste sent to landfill. Through this plant, the organic waste shall be transformed into compost to be used on agricultural fields and biogas will be generated and transformed into heat and electricity. The projected capacity of the plant is estimated to be a maximum of 74,000 tonnes per year of biowaste and is expected to be commissioned by 2030.

Waste-to-Energy Facility

The development of a Waste-to-energy (WtE) facility in Malta, which will have its first complete year of operation by 2030, is deemed a significant investment that complements the existing and planned waste management infrastructure. The waste-to-energy plant will support Malta's efforts in reducing landfilling of waste in line with the EU targets. Therefore, it will also contribute towards the reduction of emissions from landfilling once it becomes operational. The plant is designed with multiple line facilities, utilising two separate moving grates connected to the same turbine. Each line will accept 12 tonnes (total of 24 tonnes) per hour of material resulting in a net electricity generation between 14 to 16 MW and heat input to the boiler will be between 20MWth and 33.33MWth.

The infrastructural set-up will be located adjacent to existing landfills and other waste management facilities within the Maghtab complex. The additional investment in incineration pre-sorting and the skip management facility (SMF) will allow for the extraction of resources from waste prior to delivery to the WtE plant. This is also a priority and will be the modus operandi of the national waste operator. Coupled with the recent introduction of important policy tools, mainly mandatory waste separation and the introduction of differentiated gate fees, it is envisaged that organic and dry recyclables stream will significantly be diverted from the mixed waste collection to the selective collection system. Thus, the national waste operator is investing in the necessary infrastructure to pre-sort such streams (black bag and mixed bulky waste) through the necessary investment in the Malta North Plant and the setting up of the SMF.

Waste prevention measures

The Waste Management Plan (2021-2030) has been adopted in a manner that maximises the resource value from waste through holistic waste management solutions, adopting a collaborative approach whilst fostering behavioural change through the progressive adoption of various economic instruments. Waste prevention is another key priority area for the improved effectiveness of the management of waste. There is an array of measures in the waste prevention programme which is part of the national plan. These include amongst others awareness raising campaigns, incentives for waste reduction as well as other policy initiatives that will provide for a much-needed shift in consumption behaviour. This in turn will contribute towards reducing emissions from landfill.

Gas extraction from landfill

A new measure is included in the waste sector under the With Policy Measures scenario (WPM), which involves the addition of new gas capture equipment for existing landfills in Malta.

The landfill gas extraction will treat the gas extraction of the landfill following the closure of the present landfills in operation. The main aim is to increase extractions points and thus biogas generation throughout the landfill once the landfill has been closed with installation of new gas system.

This project will incorporate the drilling and necessary pipework for the construction of biogas wells and the incorporation of a new Combined Heat and Power (CHP) and Regenerative Thermal Oxidizer (RTO). A secondary RTO is required to handle the eventual increase in poor-quality biogas generation and to upgrade the existing RTO capability at the gas plant.

Landfill gas extraction is expected to have a significant impact by 2030, making it the most impactful measure/option for the waste sector.

The below charts illustrate the total waste emissions and the emissions per emitting treatment stream, under the WEM scenarios till year 2050. Emissions from solid waste disposal and wastewater treatment are projected to decrease under the WEM scenario.

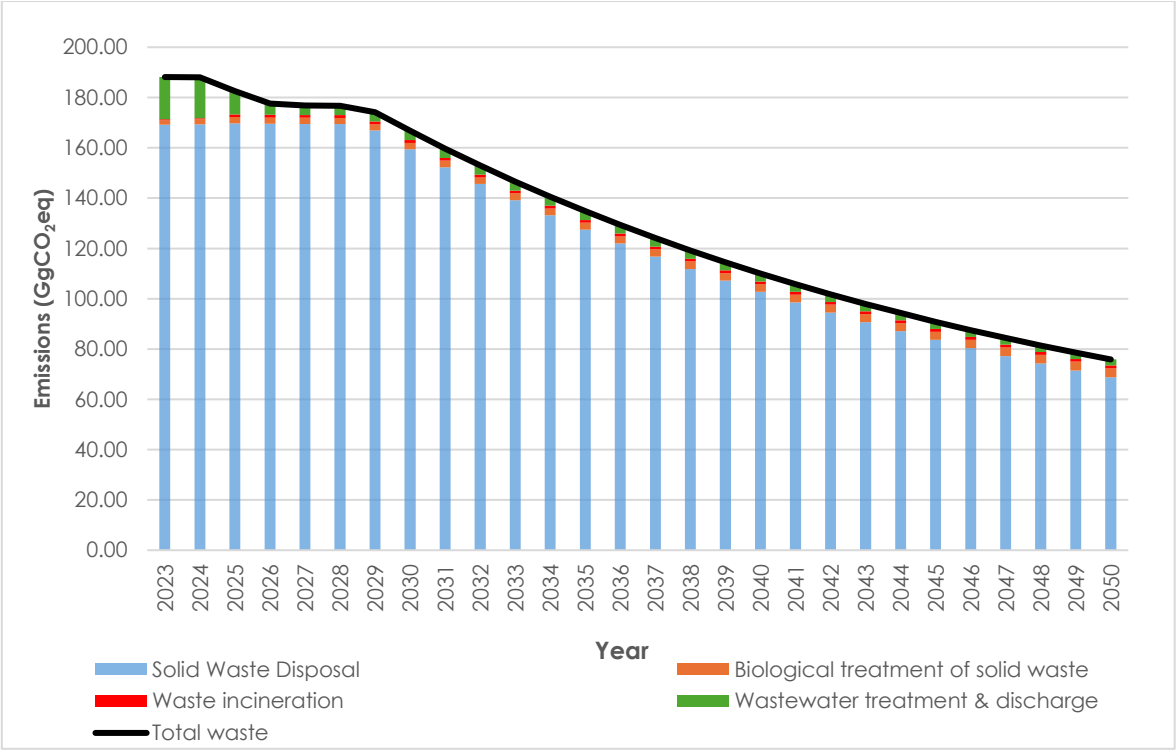


Figure 34: Total Emissions for the Waste Sector by category (WEM scenario). Source: CAA.

By year end 2030, GHG emission reduction from the waste sector (methane emissions) can be observed. This is the result of the implementation of measures aimed at diverting waste away from landfills. In future, the waste sector is expected to be the key contributor towards a reduction in methane emissions. The Wastewater category is also expected to contribute, assuming full (100%) wastewater treatment by 2030.

3.7 IMPACTS OF POLICIES AND MEASURES

Malta remains committed to contribute towards the EU collective target of climate neutrality by 2050. The policies and measures outlined in this section are in principle based on the packages of measures outlined in the Low Carbon Development Strategy, complimented by other additional policies and measures which have been introduced, adopted or planned following the publication of the LCDS.

The main contributing sectors identified in the LCDS towards GHG emissions in Malta are those related to energy systems, transport and to a lesser extent waste. The impact of the policies and measures identified in the LCDS has been estimated through the compilation of a Marginal Abatement Cost Curve (MACC) within the context of the low carbon development strategy. A Marginal Abatement Cost Curve (MACC) serves as a valuable tool to strategically determine pathways for decarbonization by taking into account cost-effectiveness. In this manner, a balanced approach between GHG emissions abatement and economic costs is ensured. Based on the outcome of the MACC compilation, sectoral measures were identified for the interim (2030) and long term goals (2040, 2050).

The qualitative impact assessment conducted on the NECP update (refer to section 5.2) has been instrumental in ensuring that the proposed updates are in harmony with the strategic directions set forth in the LCDS. This assessment has evaluated the effectiveness, coherence, and synergies of the updated NECP measures with the sectoral actions identified in the MACC, thereby reinforcing the commitment to achieving Malta's decarbonization targets. The assessment also considers the socio-economic implications of transitioning to a low-carbon economy, ensuring that the NECP update supports sustainable development while contributing to the overarching goals of the LCDS.

Country specific challenges and considerations

Malta faces inherent challenges that pose obstacles to successfully reducing emissions. These challenges, previously discussed in other sections, revolve around Malta's specific circumstances as a small island member state with limited access to raw materials, thereby heavily dependent on imports and trade for economic activity.

The difficulties Malta encounters in achieving emission reduction, as outlined in its NECP 2019, persist and remain relevant. These challenges include:

- Unique characteristics of Malta's energy system and market, such as its small scale, absence of natural gas and district heating and cooling networks, and limited number of suppliers and market players. These factors collectively restrict the range of measures available to meet energy-saving obligations.
- Geographic, environmental, and spatial constraints, such as limited land area and high population density, coupled with a rich but delicate natural environment and climate conditions. These constraints limit the options for modal shifts to reduce carbon emissions, and the economies of scale hinder the adoption of alternative technologies.ii

- Limited mitigation potential due to Malta's service-based economy. With Malta being already one of the lowest emitters per capita, there is limited mitigation potential. This means that there are high mitigation costs and significant socio-economic considerations. Addressing these challenges requires careful consideration and strategic planning to find suitable and effective solutions for Malta's unique circumstances in the pursuit of emission reduction goals.

Air quality

Air quality and decarbonization are closely interconnected since they share common sources of pollution. In fact, the policies and measures outlined in section 3 are in line with the policies and measures specified in the air quality plan issued by the Environment and Resources Authority as per regulations 32 of the Ambient Air Quality Regulations (SL 549.59). This alignment

signifies a coordinated approach to address both decarbonization and air quality concerns, ensuring a comprehensive strategy to tackle shared sources of pollution and promote sustainable development.

Water Management

The Maltese islands, with their semi-arid Mediterranean climate, face challenges related to water scarcity. During the summer, there is a general lack of rainfall and limited exploitable surface waters. The primary source of natural freshwater available throughout the year is groundwater, which has been experiencing degradation in quality and quantity due to nitrate pollution and seawater intrusion.

One of the effects on the water quality and quantity status is an increase in extreme storm events and more frequent flash floods. As these extreme events become more common, as a result of climate change, and with the increased urbanisation which occurred over the years, the ground becomes less capable of absorbing water runoff and subsequently the percolation of water runoff into the water table. This diminished absorption will eventually lead to greater run-off, which in turn may cause floods, resulting in damage to infrastructure and property if not properly managed. Proper water resource management becomes crucial to mitigate the impacts of climate change on water availability and to address potential flooding risks effectively. Since the 1980s, Malta has relied on desalination of seawater to supplement its potable water supply. Water scarcity combined with the effects of climate change on water resources poses significant pressures on the country. Climate change can impact the hydrological cycle, leading to several consequences. In view of this, the NECP aligns with the measures that are set to be committed as part of the development and implementation process of the 3rd River Basin Management Plan which is based on the conjunctive application of water supply diversification and water demand management measures – progressively in an environmentally sustainable manner. Sustainability in this case includes also energy efficiency/management measures, where 11% of measures included under Malta's 3rd River Basin Management Plan are related to Energy efficiency. The Public Works Department (PWD) is also in the process of drafting a manual and a policy guidance document for Green Infrastructure as part of the LIFE IP RBMP Malta Project, led by the Energy and Water Agency. In addition, the PWD is actively implementing five pilot projects to showcase the effectiveness of Green Infrastructure in addressing surface water runoff. These initiatives involve the cleaning and restoration of water courses to improve stormwater infiltration and storage, along with the installation of Sustainable Urban Drainage Systems in designated play areas. The pilot projects have secured a financial commitment of €2.3 million, with 80% of the funding coming from the EU. Finally, given Malta's reliance on desalination, which together with the other water services being offered by the national water utility, consumes around 6% of the country's total electricity consumption goes towards the production of water, wastewater and reclaimed water services of which 4% goes towards desalination solely), efficiency in the water sector becomes an important aspect. The primary motivation for water sector efficiency is the limitation in the supply of natural fresh water on the island, leading to the necessity of using desalination plants currently meeting 65% of the national water demands. The national water utility water services in Malta aims for better water production and distribution energy efficiencies and endeavours to contain distribution network leakages, currently distinguished by a noteworthy national infrastructure leakage index (ILI) as low as 1.8. This focus on efficiency is also driven by tariff mechanisms that encourage users to stay within the lower 'efficient water use' tariff band. In fact, Malta's National Investment Plan (NIP) has a strong focus on leakage management through the renewal of designated stretches of distribution and transfer mains and less energy intensive desalination and water transfers. Moreover, in 2023, Water Services Corporation (WSC) launched a €25 million issuance of Green Bonds through ClearFlowPlus plc, marking these as the first to be listed on the Malta Stock Exchange. These Green Bonds are funding five major green projects, which were earmarked for their potential to impact WSC's

environmental footprint positively and contribute effectively to Malta's sustainability journey. During the same year, disbursement had already kicked off, with the first portion of bond proceeds disbursed to refinance part of the Ħondoq Reverse Osmosis (RO) plant. This plant uses cutting-edge technology to lower the specific energy used in RO production. Other projects include a revamped aeration system for the Ta' Barkat wastewater treatment plant, installation of PVs on existing buildings, a revamp of the non-revenue water billing algorithm and the renewal of potable water mains to reduce leakage and improve water quality.

Efficiency measures in the water sector are essential due to the challenges in addressing the ever-increasing demand for fresh water supply and the limited natural available freshwater resources. Any improvements in the efficiency of water supply would not only benefit the sector but also lead to reduced energy requirements, consequently contributing to the reduction of greenhouse gas (GHG) emissions. By adopting water-efficient practices, Malta can optimize further the current cycle for the production, conveyance and disposal of its water resources, reduce energy consumption from the desalination processes and make significant strides towards mitigating its carbon footprint and supporting overall GHG emission reduction goals. To this effect, the most recent Reverse Osmosis plant that was built in Gozo is considered a 'state of the art' RO plant in terms of its low energy consumption required to operate. This showcases the commitment to fulfil investments that are in line with such objective in mind. Further progress in the water management sector is also being conducted at national/regional level and has contributed to reduced water leakages in the network of circa 100 GWh of energy in the last decade. This was coupled with investments in RO plant upgrades which rendered additional savings of circa 158 GWh over the same period, measuring a total of 258GWh of energy savings between 2014 and 2023.

i. *Projections of the development of the energy system and GHG emissions and removals as well as, where relevant of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.*

This section includes a list of the policies and measures under Malta's WPM scenario. The measures that have been modelled within Malta's energy modelling framework are explicitly represented in the results and outcomes of the WPM scenario presented in the sections hereunder. It is important to note that the RES projections and targets presented under the WPM scenario are in line with the revised Renewable Energy Directive (REDIII).

Table 24 below lists the policies and measures which are included in the WEM scenarios respectively. Given that this is an update of the 2019 NECP, a number of measures in the WEM were originally WPM measures in the 2019 NECP. Measures in the WEM are also contributing to the achievement of the 2030 targets. The WPM measures being proposed as part of the NECP update impact only the supply side and thus the energy mix, not the demand side.

Table 24: All policies and measures under the WEM scenario

PAM Number	Name of Policy or Measure	Modelled PAMs
2	Manure and slurry management	x
	Renovation of public buildings	x
	Incentives for increasing energy efficiency in buildings	x

11	Commissioning of second interconnector	✓
15	Financial incentives to increase renewable energy installations	✓
17	Medium to Large scale Solar PV Installations	✓
20	Utility-scale battery storage solutions	✓
23	Shore-to-ship projects	✓
	EE schemes for industries and services	✓
	Public sector leading by example	x
	Replacement of appliances in vulnerable households scheme	x
	Energy efficient street lighting	✓
	Projects in primary water network and wastewater treatment plants	✓
	Implementation of the f-gases regulation	x
	Electrification of vehicles	✓
	Incentivise active transportation modalities	x
50	National free transport service	✓
	Biofuels substitution obligation (2021-2030)	✓
	Road and infrastructure projects	✓
67	Free public transport for school children	✓
70	High bio-waste capture	✓
72	Waste-to-Energy facility	✓
	Eco-reduction in electricity tariffs	x
	Incineration pre-sorting	x
81	Investments in Agrovoltaics	x

Projections in the ESR sector

The Government of Malta has demonstrated a strong commitment to reducing emissions through a variety of measures and initiatives. The aggregated effect of the With Existing Measures (WEM) scenario compared to the With Policy Measures (WPM) scenario is illustrated in Figure 35 and Figure 36, providing a comparative analysis for the non-ETS emissions sectors.

Figure 35: ESR emission projections by sector, WPM Scenario

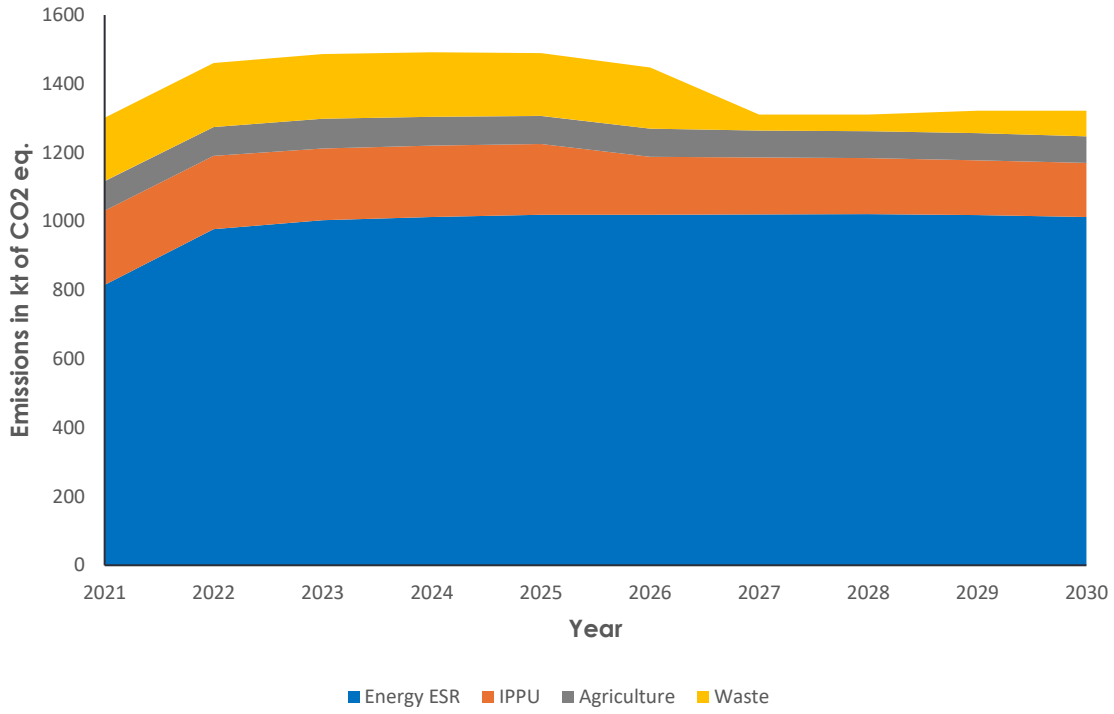
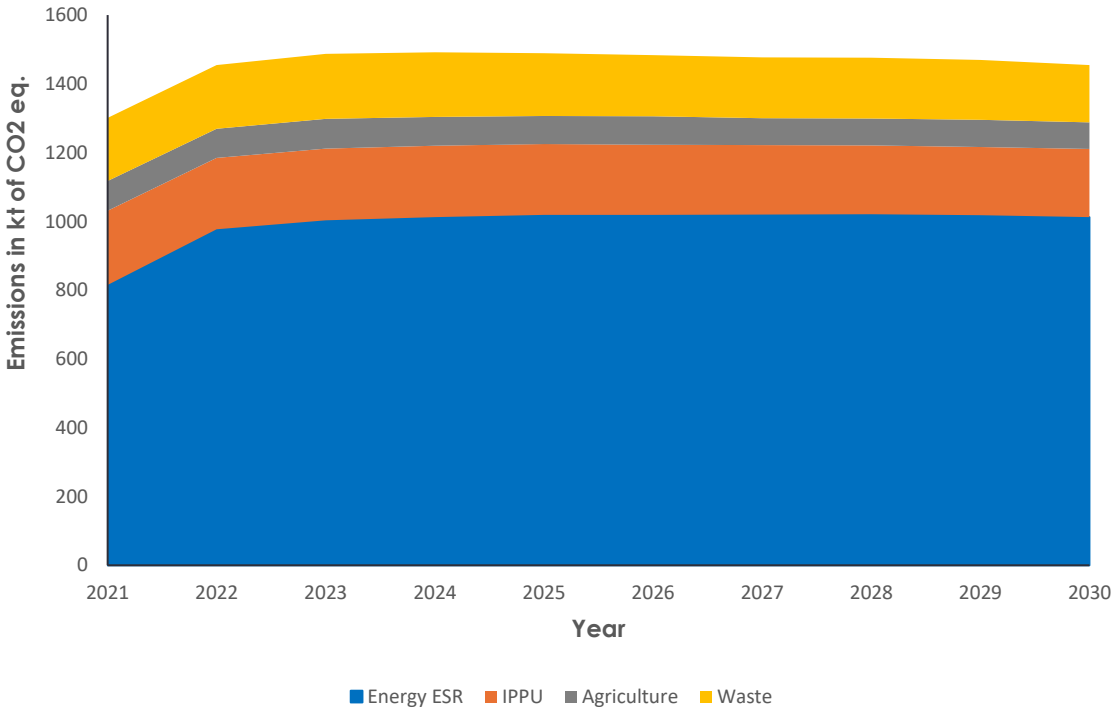


Figure 36: ESR emissions projections by sector, WEM Scenario



Notably, several measures that were previously part of the WPM scenario in the 2019 NECP have now been incorporated into the WEM scenario in this update, particularly in the transport sector. For instance, the electrification of 65,000 vehicles is expected to result in savings of 70.73 kt of CO_2. Additionally, the biofuel obligation for petrol and diesel fuel suppliers, results in CO_2 from biomass amounting to 48.45 kt.

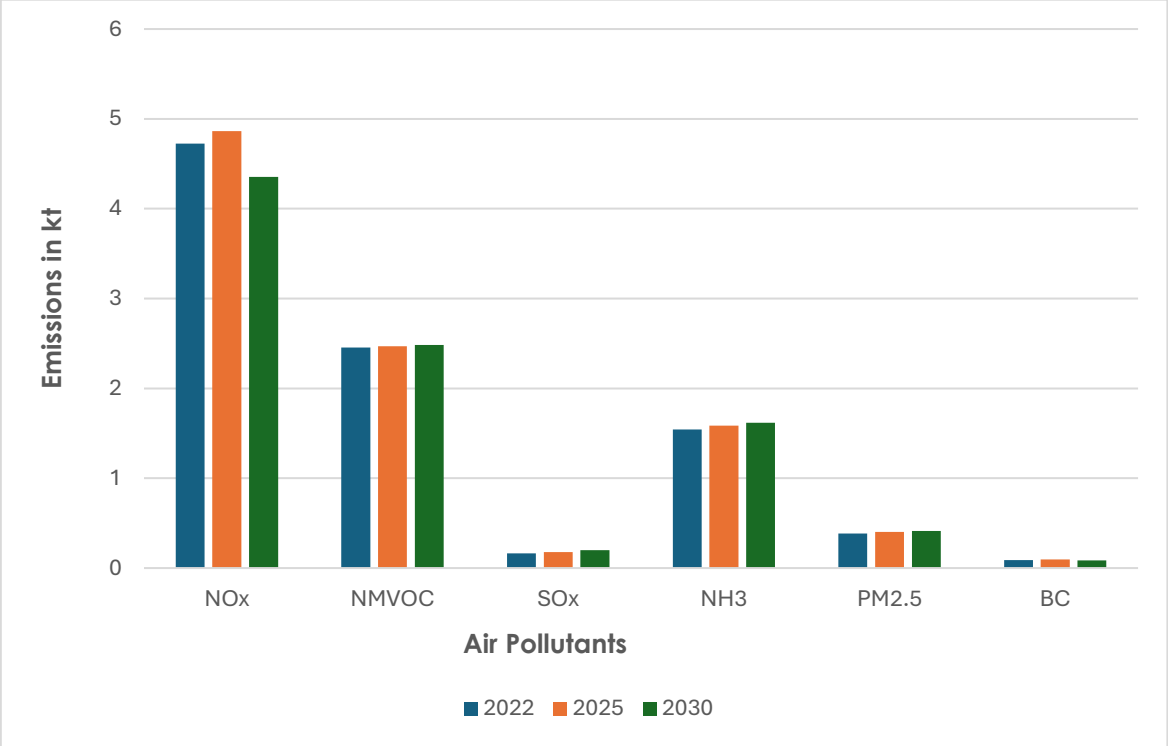
Furthermore, the Government is considering additional measures and initiatives for adoption in the transport sector. The Ministry for Transport is developing a comprehensive strategy to enhance the nation's transportation infrastructure. The plan includes key proposals such as

implementing a 24-hour economy to alleviate peak-hour congestion, revisiting and optimising public transport routes, and establishing a Coordination of Works committee to streamline road works. It also aims to address parking challenges by expanding park-and-ride facilities and utilizing government properties for parking. To reduce private vehicle usage, the plan is considering financial incentives, carpooling initiatives, and updates to the Employee Transportation Deduction Act. A strong emphasis is placed on sustainable mobility, with proposals for a national walking/cycling strategy. The long-term vision integrates land and sea public transport systems, featuring Bus Rapid Transit (BRT), feeder buses, and expanded ferry services, aiming to create a more efficient and sustainable transportation network for Malta.

A new measure has been included in the waste sector under the WPM scenario, which involves the addition of new gas capture equipment for existing landfills in Malta. This landfill gas extraction measure is expected to have a significant impact by 2030, making it a very impactful measure for the waste sector emissions. The project aims to increase extraction points and biogas generation throughout the landfill once it has been closed, incorporating drilling, necessary pipework, and the construction of biogas wells, as well as the installation of a new Combined Heat and Power (CHP) and Regenerative Thermal Oxidizer (RTO) system. In line with Regulation (EU) 2024/573 on fluorinated greenhouse gases, Malta will promote the recovery, recycling, reclamation, and destruction of fluorinated greenhouse gases from containers, products, and equipment prior to their disposal. These activities will be performed by appropriately qualified individuals, ensuring that fluorinated greenhouse gases that would otherwise be emitted are instead adequately recycled, reclaimed, or destroyed. Through these comprehensive measures and initiatives, the Government of Malta is making significant strides in reducing emissions in the IPPU sector . In relation to the National Air Pollution Control Programme, Malta is still working out its projections and hence any values expressed below are still subject to further changes based on further sectoral information that may reach the local Environment and Resources Authority (ERA) post the NECP submission. As a result of this, figures portrayed below should be viewed as preliminary indications. The NEC Directive (2016/2284/EU) requires Member States to draw up a National Air Pollution Control Programme (NAPCP), which should contribute to reduce air pollutant emissions for the purpose of reaching compliance with the national emission reduction commitments under the same Directive and to improve air quality in line with the limit values set out in the Ambient Air Quality Directive (2008/50/EC). Additionally, NAPCPs should be consistent with other relevant plans and programmes, including climate policies. For this reason, alignment between Malta's Draft NECP and NAPCP processes was ensured, whereby the assumptions and outputs of one exercise fed into the other and vice-versa. The Environment and Resources Authority (ERA) is the government body responsible for the development of the NAPCP.

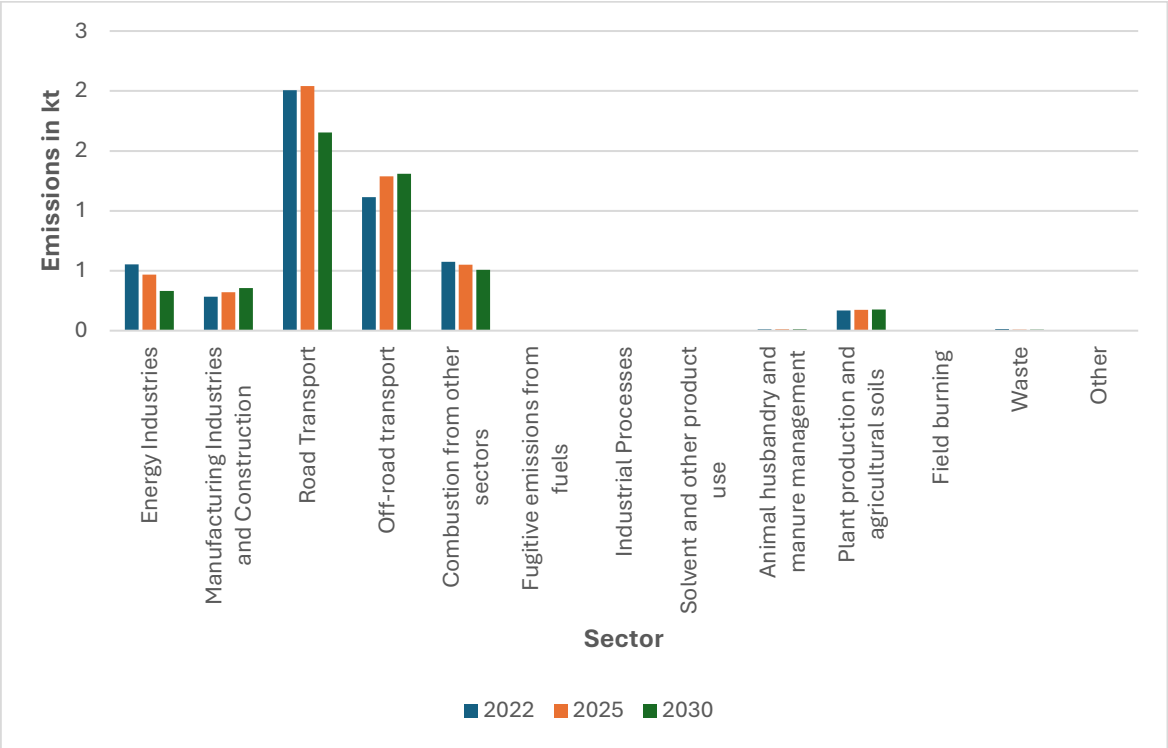
Figure 37 shows the national total emissions of air pollutants on the Maltese territory split by the five main pollutants, including black carbon. The projected trends show a small decrease in emissions for NO_x and NMVOC, and a stable trend for the remaining pollutants.

Figure 37 : National total air polluant emissions projections, kt



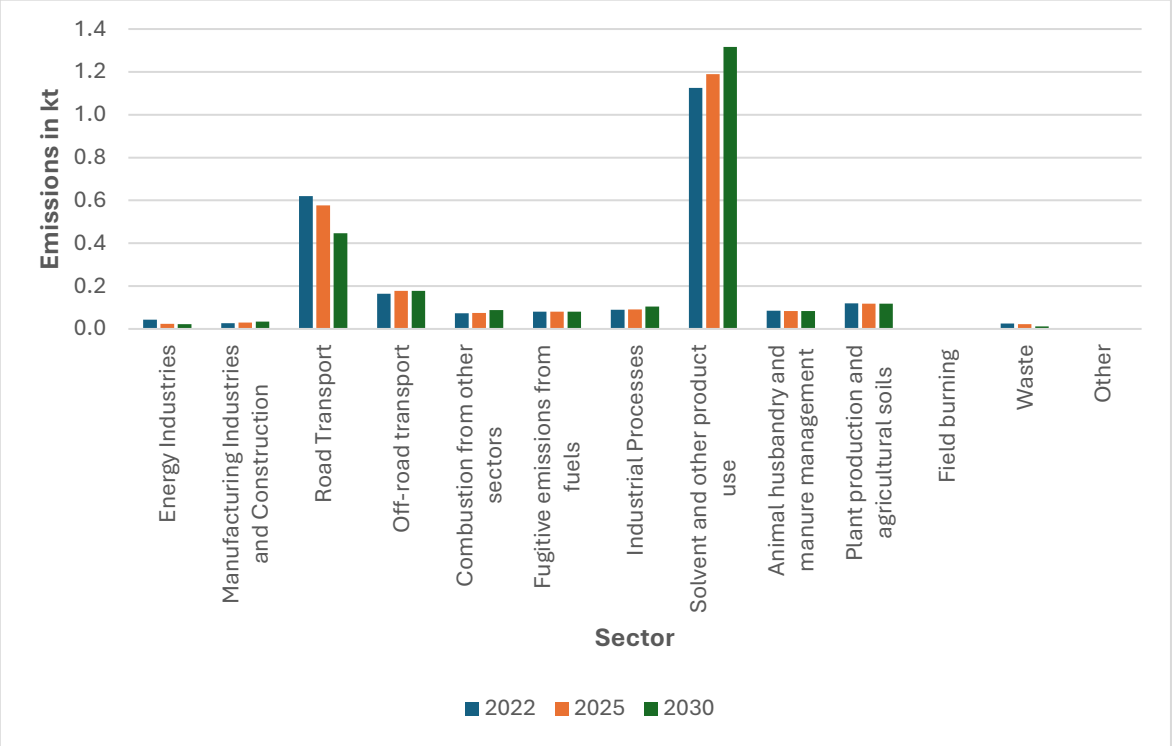
Nitrogen Oxides (NO_x) emissions are expected to decrease by 8% in 2030 for the projected period, when compared to 2022. Nevertheless, it is worth noting that emissions need to decrease by 57% from 2022 to achieve the emission reduction commitment in 2030. Nitrogen oxide emissions are most prevalent in the 'Road transport' sector – it is expected however, that NO_x emissions in 'road transport' should decrease by 18% by 2030, as a result of newer vehicle technologies, and increased electrification. To calculate NO_x emissions in the road transport sector, the outputs of the vehicle profile model and vehicle kilometre projections were used as input to COPERT. The largest NO_x level increases, compared to 2022 emissions, are expected in the 'Energy Industries' sector, as a result of the commissioning of the new Waste-to-Energy facility in 2028. The increase in emissions from this sector was partly mitigated through the introduction of a second interconnector, which will reduce the quantity of fuel combusted. NO_x emissions are also expected to increase in the 'Off-road transport' sector, which considers emissions from national shipping and aviation, as well as 'Manufacturing Industries and sectors', following a projected increase in fuel use consumption. Figure 38 shows the projected NO_x emissions by sector.

Figure 38: NO_x emission projections by sector, kt



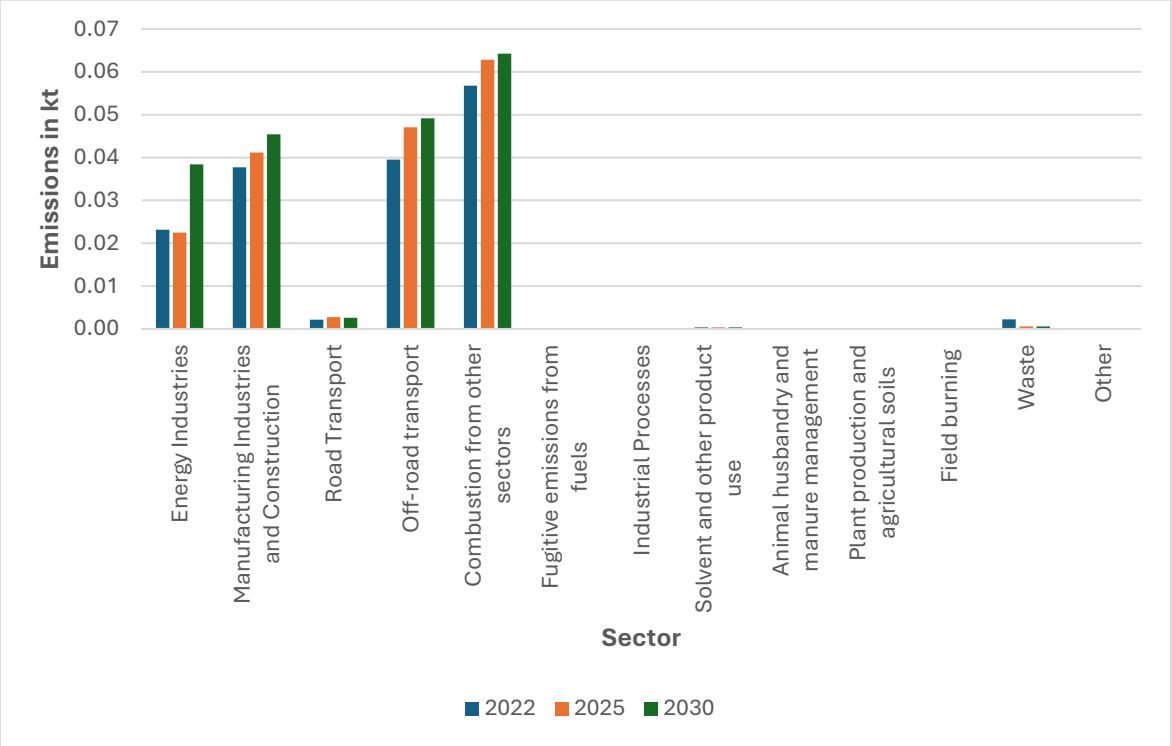
Non-methane volatile organic compounds (NMVOCs) are expected to increase by 1% in 2030 for the projected period, when compared to 2022, mainly as a result of an increase in emissions the 'Solvents and other product use', and a decrease in the 'Road transport' sector. Concerning the 'Road transport' sector, it is expected that NMVOC emissions will decrease by 28% by 2030, due to fleet renewal and an increase in the rate of vehicle electrification. On the other hand, NMVOC levels are expected to rise by 14% in the 'Solvents and other product use' sector. This increase can be attributed to an increase in product consumption, as both the population and the GDP of the Maltese Islands are expected to increase in 2030. Additionally, NMVOC emissions will be reduced from the 'Waste' sector following the partial closure of the landfill in 2026, the complete closure of landfills in 2029, and the commissioning of the landfill gas extraction system in 2027. However, as seen in the figure below, the total emission reduction contribution from the 'Waste' sector is minor. Projected NMVOC levels are shown in Figure 39.

Figure 39: NMVOC emission projections by sector, kt



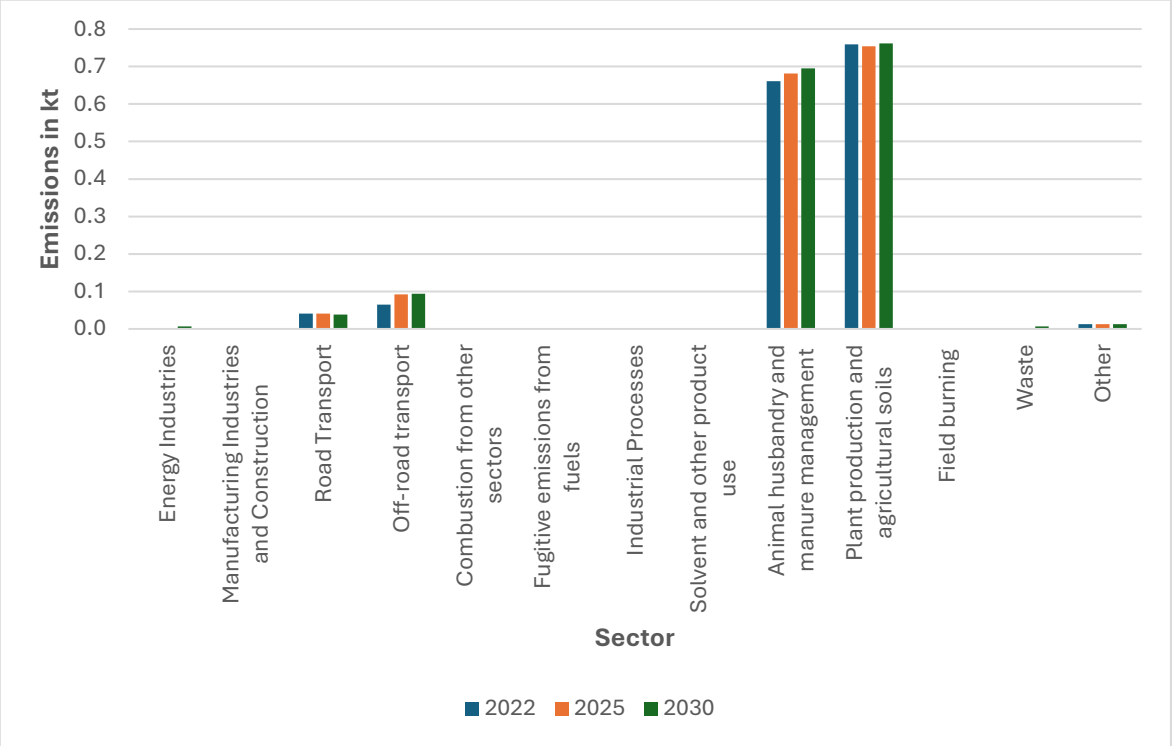
Sulphur dioxide (SO_2) emissions are projected to increase by 24% in 2030 for the projected period, when compared to 2022. However, it is worth noting that the emissions of SO_2 have decreased by almost 99% in 2022 compared to 2005, following a reform in the 'Energy industries' sector. The projected increase in SO_2 emissions can be observed within multiple sectors, such as: 'Energy industries', 'Manufacturing Industries and Construction', 'Off-road transport', and 'Combustion from other sectors'. In all cases, this increase in emissions is derived from an increase in projected fuel consumption. Projected SO_2 levels are shown in Figure 40.

Figure 40: SO2 emission projections by sector, kt



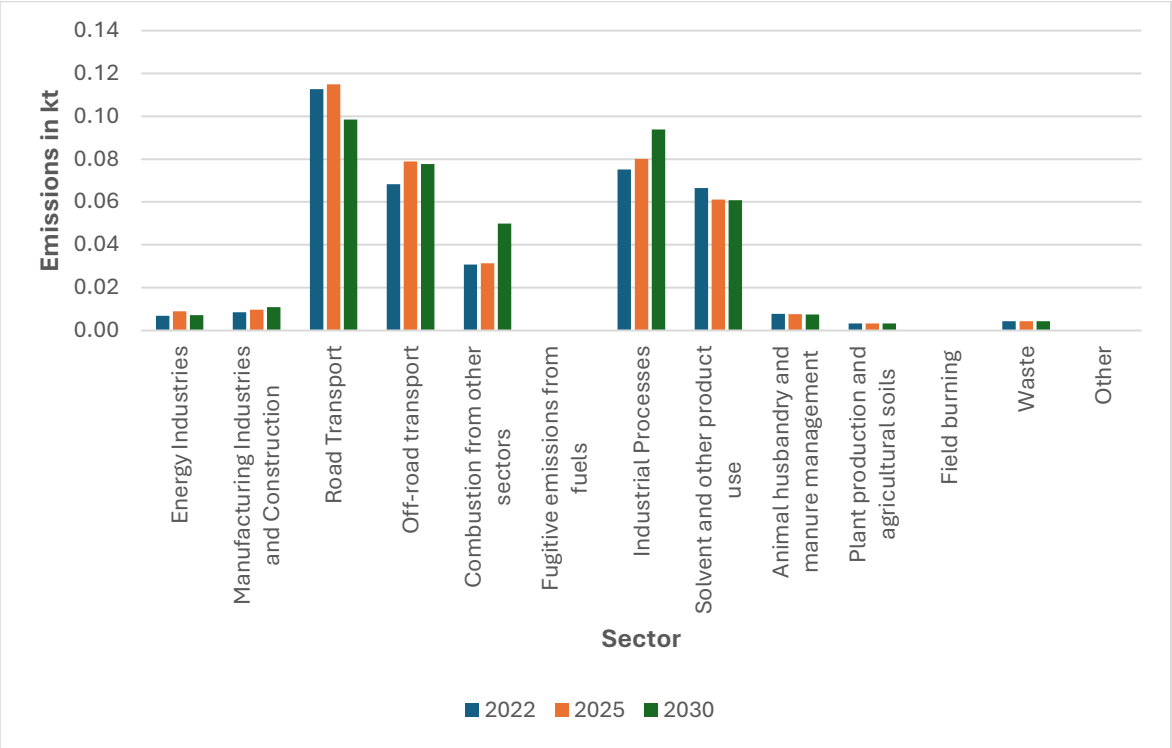
Ammonia (NH_3) emissions are projected to increase by 5% in 2030 for the projected period, when compared to 2022. Nevertheless, it is worth noting that emissions need to decrease by 11% from 2022 to achieve the emission reduction commitment in 2030. More than 90% of NH_3 emissions are derived from 'Animal husbandry and manure management' and 'Plant production and agricultural soils'. These sectors mainly refer to the emissions of NH_3 from manure storage, and the application of manure and synthetic fertilisers. The increase in emissions can be attributed to small increases in the quantity of animal heads. NH_3 emission projections are provided in Figure 41.

Figure 41: NH3 emission projections by sector, kt



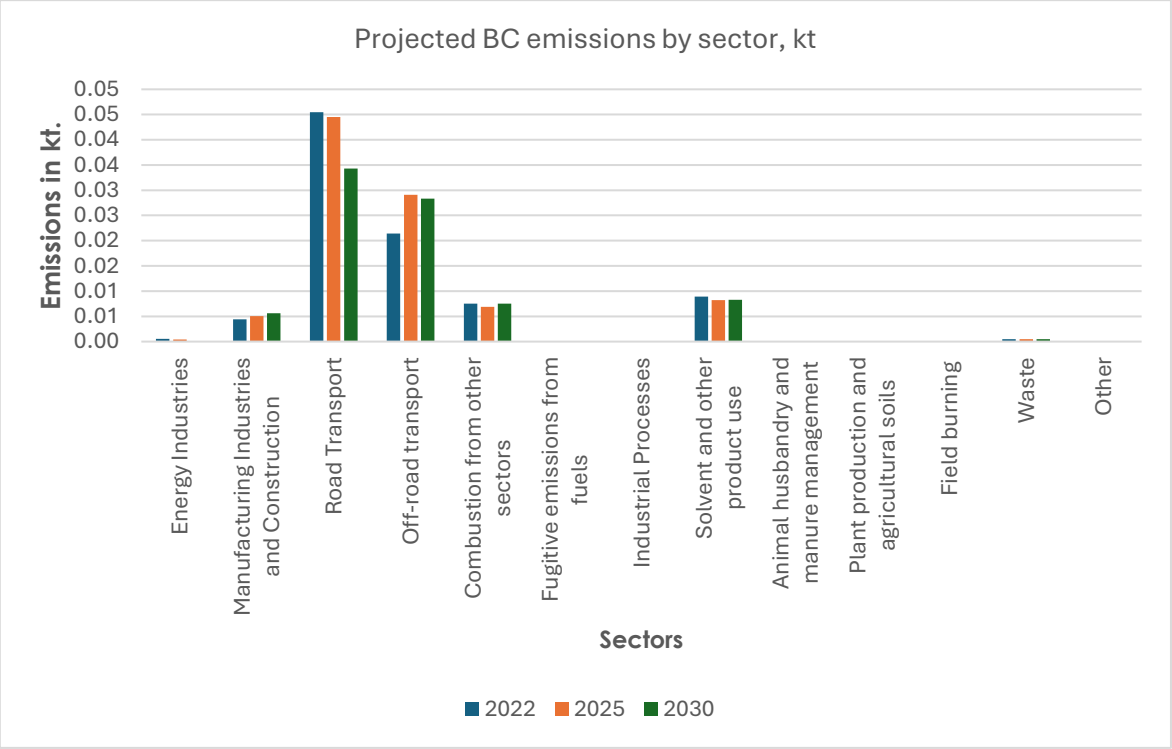
Fine particulate matter (PM2.5) emissions are projected to increase by 8% in 2030 for the projected period, when compared to 2022. Nevertheless, it is worth noting that emissions need to decrease by 2% from 2022 to achieve the emission reduction commitment in 2030. Exhaust emissions are expected to decrease in the 'Road transport' sector, due to the increased electrification of vehicles, as well as fleet renewal. Nevertheless, it is worth noting that work is being carried out on improving the estimate for non-exhaust emissions from electric vehicles and hence are not being included within these calculations. Additionally, a small decrease in emissions is observed for 'Solvent and other product use', due to a small decrease in the projected quantity of asphalt laid on roads. Notable increases in emissions came from the combustion based sectors, such as 'Off-road transport' and 'Combustion from other sectors'. These increases are a result of the projected increase in fuel consumption for the residential sector and the increased number of landing and take-off cycles for international aviation. $PM_{2.5}$ emission projections are provided in Figure 104.

Figure 42: PM2.5 emission projections by sector, kt



Black carbon (BC) emissions are projected to decrease by 5% in 2030 for the projected period, when compared to 2022. There are no emission reduction commitments for BC. The most significant emissions reductions were in the 'Road transport' sector due to the increased electrification of vehicles, as well as fleet renewal. In contrast, emission increases were noted in 'Off-road transport', due to increases in projected fuel consumption under recreational crafts. BC emission projections are provided in Figure 43.

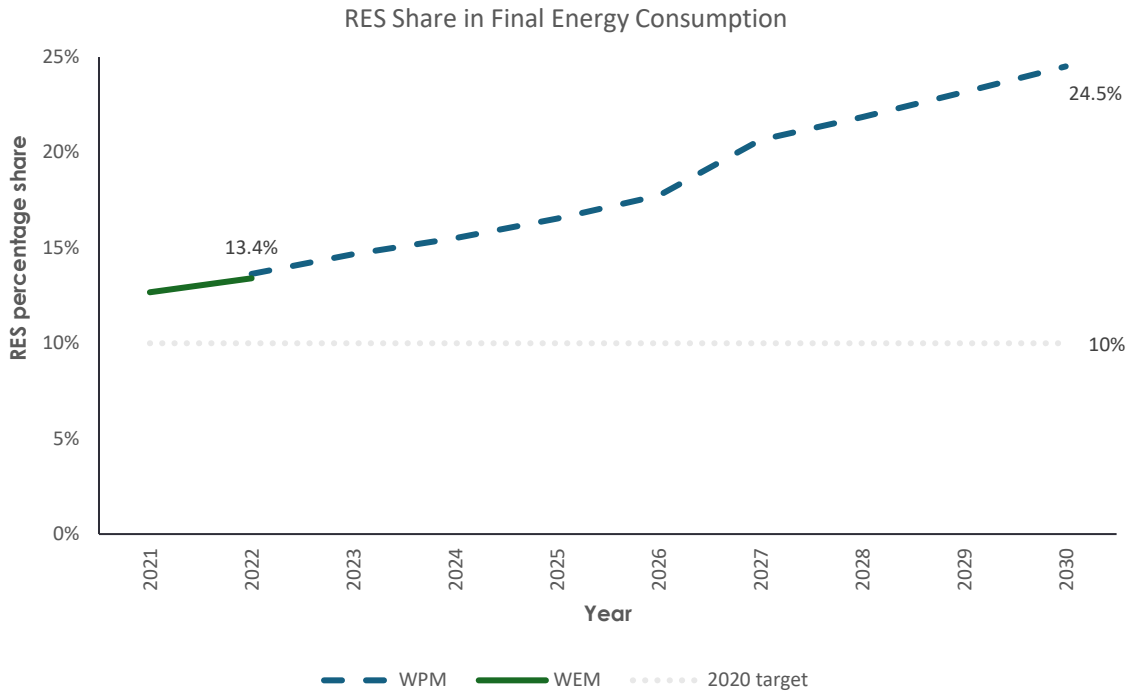
Figure 43: Black carbon emission projections by sector, kt



Dimension Decarbonisation – Renewable Energy

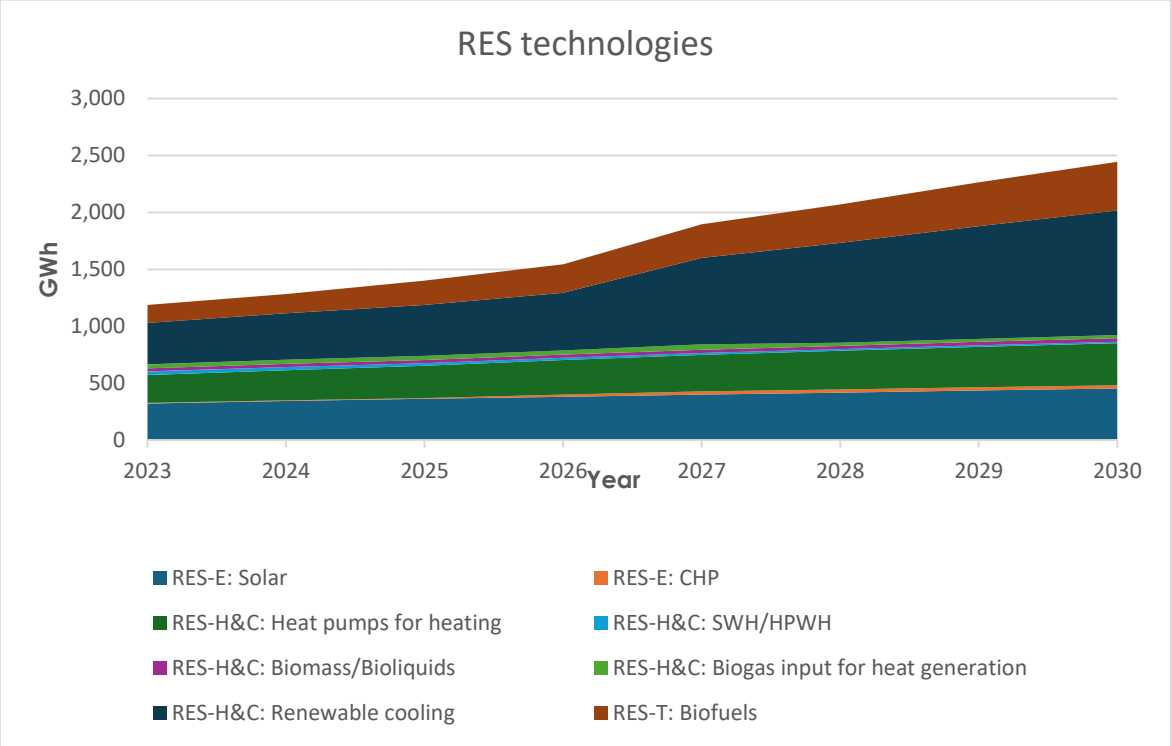
In line with Annex I of the Governance Regulation (EU) 2018/1999, Malta's overall RES contribution in 2030 represented as a RES share in total gross final consumption of energy is presented in Section 2.1.2 of this plan. Likewise, estimated trajectories for the sectoral share of RES in final energy consumption and by technology are also provided within Section 2.1.2. In order to avoid repetition, this section is intended to provide a general overview of Malta's WPM scenario projections in the area of renewable energy.aFigure 44 provides an overview of Malta's RES share trajectory from 2010 to 2030, whilst comparing the WEM and WPM scenarios. Based on these estimated projections and historical figures, Malta has reached its 10% RES target in 2020. Malta is expected to continue increasing its RES share gradually annually, reaching a 24.5% RES share by 2030. aa

Figure 44 :RES Share in Final Energy Consumption



The projected evolution of RES share by technology under the WPM scenario from 2023 to 2030 is provided in Figure 45. Policies and measures for the period post-2030, namely related to offshore renewable energy development, have been detailed in Section 3.1.2.

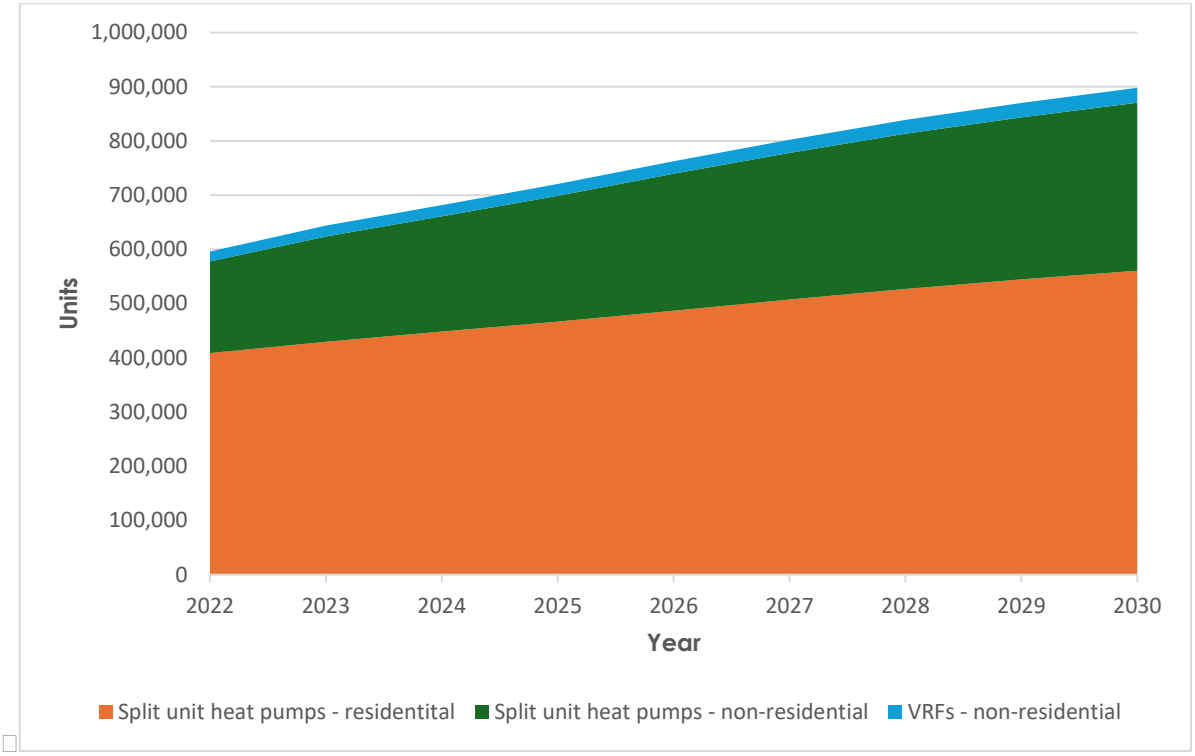
Figure 45: RES technology consumption under WPM



RES Heating & Cooling

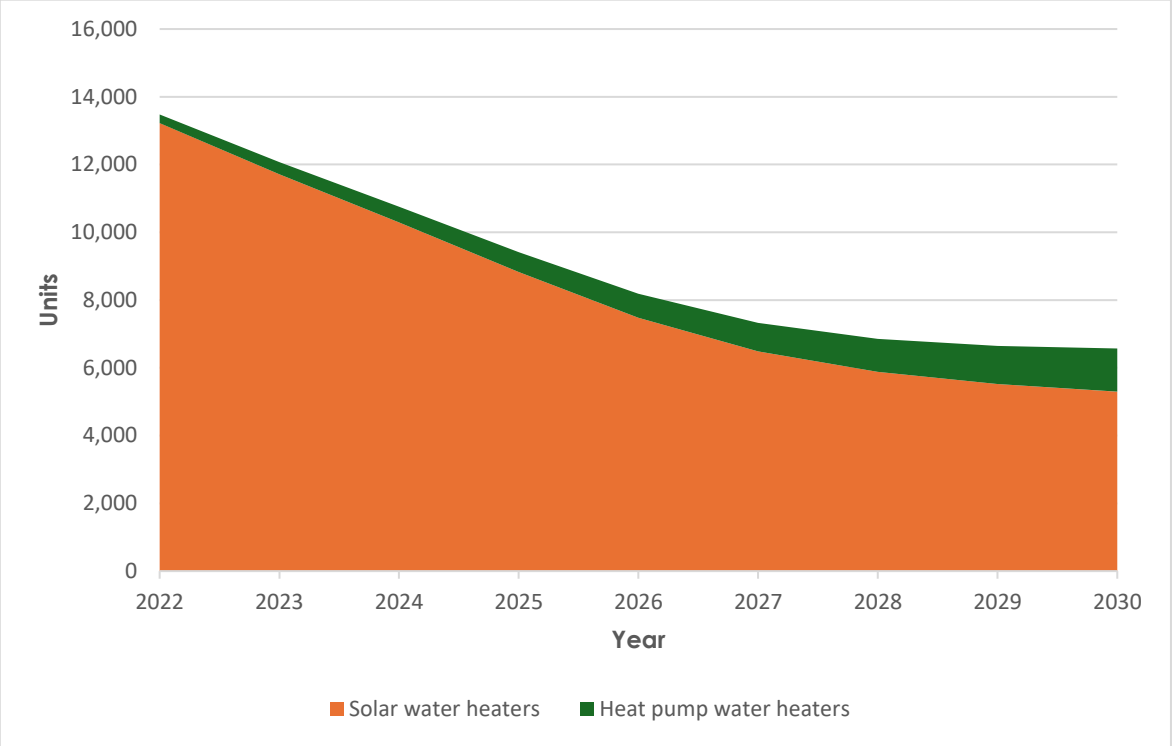
Ambient cooling from heat pumps is projected to have the most significant contribution to the heating and cooling sector. The affordability of this technology combined with the continual rise in expectations of thermal comfort ensures sustained growth, also reflecting demographic changes. In 2021, the estimated number of split-unit heat pumps installed in Malta stood at 519,000. The share of households with at least one heat pump (air conditioner unit) stood at 78% in 2021 (Source: NSO-EWA 'Household Energy' survey). This uptake is expected to continue with the share of households with heat pumps reaching 93% in 2030. Furthermore, the number of heat pumps per representative 'household with heat pump' is also projected to increase to 2.3 in 2030 and their use in SMEs and large enterprises for both heating and cooling has also been on the rise. Under the WPM scenario, the stock of split-unit heat pumps in the residential sector is projected to grow from 408,768 units in 2022 to 560,725 units in 2030. In the non-residential sector, the number of split-unit heat pumps is expected to increase from 168,879 units in 2022 to 309,865 units in 2030. Additionally, the number of VRFs (Variable Refrigerant Flow systems) in the non-residential sector is projected to grow from 18,251 units in 2022 to 27,655 units in 2030.

Figure 46: Stock of space heating and space cooling



In contrast to air-to-air heat-pumps, solar water heaters (SWH) and heat pump water heaters (HPWH) are unlikely to be installed if grant schemes to promote uptake are not maintained. Due to their high capital cost (compared to alternatives such as electric water heaters) and long payback period, it is assumed that no new or replacement units will be installed without Government intervention. Indeed, in recent years, Malta has observed a downward trend in the sales new SWH installations despite the availability and promotion of grants. This downward trend can be attributed mainly to consumer shift towards PV systems, developments in the construction and renovation of buildings linked with limited roof accessibility and reliability concerns accentuated by the prevalence of hard water in Malta. Under the WPM scenario, the stock of solar water heaters is projected to decrease from 13,225 units in 2022 to 5,297 units in 2030. Conversely, the number of heat pump water heaters is expected to increase from 253 units in 2022 to 1,275 units in 2030.

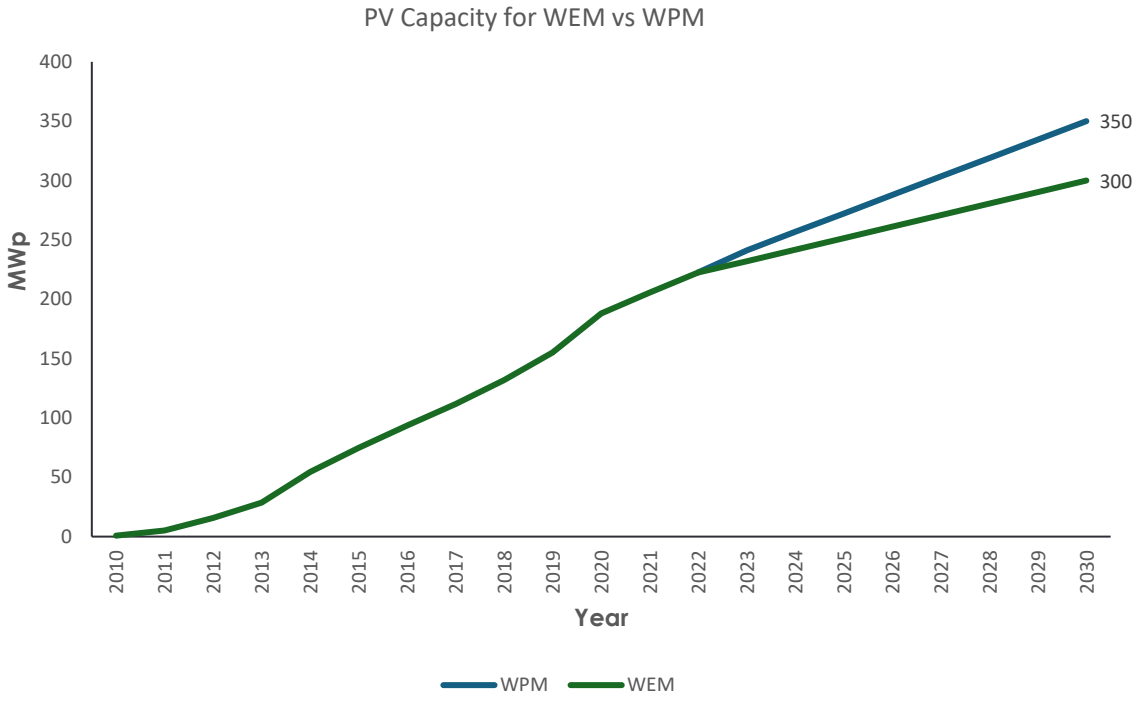
Figure 47: Stock of solar water heat pumps and heat water heat pumps



Biomass imports, used for space heating by a small number of households, is not projected to increase as heating by heat pumps, followed by LPG heaters is likely to remain the preferred mode of space heating.

RES-Electricity The Organic Processing Plant (OPP), will transform organic waste into compost and biogas, , while the gas extraction project will enhance biogas generation and incorporate a new Combined Heat and Power (CHP) system contributing to Malta's RES-E targets., however, this will continue to constitute only a small percentage of RES-E in Malta, as most of RES-E will result from solar PV. The projected capacity of solar PV up till 2030 is expected to reach 350MWp, based on the Government's commitment to maintain increased penetration of solar PV through financial support schemes and other measures to facilitate uptake was already presented under Section 2.1.2.

Figure 48: PV capacity for WEM vs WPM scenarios



RES-Transport

The transport sector in Malta is set to increase its renewable energy share, primarily through an extended substitution obligation on fuel importers that now includes maritime and aviation sectors, alongside road transport, in line with the revised Renewable Energy Directive (EU) 2023/2413. This obligation is expected to boost biofuel consumption, also in line with ReFuelEU Aviation Regulation targets. The electric vehicle (EV) fleet is also projected to grow significantly, as outlined in section 2.1.2, encouraged by stricter EU CO_2 emissions standards and government incentives. Malta's lack of a rail system emphasizes its reliance on road transport. As illustrated in Figure 49 the projected surge in electricity's contribution to Malta's transport sector is primarily due to the expected increase in electric vehicles within the road transport fleet. This trend is a direct consequence of the post-2020 CO2 emission regulations targeting vehicle manufacturers for various vehicle categories, including passenger cars, light commercial vehicles, and heavy-duty vehicles. These regulations are set to shape the new vehicle import profile in Malta. The anticipated peak in energy consumption in road transport by 2030, followed by a reduction, hinges on key developments: the fleet's gradual shift towards electrification, aiming for 65,000 electric and plug-in hybrid passenger cars by 2030; and the impending ban on sales of internal combustion engine vehicles, including passenger cars, light commercial vehicles, and motorcycles, from 2035, which will accelerate the adoption of electric mobility.

Figure 49: RES share in road transport in WPM (without multiplying factors)

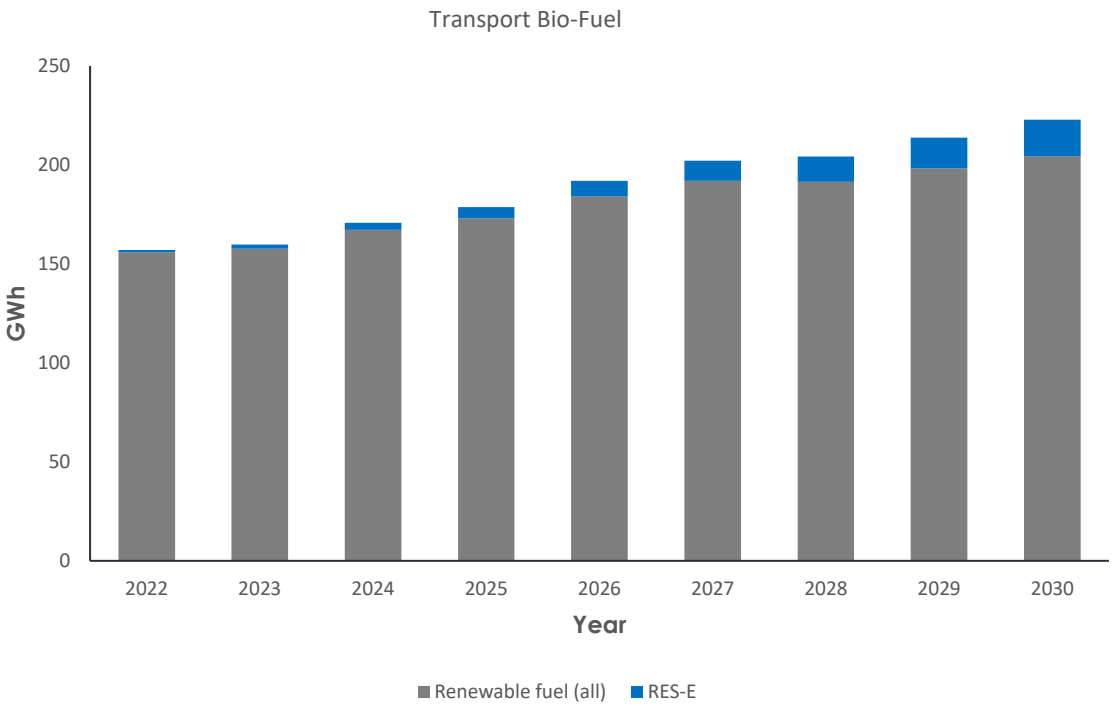


Figure 50: Projections for final energy consumption for road transport, under the WEM scenario, split by fuel, GWh

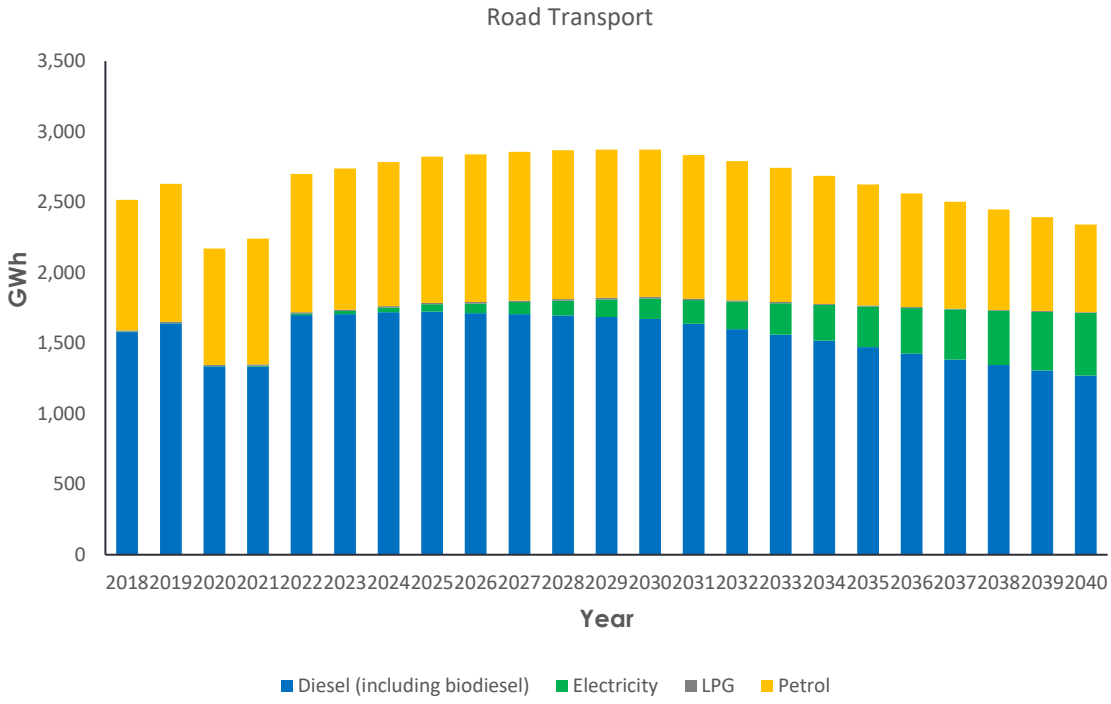


Figure 51 illustrates the projected final energy consumption for aviation. The projected increase in final energy consumption is consistent with the expected rise in aircraft movements and scheduled flight arrivals. In 2023, scheduled flight arrivals rebounded to the levels seen in 2019, yet Jet A1 fuel consumption remained approximately 9% lower. This discrepancy could be attributed to a combination of factors, including a gradual transition to more fuel-efficient aircraft product lines/series operating in Malta and a shift in aircraft movements towards

shorter routes. Notably, the proportion of aircraft movements between Malta and the UK decreased from 23% in 2019[45] to 18% in 2023[46], while movements between Malta and Italy rose from 20% in 2019 to 24% in 2023, reflecting changes in travel patterns and potentially contributing to the reduced fuel consumption despite the recovery in flight arrivals.

Figure 51: Final energy consumption in aviation sector under WEM scenario.

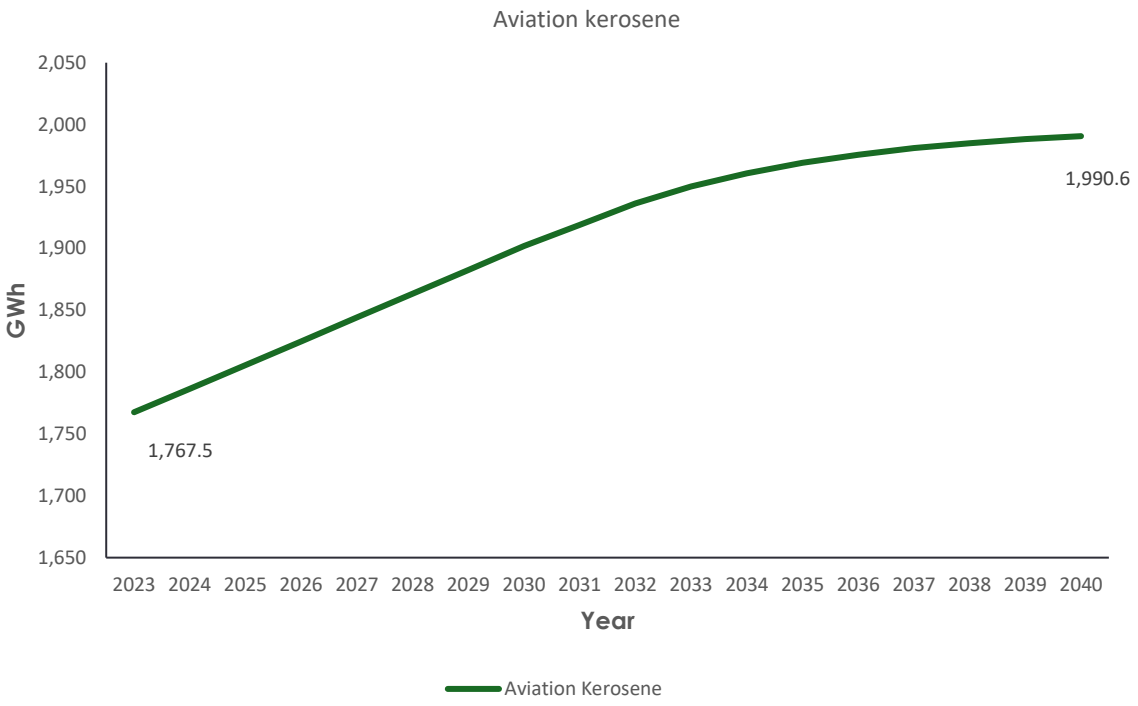
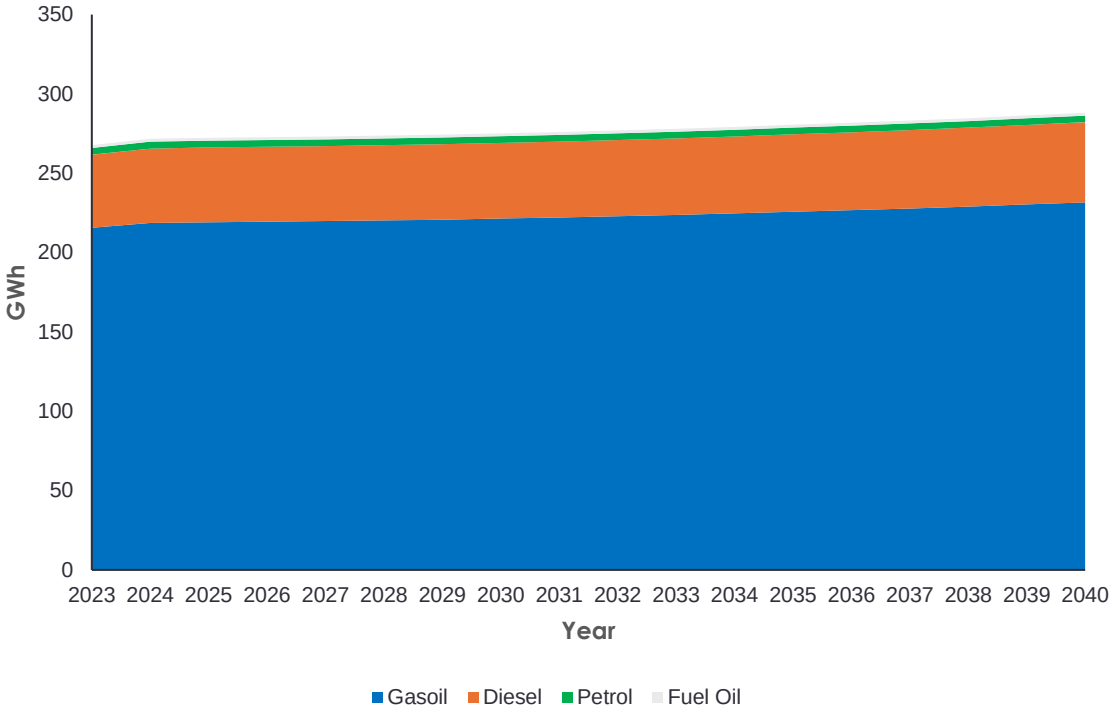


Figure 52 provides projections for final energy consumption for navigation by fuel type. In this sector the Ċirkewwa – Mġarr ferry service and the Valletta – Mġarr fast-ferry service are significant contributors, accounting for over half of the sector's energy consumption. Both services are assumed to continue operating until 2040, resulting in a steady and continued reliance on gasoil as the primary fuel source for these services.

Figure 52: Final energy consumption in inland navigation sector, under WEM Scenario, split by fuel

[45] Malta International Airport p.l.c. (2019), Malta International Airport p.l.c. Report 2019. Available at: https://www.maltairport.com/wp-content/uploads/2020/10/Business-Report-2019-1.pdf

[46] Malta International Airport p.l.c. (2023), Malta International Airport p.l.c. Annual Report 2023. Available at: https://www.maltairport.com/wp-content/uploads/2024/04/Business-Report-2023.pdf



Economic Sectors

Figure 53 shows total final energy consumption by sector from 2023 to 2040 across various sectors. The agriculture sector experiences a steady decline in energy use, while the industrial, residential, and services sectors see a consistent increase. The transport sector, which consumes the most energy, shows a significant increase throughout the period. Overall, while some sectors are reducing their energy consumption, others are on an upward trajectory, reflecting varying energy demands and efficiencies across different areas of the economy.

Figure 53: Total Final Energy Consumption by Sector

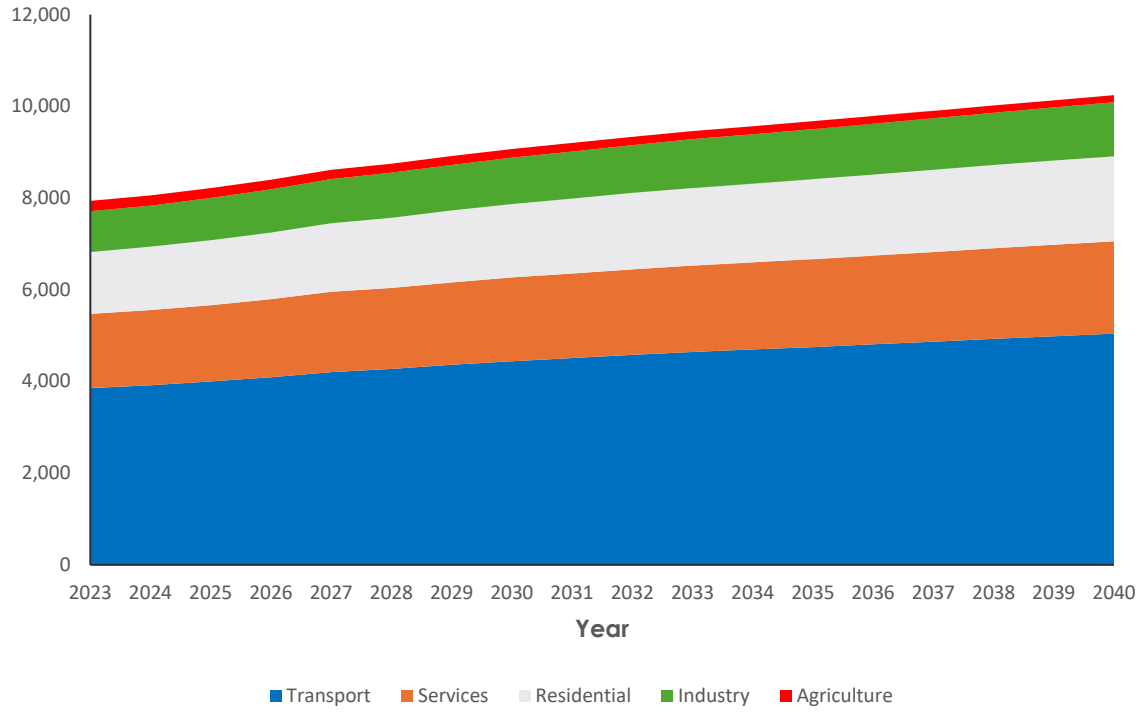


Figure 54 includes projections for final energy consumption by industry. Whilst most fuels are projected to remain largely constant, electricity and diesel consumption is projected to continue increasing.

Figure 54: Final energy consumption under WEM, split by fuel for Industry sector

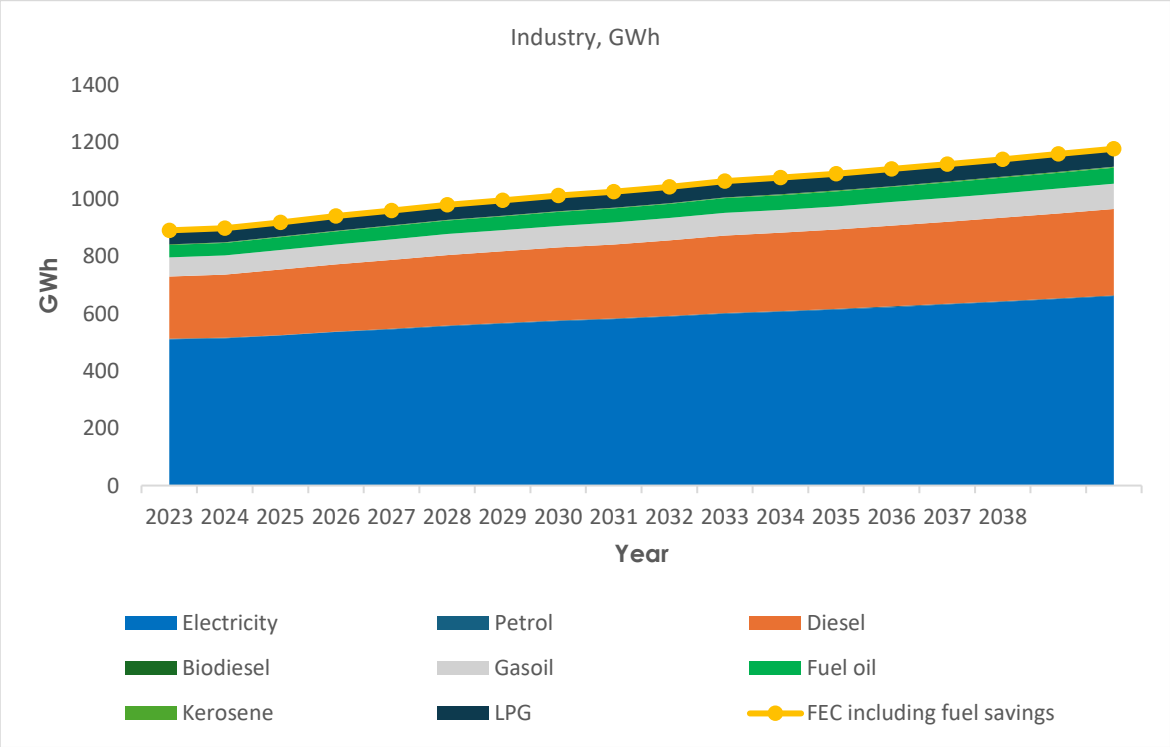


Figure 55 illustrates projections for final energy consumption for the services sector. Electricity consumption in this sector is projected to increase until 2040, along with certain key fuels such

as LPG and ambient heat; the consumption of other conventional fuels is set to remain largely constant.

Figure 55: Final energy consumption, split by fuel for service, WEM scenario

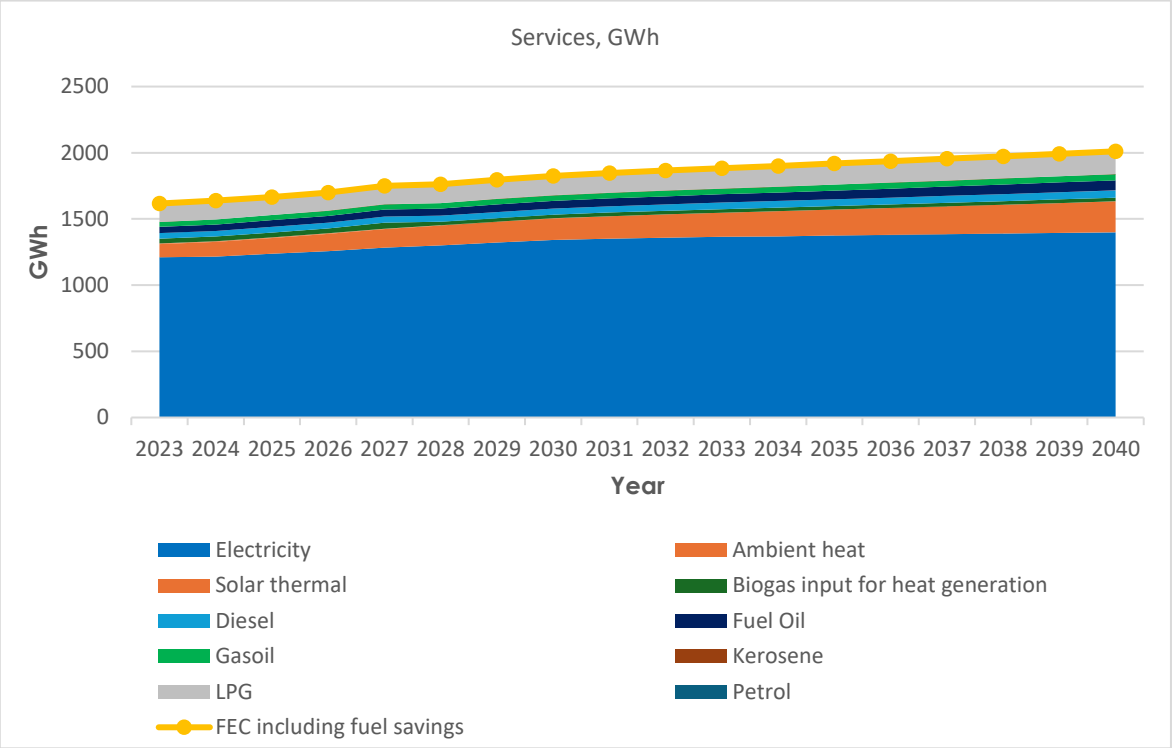
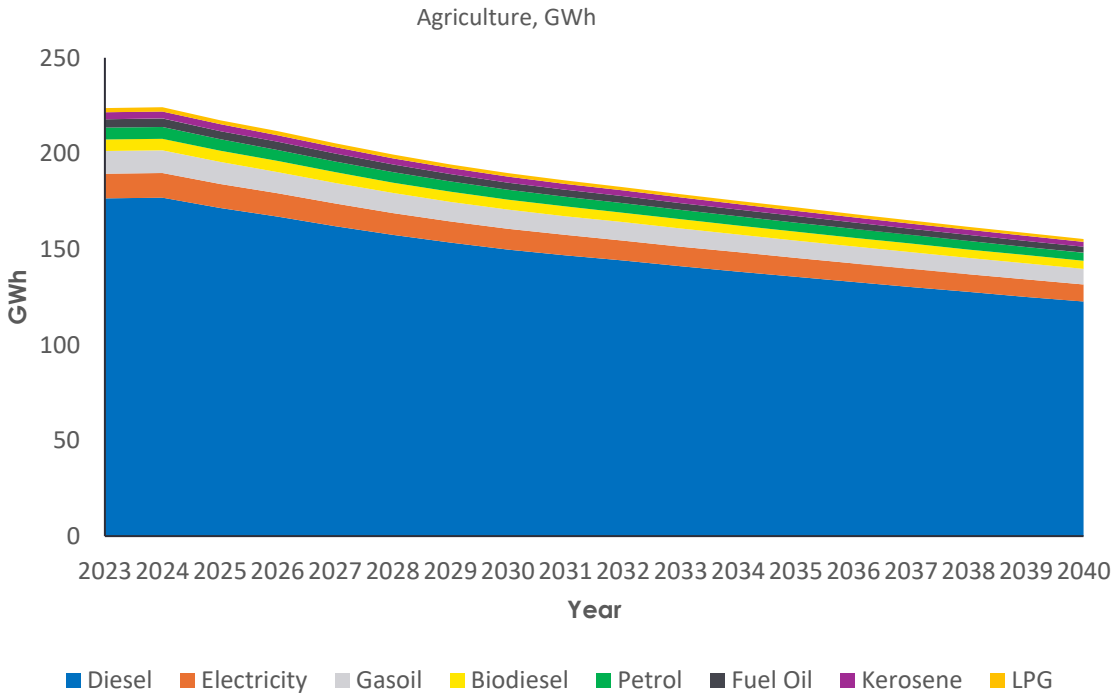
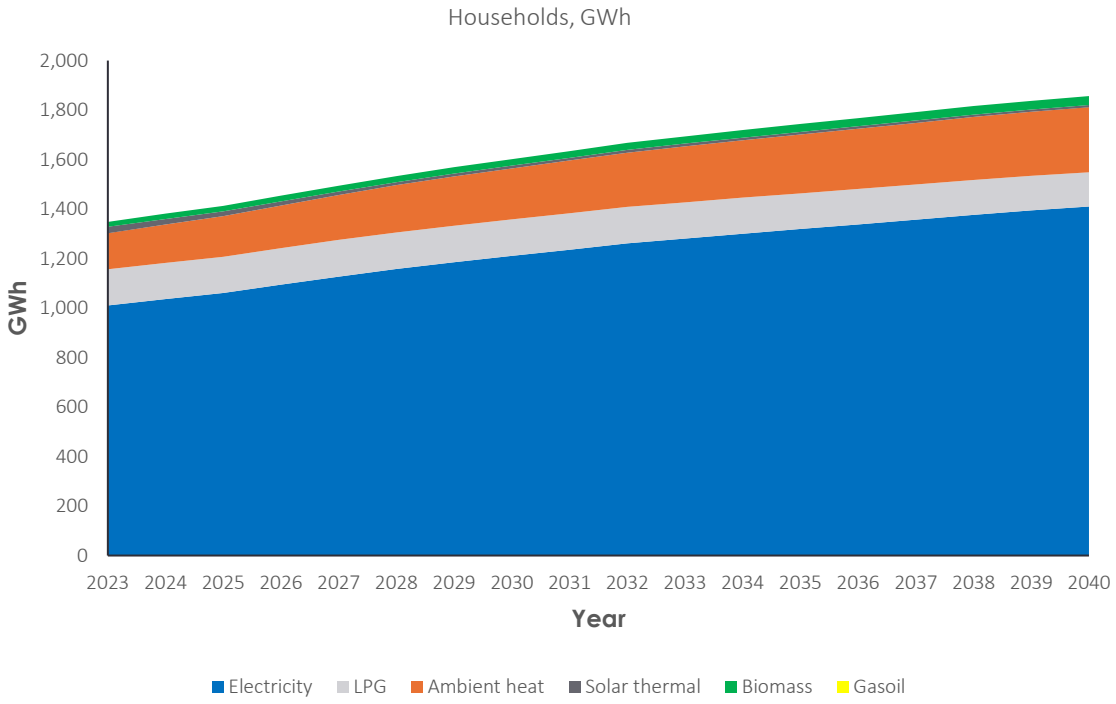


Figure 56: Final energy consumption split by fuel for agriculture sector under WEM



Residential Sector

Figure 57: Final energy consumption in the residential sector, under WEM scenario, split by fuel



The projected growing energy demand implies the need for more energy in the coming decade and beyond, which in turn will require more generation capacity and/or imports over the interconnector, as well as a more flexible electricity system. These developments will have a direct impact on how Malta shall continue to ensure the desired level of security of supply and resource adequacy. It is also expected that early in the next decade Malta will find it increasingly challenging to meet its electricity demand with the current and projected (under WPM) power generation infrastructure. The projected electricity generation by source, split into conventional gas-fired power plants, net imports over the electricity interconnectors, renewables and the projected waste-to-energy facility in 2030 is shown in Figure 58.

Figure 58: Electricity generation by source in GWh under WPM

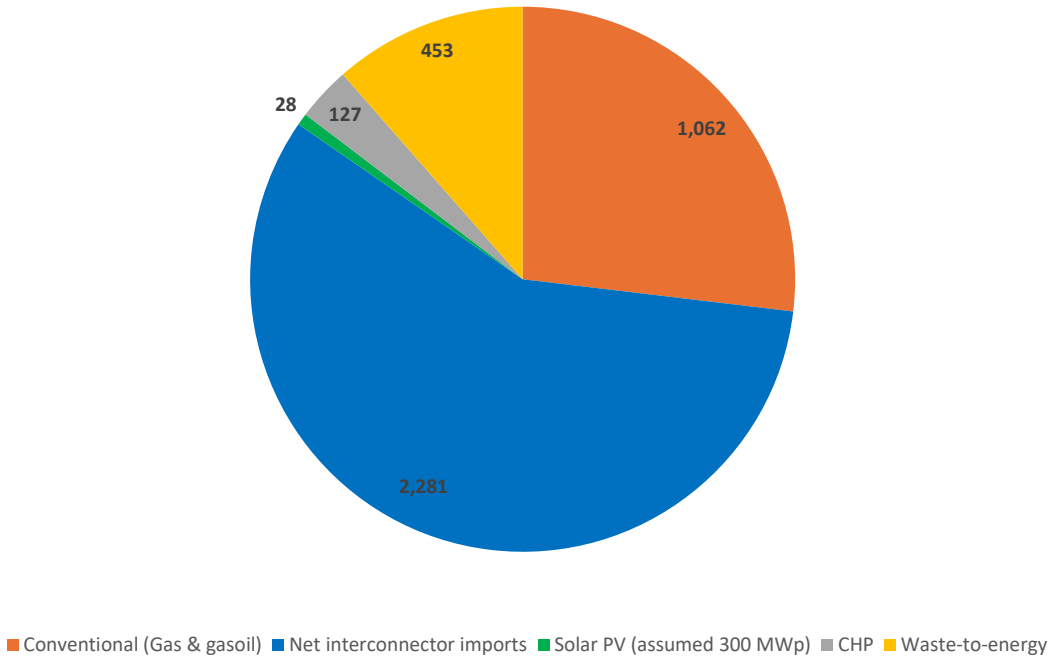


Figure 59: Net import dependency

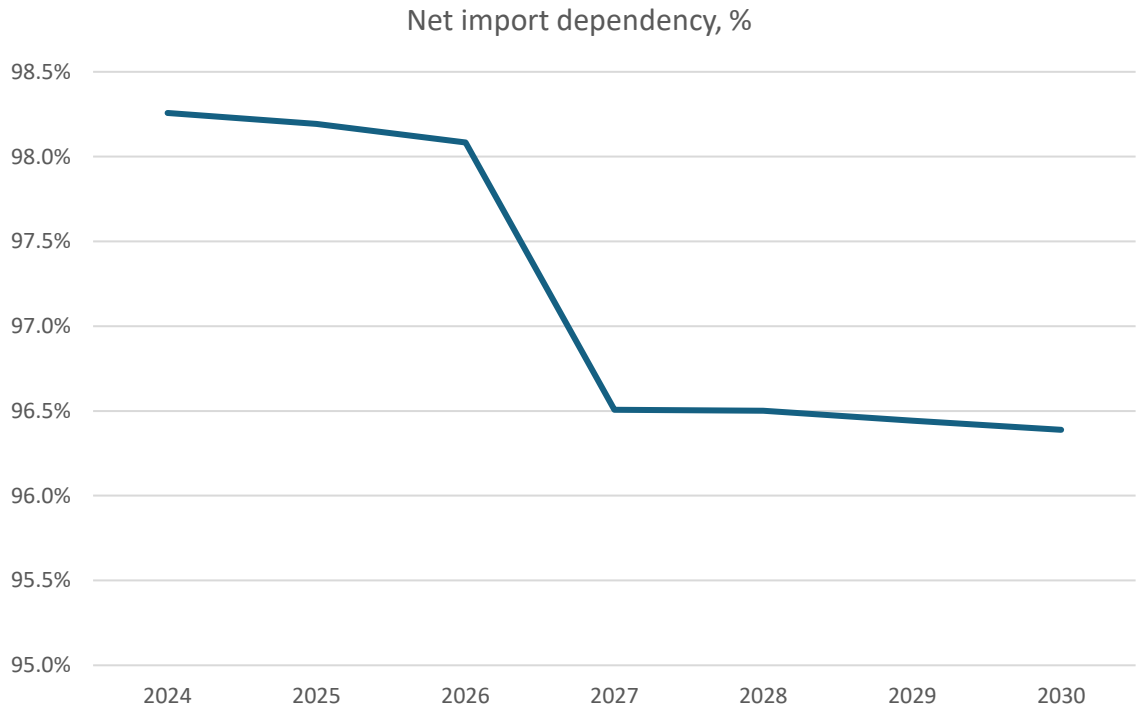
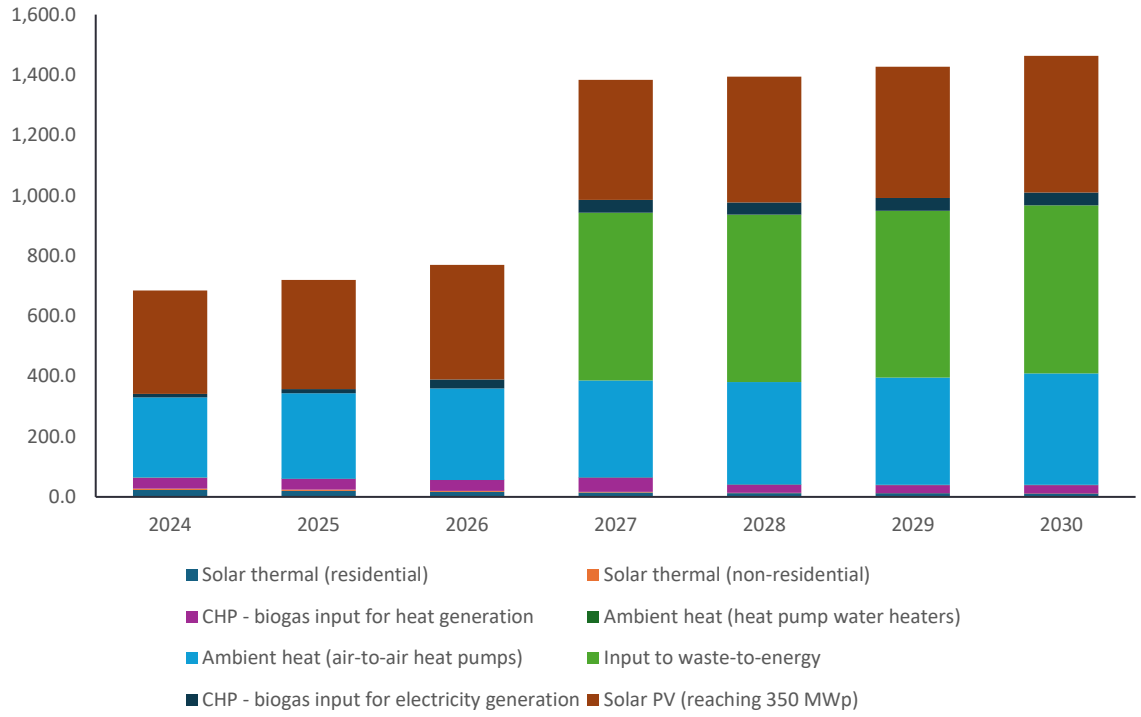


Figure 60: Projected consumption of domestic energy sources



Dimension Internal Energy Market

As referred under the relevant sections of the Internal Energy Market dimension, there are no liquid wholesale electricity or gas markets in Malta. Enemalta performs the functions of a DSO and constitutes the sole electricity supplier to final consumers. There is no electricity transmission system in Malta and hence no transmission system operator (TSO). Malta was also granted derogations from the application of provisions on unbundling of DSO, third party access and free choice of supplier under the Electricity Market Directive. rUnder the energy system modelling framework used for the development of the NECP, these factors are taken into consideration and assumed to continue to apply throughout the projected period. Projections of electricity interconnectivity, including the indicators of urgency of action are already outlined in Section 2.4.1. of the NECP[47], while the key relevant indicators for natural gas, such as gas demand and supply and the electricity generation mix are included under the Energy Security dimension of the Plan. The sole use of natural gas in Malta is in the power generation sector.

The projected installed power generation capacity by source under the WPM Scenario is shown in Figure 61. This amounts to the current and expected operational capacity in Malta, excluding gas-oil fired stand-by capacity. The currently existing power generation capacities running on natural gas at the Delimara Power Station, as well as the stand-by generation capacity running on gas-oil is expected to remain largely the same. Solar PV capacity will increase throughout the projected period until 2030, reaching 350 MW. It is also expected that the waste incinerator plant comes into operation before 2030.

The central scenario referenced in Figure 125 represents the baseline scenario used in the NECP modelling framework. The high scenario, on the other hand, was developed to assess the impact of higher projected population growth and inbound tourism, as well as variations in electrification rates and technological efficiency, on electricity demand. As a sensitivity scenario, the high scenario serves as a tool for informing investment decisions when considering power system adequacy.

[47] NECP Submissions: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

Figure 61: Installed Capacity by fuel, WPM

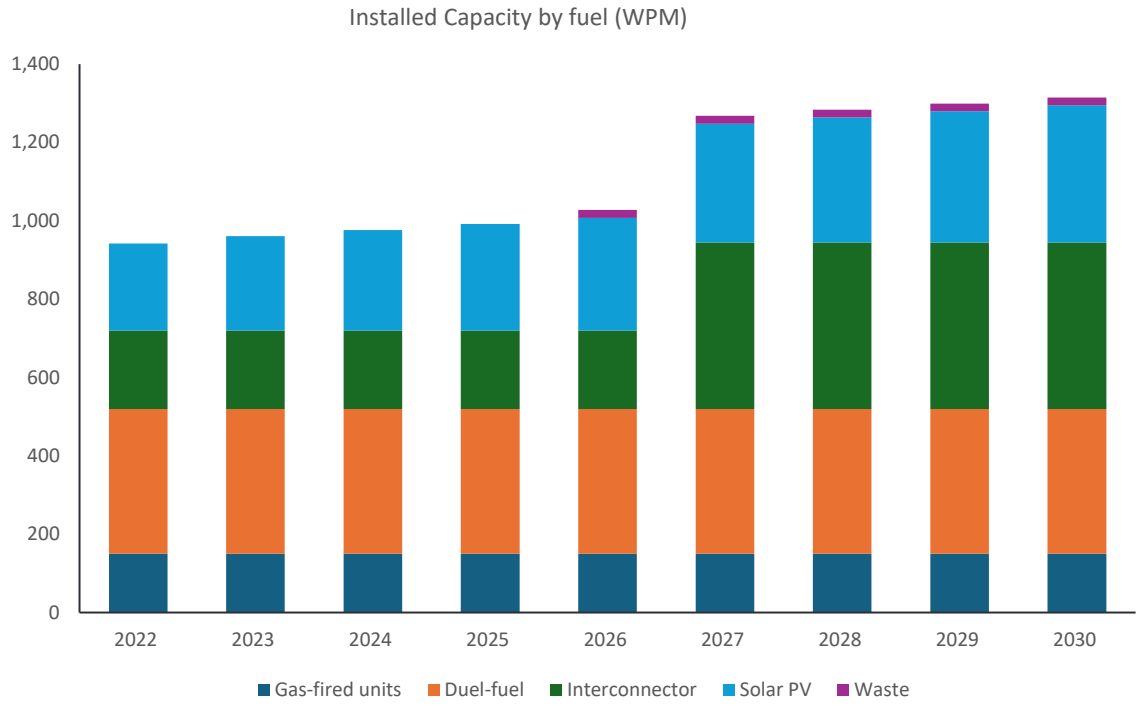


Figure 62: Peak demand (MW) and electricity demand (GWh) under WEM scenario, 2023-2040.

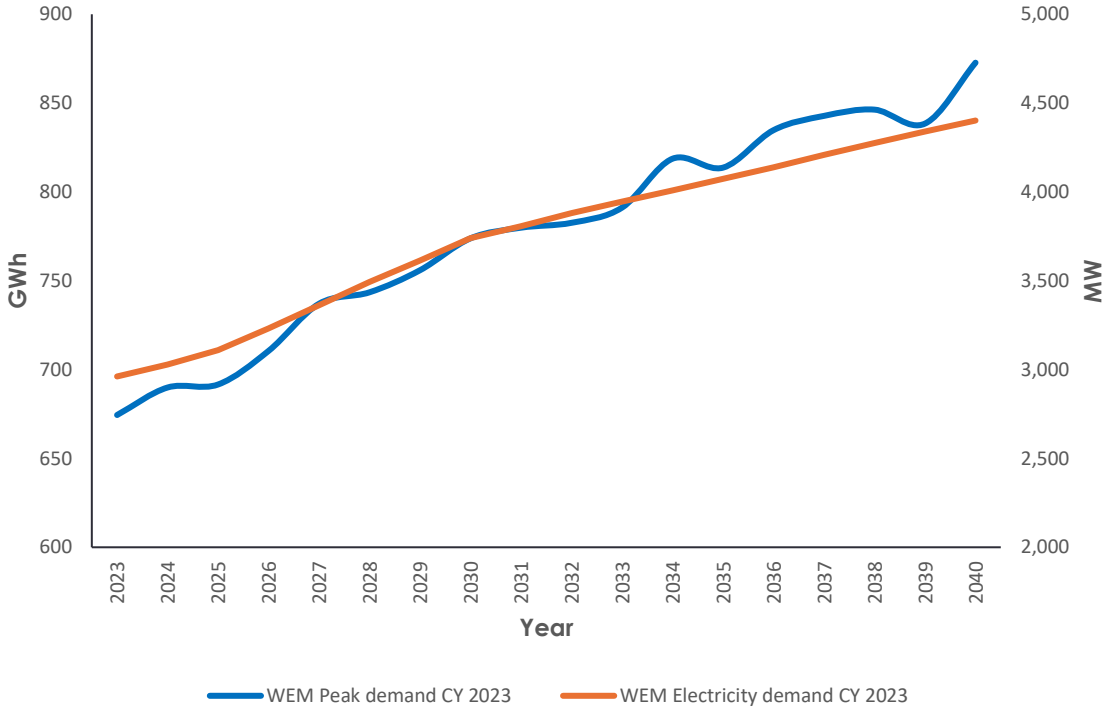


Figure 63: WEM Peak Demand (MW) under the central and high scenario

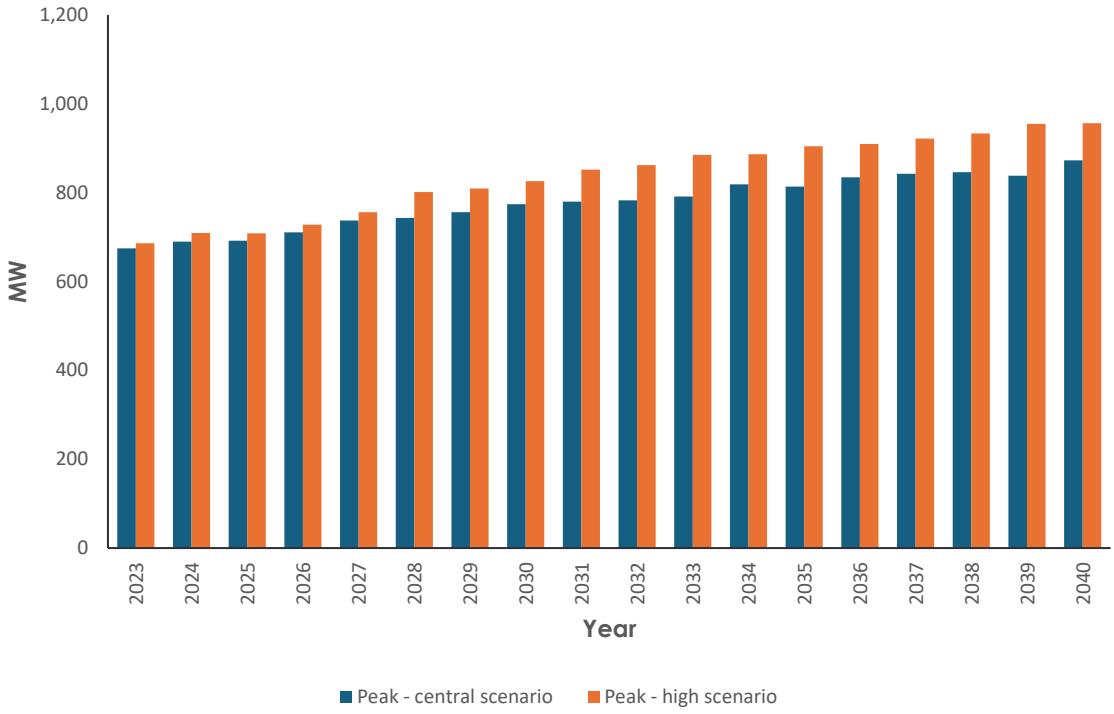


Figure 64: Electricity Imports and Exports over the interconnector, 2024-2030

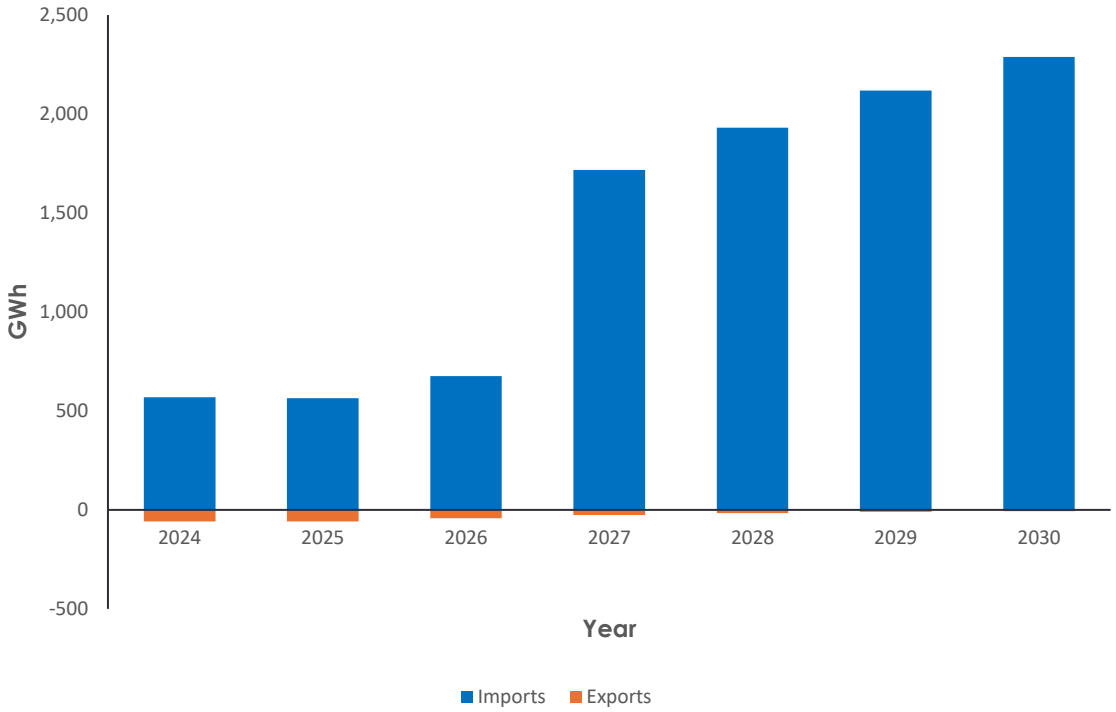


Figure 65: Projected trends in electricity spot prices, gas and gasoil prices

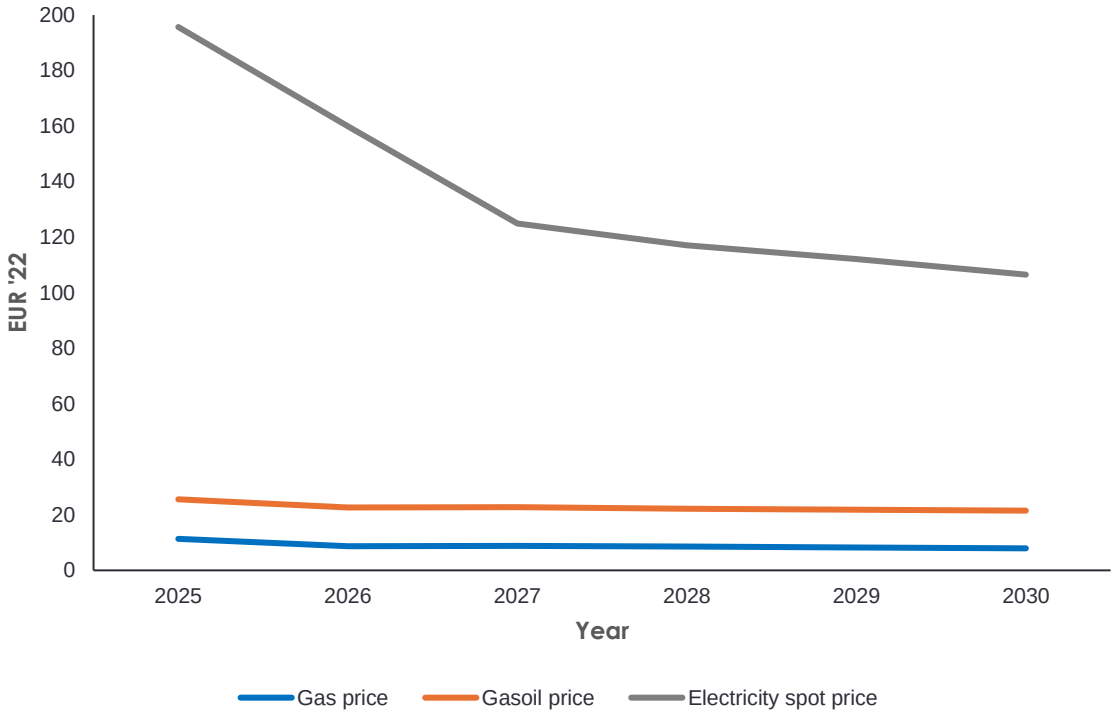


Table 25 : Projected EU ETS carbon prices

	78.72	74.31	73.46	73.7	76.49	82.65

Air-to-air heat pumps are considered by many households to be essential for thermal comfort. In fact, the share of households with at least one heat pump (air conditioner unit) stood at 78% in 2021. This uptake is expected to continue growing given the increase in population. The share of households with heat pumps is expected to reach 93% and 98% in 2030 and 2040 respectively (Figure 66). Furthermore, the number of heat pumps per 'household with heat pump' is also projected to increase to 2.3 in 2030 (Figure 67), reaching a saturation point where no further installation of heat pumps will be required in households.

Figure 66: Number of households with/without heat pumps

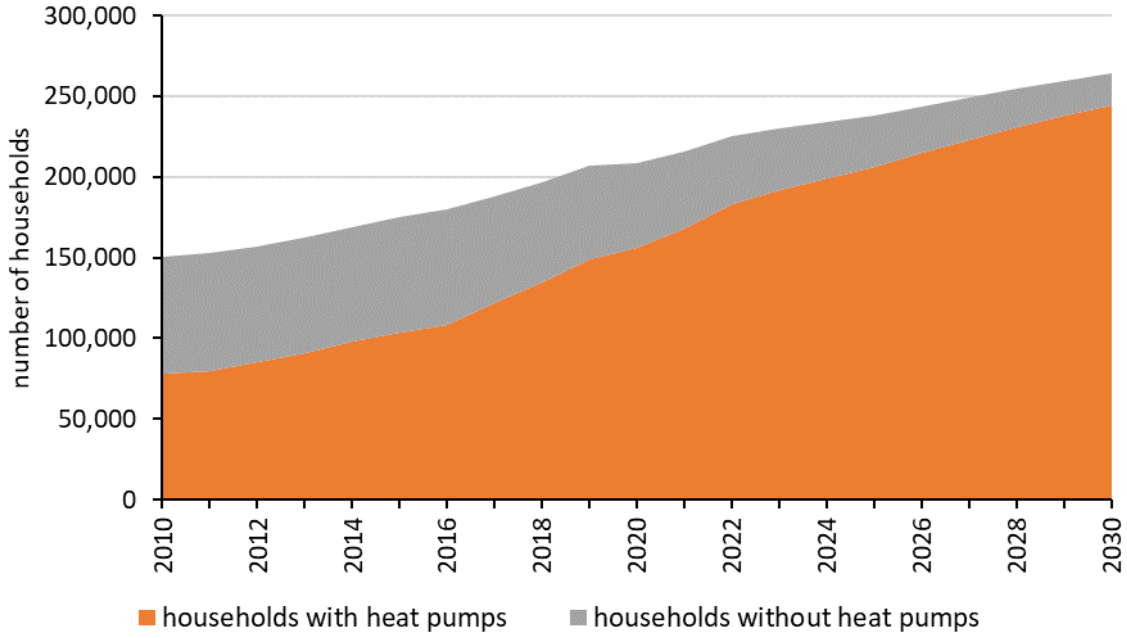
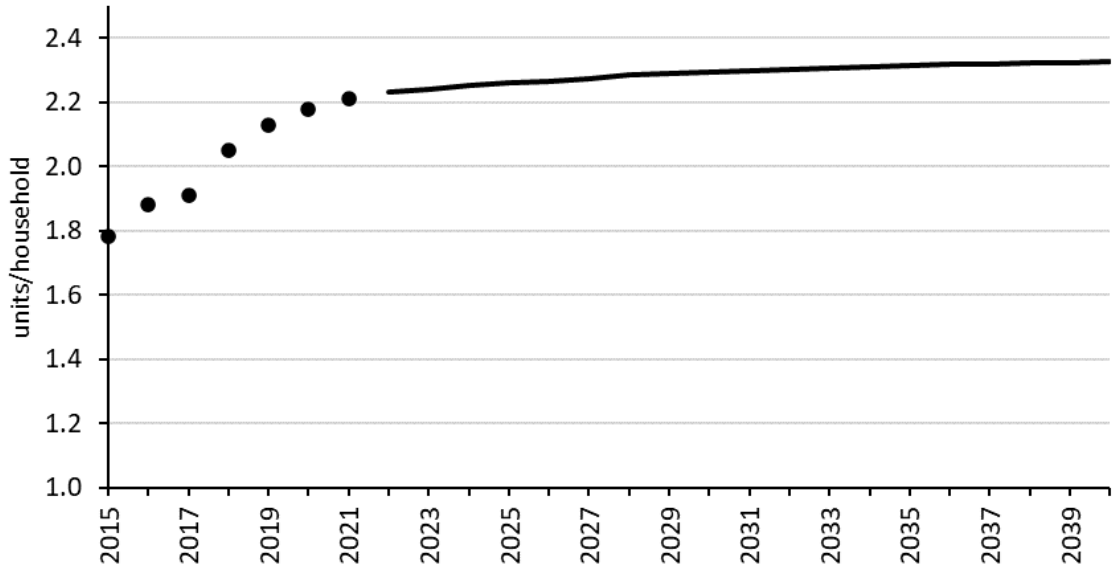


Figure 67: Number of heat pumps per 'household with heat pump'.



ii. *Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply.*

Projections indicate that, notwithstanding the planned implementation of a number of energy efficiency measures, energy demand shall continue to rise. The plan envisages investments in a second interconnector before the 2030 time window. Investments in renewables also need to take into account the capacity of Malta's small grid to further integrate intermittent sources, keeping in mind the similarity between the local demand profile and that of Sicily, towards which excess electricity could potentially be exported.

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

Malta's policies and measures included under the WEM and WPM scenarios are aligned to the Union energy and climate acquis. Existing and planned policies are expected to be implemented to contribute and fulfil objectives and targets at the national, EU and international level. PAMs under the decarbonisation dimension are set out to contribute to the Paris Agreement and the Effort Sharing Regulation, while policies to promote the deployment of renewables align with the requirements of the Renewable Energy Directive. This can also be said for energy efficiency policies and the Energy Efficiency Directive, including policy measures in the remaining dimensions, such as obligations stemming out of the Gas Security of Supply Regulation. Table illustrates the impact of various policies and measures within the WPM scenario across different Energy Union dimensions.

Table 26: Policy interactions under WPM scenario between Energy Union dimensions

PAM number	Name of Policy or Measure	GHG Emissions reduction	Renewable energy	EE	Energy Security	IEM	R&I and competitiveness
7	Regulatory measures to increase energy-efficiency in buildings	✓		✓			
12	Development of an offshore wind/solar farm	✓	✓		✓		✓
18	Melita Transgas hydrogen ready Pipeline				✓		
47	Modal shift to Active Mobility	✓		✓			
	Modal shift to Alternative Transport	✓		✓			
	Green Mobility Scheme	✓	✓	✓			

73	Gas Extraction from Landfill	✓					
16	Regulatory policies to increase PV installation	✓	✓		✓		
	Increase in PV capacity to 350MW	✓	✓		✓		

Table 27: Policy interactions under WEM scenario between Energy Union dimensions

PAM Number	Name of Policy or Measure	GHG Emissions reduction	Renewable energy	EE	Energy Security	IEM	R&I and competitiveness
2	Manure and slurry management	✓					
	Renovation of public buildings	✓	✓	✓			
	Incentives for increasing energy efficiency in buildings			✓			
11	Commissioning of second interconnector	✓	✓	✓	✓	✓	
15	Financial incentives to increase renewable energy installations	✓	✓			✓	
17	Medium to Large scale Solar PV Installations	✓	✓		✓		
20	Utility-scale battery storage solutions	✓		✓	✓		
23	Shore-to-ship projects						
	EE schemes for industries and services			✓			
	Public sector leading by example	✓		✓			
	Replacement of appliances in vulnerable households scheme			✓			
	Energy efficient street lighting			✓			
	Projects in primary water network and wastewater treatment plants					✓	

	Implementation of the f-gases regulation	✓					
	Electrification of vehicles		✓	✓			
	Incentivise active transportation modalities						
50	National free transport service			✓			
	Biofuels substitution obligation (2021-2030)	✓					
	Road and infrastructure projects			✓			
67	Free public transport for school children			✓			
70	High bio-waste capture	✓					
72	Waste-to-Energy facility	✓					
	Eco-reduction in electricity tariffs			✓			
	Incineration pre-sorting	✓					
81	Investments in Agrovoltaics	✓					

3.8 OTHER INFORMATION

No additional information is reported under this section. All relevant information can be found in the previous sections under chapter 3.

CHAPTER 4 CLIMATE CHANGE IMPACTS AND ADAPTATION

4.1 NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND LEGAL FRAMEWORKS

Climate change poses significant risks to Malta, a small island nation with heightened vulnerabilities due to limited land area, reliance on coastal infrastructure, and dependence on sensitive economic activities such as tourism and agriculture.

The importance of climate adaptation has been increasingly recognised globally. In 2021, the Commission published a new EU strategy on adaptation to climate change[48], which underlined the importance of integrating climate resilience in national fiscal frameworks and of nature-based solutions. The European Climate Law[49] stresses the importance of sectoral measures being resilient to the potential adverse impacts of climate change. Beyond this, in 2024 The European Environment Agency (EEA) published the European Climate Risk Assessment (EUCRA)[50]. This assessment highlights significant challenges posed by climate change to Europe. It identifies 36 critical climate risks, with regions like Southern Europe, low-lying coastal areas, and the EU's outermost regions facing vulnerabilities due to heatwaves, droughts, flooding, and sea-level rise. The assessment also underscores the economic impact, predicting potential losses and calls for integrated actions across governance levels to improve resilience and adapt policies to address these growing risks. This emphasis is being made internationally as well through Article 7 of the Paris Agreement, which established *'The Global Goal on Adaptation'* (GGA). Additionally, through the UAE Framework for Global Climate Resilience , adopted at CMA 5, which provides targets for adaptation actions This includes a two-year UAE – Belém work programme focusing on developing indicators to measure progress towards these targets, a process Malta is currently following closely.

Beyond the work ongoing on adaptation on an international level, Malta also has a number of policies, initiatives, and projects that aim to strengthen adaptation efforts locally, including the Low Carbon Development Strategy (LCDS) and the Vulnerability Risk Assessment (VRA). The LCDS puts forward the pathway to achieve carbon neutrality by 2050, with 47 sector-specific measures addressing energy, transport, buildings, industry, waste, water, and agriculture. Moreover, the VRA provides a detailed analysis of sectoral vulnerabilities and adaptive capacities, with the aim of guiding effective adaptation strategies moving forward. Both the LCDS and the VRA will be discussed in greater detail in upcoming chapters.

4.1.1 LEGAL FRAMEWORK

Malta has also been engaging with adapting governmental structures to better respond to climate-based needs. One such structure is the Climate Action Authority. The Climate Action Authority, established by the Climate Action Act of 2024[51], is designed to serve as the national competent authority responsible for overseeing and coordinating climate action in Malta. Its primary functions include regulating climate-related matters, ensuring compliance with climate policies, and coordinating mitigation and adaptation strategies to reduce

[48] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN
[49] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1119
[50] https://www.eea.europa.eu/publications/european-climate-risk-assessment
[51] https://legislation.mt/eli/cap/643/eng

greenhouse gas emissions and adapt to climate change impacts. The Authority is tasked with setting national and sector-specific targets aligned with overall climate objectives, developing and updating policies to limit greenhouse gas emissions, and enhancing climate resilience. It also monitors and reports on progress through national inventories of greenhouse gas emissions and removals, ensuring transparent tracking of efforts to reduce vulnerability and enhance resilience to climate impacts.

The Authority also promotes sustainable practices by encouraging the development and use of technologies and practices that reduce emissions, and it cooperates in scientific research, information exchange, and public awareness initiatives related to climate change. Moving forward, the Authority will be responsible for preparing long-term strategies and National Adaptation Plans (NAPs) and coordinating climate action projects across different ministries. The governance structure includes a Board composed of a chairperson and 4-6 members appointed by the Minister for a term of up to six years, and a Chief Executive Officer responsible for the executive conduct, administration, and organisation of the Authority.

Inter-ministerial coordination is facilitated through Climate Action Coordinators in each ministry, with Permanent Secretaries serving as coordinators within their respective ministries. The legal and administrative framework empowers the Authority to enforce compliance with climate policies and regulations, including the imposition of administrative penalties for non-compliance, and ensures public consultation in the development of strategies and policies. This comprehensive framework equips the Climate Action Authority to effectively manage and promote climate action in Malta, ensuring alignment with both national and international climate objectives.

Beyond establishing the Climate Action Authority (CAA), the Climate Action Act of 2024[52] outlines a comprehensive legal framework for climate action in Malta. The Act acknowledges climate change as a common concern and aims to limit greenhouse gas emissions, enhance resilience, and adapt to climate impacts. It mandates the Government to protect the climate for present and future generations, develop national inventories of emissions, and formulate policies for mitigation and adaptation. Climate action must consider social, economic, and environmental policies, be cost- effective, use the best available technologies, and involve all sectors of society. The Act emphasises precautionary measures, sustainable development, and public participation.

The Act requires the preparation of a national long-term strategy, a National Energy and Climate Plan (NECP), and a national adaptation strategy, which must be periodically reviewed and updated with public consultation. An independent statutory body, the National Climate Action Council (NCAC), was also formed to advise the Government on climate action and monitor the implementation of the Act. The Council consists of experts in various climate-related fields and reports annually on progress.

[52] https://legislation.mt/eli/cap/643/eng

4.2 NATIONAL ADAPTATION STRATEGY, PLANS AND ACTIONS

4.2.1 THE LOW CARBON DEVELOPMENT STRATEGY (LCDS)

Malta, due to its small island state characteristics, is highly vulnerable to climate change. To tackle the urgent threats posed by climate change, it has initiated a Low Carbon Development Strategy (LCDS). Spearheaded by the Ministry for the Environment, Climate Change and Planning (MECP), now under the remit of MEEC (Ministry for the Environment, Energy, and Pub), the LCDS involves collaboration across ministries and stakeholders. Extensive research and stakeholder consultations have informed the identification of feasible mitigation measures, considering economic and environmental impacts.

Despite its challenges, Malta remains committed to its obligations under the EU climate action regulations and the Climate Action Act[53], which mandates the development of the LCDS. The LCDS aims to achieve carbon neutrality by 2050, aligning with both EU and global climate goals. It encompasses sector-specific adaptation measures targeting energy, transport, buildings, industry, waste, water, and agriculture, as well as adaptation initiatives to enhance resilience to climate impacts.

The Low Carbon Development Strategy (LCDS) consists of seven tasks, each aimed at addressing different aspects of climate change mitigation and adaptation. This was done through identifying mitigation and adaptation measures from national and international policies, followed by stakeholder consultations. A total of 47 adaptation measures were put forward in the LCDS, of which two have been completed, 42 are currently ongoing, and three are set to start very soon.

4.2.1.1 Adaptation Priorities

Evidence demonstrates that climate change is occurring on global, regional (including the Mediterranean), and local levels. According to global and regional climate models and trends, various studies identify four principal impacts on countries, including our islands.

- Higher temperatures;
- Change in precipitation patterns;
- Sea level rise; and
- Ocean acidification and warming.

The sectors outlined below were identified as requiring the highest priority in the formulation of adaptation measures, owing to their current vulnerabilities and heightened susceptibility to the effects of climate change on the Maltese islands:

1. **Water Resources:** Malta faces water scarcity due to its semi-arid Mediterranean climate, limited rainfall, and reliance on groundwater, which is affected by nitrate pollution and seawater intrusion. Climate change exacerbates these issues with extreme storms and flash floods, reducing groundwater recharge and increasing runoff, leading to potential flooding and infrastructure damage.

2. **Infrastructure and Transport:** Malta's infrastructure, particularly its transport systems, is at risk from more intense and frequent extreme weather events like storms and high winds. As an island nation reliant on air and sea transport for supplies, disruptions can

[53] https://legislation.mt/eli/cap/643/eng

significantly impact food and resource security. Increased maintenance and resilience in infrastructure are necessary to cope with these challenges.

3. **Land Use and Buildings:** Adaptation measures are needed to address the impacts of changing climatic conditions on land use and building infrastructure, including managing risks related to soil erosion, landslides, and the stability of buildings and other structures.

4. **Natural Ecosystems, Agriculture, and Fisheries:** Malta's natural ecosystems and agricultural sectors are vulnerable to climate change. Changes in temperature and precipitation patterns can affect crop yields, fish populations, and overall ecosystem health, necessitating adaptive measures to protect these resources.

5. **Health Issues and Civil Protection:** The strategy acknowledges the potential health impacts of climate change, such as heat-related illnesses and the spread of vector-borne diseases. It also emphasises the importance of civil protection measures to ensure public safety during extreme weather events and other climate-related emergencies.

6. **Tourism:** Given the significance of tourism to Malta's economy, the strategy highlights the need to adapt to climate change impacts that could affect tourist attractions and infrastructure. Ensuring the resilience of the tourism sector is vital for sustaining economic stability.

7. **Cross-Sectoral:** Recognising that some adaptation measures have implications across multiple sectors, the strategy includes a cross-sectoral category to address risks and vulnerabilities that require coordinated efforts among different sectors.

The adaptation priorities are based on a vulnerability assessment and an impact-likelihood matrix, which evaluates the importance of climate change risks based on their potential impact and likelihood. This approach helps identify which risks need to be addressed first to enhance Malta's resilience to climate change.

Some of the adaptation actions put forward in the LCDS are discussed below, categorising measures by sector and advancement since the launch of the LCDS.

4.2.1.2 Completed Actions

1. Water Resource Measures:

I. A comprehensive study of the current hydrological cycle monitoring capacity and new hydrological data modelling and management. This measure involves a study which aims to better understand the hydrological cycle (e.g., rainfall, run-off, evaporation) while also analysing whether gaps in data collection exist currently. The study was done through the 'Cohesion Fund Project', which concluded in December 2023.

2. Cross Sectoral Measures:

I. Survey to gauge level of CC understanding in Malta. This measure includes a study to assess climate change concerns, perceived impacts, and awareness levels among the Maltese

population aged 16 and over, based on telephone interviews with 600 individuals conducted between March and May 2021. The study found that the top three environmental concerns are air pollution (63.0%), construction (59.6%), and traffic congestion (59.0%). Concerns varied by age group and region, with younger individuals (16-25) most troubled by traffic congestion, while older individuals (66+) are more concerned about air pollution and construction. Regionally, Northern Harbour and Gozo and Comino residents worry most about construction, while Southeastern district residents are primarily concerned with air pollution.

A significant portion of respondents (44.6%) attribute climate change to human activities affecting the global atmosphere, leading to rising sea levels and shrinking glaciers. This view is especially prevalent among older respondents (66+), with 67.9% attributing climate change to global warming. Similar views are echoed by residents of Gozo and Comino and the Western district.

The study also found that awareness of climate change varies across demographics. About 64.3% of respondents are familiar with the concept of a carbon footprint, with the highest awareness among the 16-25 age group. However, only 5.4% have used a carbon footprint calculator. A large majority (87.2%) supports mandatory inclusion of climate change education in the national curriculum. Moderate awareness of the European Green Deal exists, with 36.0% having heard of it. Awareness is higher among females and younger age groups (16-25 and 26-35), suggesting younger generations are more attuned to international climate initiatives. This study highlights the diverse concerns, perceptions, and awareness levels regarding climate change among the Maltese population.

This study guided our communication team in creating the #Climateon Campaign, which aimed to tackle the gaps highlighted within this study. Understanding these demographic differences enables policymakers and educators to enhance public engagement and foster a more informed and responsive society, crucial for shaping effective and inclusive environmental policies in Malta.

4.2.1.3 Ongoing Actions

1. Water Resources Measures:

I. Surveying and managing existing rainwater harvesting infrastructure. This measure includes surveys of the status of existing relevant infrastructure (e.g. public reservoirs, wells), including the identification of the potential users of such rainwater. This is being done through the Alteraqua Project. Which allowed the Energy and Water Agency (EWA) to pilot the rehabilitation of specific reservoirs in *Kottonera.*

II. Further enforcement of legislation mandating rainwater capture reservoirs or wells. This measure involves the assurance that all new developments are provided with a water reservoir that is connected to a pump connected to a second-class distribution system, enabling each dwelling to store and re-use its rainwater run-off from its own built-up area.

III. Studies to identify new areas for water catchment infrastructure. This study set out to identify areas where reservoirs and retention systems can be developed (preferably located within the urban context and within existing committed road network infrastructure) to increase the local water storage capacity, collect water run-off and decrease flooding whilst creating an additional water supply. At this stage, preliminary consultations together with the Lands

Authority are in the process to identify new reservoirs and retention systems that can be developed within Urban Areas.

Moreover, amid 2020/2021, a new underground soakaway with a capacity of 11,000 cum was constructed by the Planning Works Department (PWD) as part of the upgrading of the *Mqabba* Square. A manual and a policy guidance document for Green Infrastructure is being drafted by PWD as part of the LIFE Rainwater Basin Management Plan. Moreover, works in relation to the implementation of 5 pilot projects to demonstrate the effectiveness of Green Infrastructure in dealing with surface water runoff are also being carried out by the PWD as part of an EU Life Project in preparation of the 3rd River Basin Management Plan. The water courses will be cleaned and restored to improve stormwater infiltration and storage, and Sustainable Urban Drainage Systems will be installed in the play areas. This pilot project has a financial commitment of €2.3 million of which 80% is EU Funded.

2. Infrastructure and Transport Measures:

I. Energy Efficiency (EE) Standards (infrastructure). This measure involves supporting EE standards for infrastructure, through both legislation and economic incentives. The Minimum Energy Performance Requirements for new and renovated buildings are being updated in accordance with the Energy Performance of Buildings Directive (10/31EU and 844/18 EU), replacing those enforced since 2016 under Legal Notice 434/2015. These updates follow extensive studies mandated by the EU directives and are divided into three parts. Part 1 and Part 2 pertain to dwellings and non-dwellings, respectively, focusing on overall energy performance and the integration of renewable energy sources. Part 3 outlines requirements for technical systems within buildings, addressing the energy efficiency of heating, cooling, domestic hot water, and lighting systems.

The document emphasises energy adaptation through enhanced Energy Efficiency (EE) standards for infrastructure, supported by both legislation and economic incentives. For dwellings, it mandates maximum whole-building energy performance and specifies minimum performance levels for building elements, including thermal transmittance limits for opaque and glazed elements, solar gains, and shading factors. It also requires the integration of on-site renewable energy systems such as solar photovoltaic systems and heat pumps to reduce overall primary energy demand. For non-dwellings, the document sets similar requirements, ensuring energy performance limits and promoting renewable energy generation. It includes provisions for on-site energy generation to cover a portion of annual primary energy consumption, leveraging systems like solar photovoltaic panels and geothermal systems. Additionally, new buildings must incorporate rainwater collection and reuse systems, and renovated buildings must utilise existing water reservoirs. Overall, these measures aim to achieve nearly zero energy buildings by reducing energy consumption and enhancing the use of renewable energy sources, thus contributing to both mitigation and adaptation strategies against climate change.

II. Study on green infrastructure in Malta. A study is underway to identify green features and integrate infrastructure in urban areas, including ports, for sustainability. The Intelligent Planning Consultative Forum is involved in assessing scenarios for success. PWD is drafting a manual and policy guidance for Green Infrastructure as part of the LIFE Rainwater Basin Management Plan. Additionally, the department is implementing five pilot projects, largely EU funded, to demonstrate the effectiveness of Green Infrastructure in managing surface

water runoff. These projects aim to improve stormwater infiltration and storage, contributing to sustainable urban development efforts.

III. Identify and screen critical risks and concerns for the aviation sector and airports and the maritime sector and ports.

IV. Introduce maritime weather stations in ports to record trends of major parameters. This measure involves the development of port weather stations and data collection buoys to collect information in relation to the major sea climate parameters, such as sea temperature, sea level rise and wave strength.

3. Land use and Buildings Measures:

I. Identify high-risk/vulnerability areas in Malta and apply appropriate treatment. To fulfil this measure, a number of research projects were initiated to tackle risk and vulnerability. VRA and Coastal SAGE projects aim to evaluate climate risks and address coastal erosion in Malta. It assesses national climate risks to economic sectors (which will be discussed below in further detail), while Coastal SAGE utilises SAR and deep learning techniques to monitor coastal erosion. The C-COVER project, funded by the European Commission (EC) aims to develop a sustainable coastal protection management system to mitigate global warming impacts. It includes policy prioritisation, risk assessment, and stakeholder engagement, led by the Coastal & Marine Union (EUCC) and supported by international experts.

4. Natural Ecosystems, Agriculture, and Fisheries Measures:

I. Implement good sustainable farming practices (e.g., wind curbing, soil conservation techniques, cultivation methods). This measure involves the implementation (through research and experimentation) of wind curbing and soil conservation techniques (e.g., rubble walls) that are suitable for local climatic conditions, including the protection of green water. While also carrying out research and experimentation on new crops that require less water and fertiliser requirements, and which have a higher economic return.

II. Implementation of the National Strategy on Invasive Alien Species and promotion of complementing, sector-specific Codes of Best Practice.

5. Tourism Measures:

I. Increase awareness of climate change effects within the hospitality industry. This is being done by carrying out a tailored awareness program, directed specifically at informing industry operators, on the potential CC effects on operations and solutions to the problem (e.g. sustainable/eco-tourism practices). Through this knowledge sharing, the market will be better equipped to respond to such changes. The Tourism Strategy to 2030 gives due recognition to this through two specific strategies, namely Strategy 10 and Strategy 11, described hereunder, which deal directly with addressing climate change from the Tourism Perspective. Strategy 10 gives due recognition to the detrimental effects which unchecked climate change and global warming are bound to have on the country's tourism appeal and to engage in a national and global effort aimed at achieving Climate Friendly Travel by 2050. Strategy 11 introduces a set of measurable climate and sustainability indicators to properly measure tourism impacts on the environment to ensure that future tourism

development embraces sustainable parameters within the widest possible range of measurable variables. Beyond this, further discussions are being held regarding how climate change effects the tourism industry, and possible adaptation and mitigation strategies to counteract these effects.

6. Cross Sectoral Measures:

I. Update policies with climate change considerations.

II. Joint initiatives between Malta Council for Science and Technology (MCST), presently Xjenja Malta and Ministry for the Environment, Energy and Public Cleanliness.. This measure aims to further push research and innovation within climate change.

III. Create an 'online community' where entities can share their knowledge on climate change as well as possible adaptation measures. This measure's activities will be developed by building upon efforts within the #ClimateOn campaign and the Climate Action Awards to bring together thematic and/or sectoral stakeholders.

IV. Carry out vulnerability assessments to identify where the greatest efforts should be made in terms of adaptation. VRA and Coastal SAGE projects aim to evaluate climate risks and address coastal erosion in Malta. The VRA assesses national climate risks to economic sectors (this assessment will be discussed in greater detail below), while Coastal SAGE utilises SAR and deep learning techniques to monitor coastal erosion. The C-COVER project, funded by the Technical Support Instrument Fund (TSI) under the European Commission (EC) aims to develop a sustainable coastal protection management system to mitigate global warming impacts. It includes policy prioritisation, risk assessment, and stakeholder engagement, led by EUCC and supported by international experts. The total cost is €637,500, with VRA funded nationally and C-COVER funded by the EU.

4.2.1.4 Stakeholder Engagement

The strategy's comprehensive approach to both mitigation and adaptation necessitated extensive stakeholder engagement throughout the LCDS process. This consultation was essential for several reasons. Firstly, it integrated expert input to ensure sector-specific feasibility. Secondly, it facilitated the collection of data that might not have been publicly available, thereby allowing for more accurate quantification. Finally, the involvement of diverse stakeholders, including experts and various entities/agencies, ensures that the strategy is developed through a bottom-up approach. This inclusive process aims to secure broad community ownership and facilitate implementation buy-in.

The consultation process is comprised of the following steps:

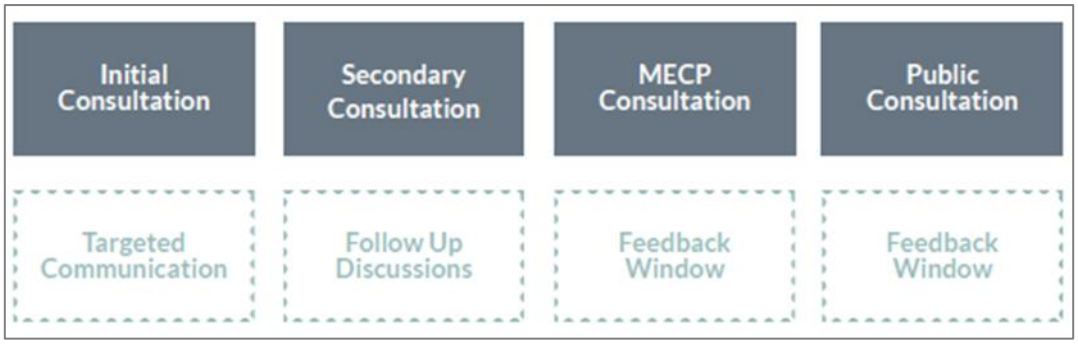


Figure 68: Consultation Process

Note: 'MECP' has now been change to 'MEEC' (Ministry for the Environment, Energy and Public Cleanliness.

At the project's inception, key stakeholders consisting of Ministries, government entities, agencies, and authorities were identified for initial consultations. A detailed list of consulted stakeholders is presented in figure 1 of this report. Meetings to discuss mitigation measures took place between August 2018 and January 2019, with face-to-face consultations and follow-ups continuing until June 2019.

From February to August 2019, a fresh consultation process was held to gather additional insights from other stakeholders. Starting in August 2019, several consultation sessions were conducted, focusing on adaptation measures. This process allowed for the selection of the most viable, feasible, and cost-effective measures, refining the initial long list into a more focused short list. Feedback from these consultations was used to model the measures and draft the LCDS.

During January and February 2020, the Ministry conducted additional consultations with stakeholders, allowing for further feedback and discussions into the draft. By May 2020, the preliminary mitigation and adaptation measures were presented to the Climate Action Board. The finalised shortlist of measures was subsequently presented to various stakeholder groups, including regional committees, local councils, academics, business representatives, and civil society members, to gather their preliminary views before the public consultation process. These included separate meetings with representatives of the regional committees and local councils, a selection of academics, business representatives from the Chamber of Commerce and from the Chamber of SMEs (transport section), as well as various members of civil society.

In June 2021, a public consultation document was disseminated to gather feedback from all interested stakeholders and the general public. Responses were submitted until August 2021, followed by an analysis of the responses and the finalisation of this LCDS.

Transitioning towards a low-carbon, and eventually carbon-neutral economy and society will require effort and behavioural changes from all sectors – government, employers, employees, civil society, and citizens. Achieving these ambitions is only possible through a collective effort.

Beyond the Low Carbon Development Strategy (LCDS), which is Malta's overarching national plan for both mitigation and adaptation, several sectoral strategies and plans also reference adaptive action. Emphasising climate adaptation as a cross-sectoral priority is essential to ensuring climate resilience across all relevant sectors. By integrating adaptation measures into these areas, Malta can take a cohesive approach to minimise climate risks. The Government

of Malta remains committed to advancing this cross-sectoral inclusion to strengthen a climate-resilient nation moving forward, as it evident in the newly formalised Climate Action Act[54].

Malta's commitment to advancing cross-sectoral adaptation is further reinforced by the Sustainable Development Strategy. The principles of sustainable development, as outlined within Malta's Sustainable Development Strategy for 2050[55], are wide and overarching, incorporating all the elements that make up our environment, economy, and society as a whole. Furthermore, the same Strategy is founded on the principle that environmental protection, economic growth, and social cohesion (the key themes upon which Malta's Vision 2050 is based) are interlinked and thus cannot function in isolation. This holistic and systems approach is one that underlies the successful implementation of the 17 SDGs and the Agenda 2030 by recognising the existence of several linkages between the Sustainable Development Goals (SDGs), synergies, and trade-offs. Recognising these principles aids in identifying the influence of climate adaptation actions on other development goals. For example, by reducing risks associated with climate impacts, adaptation actions protect economic assets and infrastructure (SDG 8: Decent work and economic growth).

Furthermore, adaptation measures can improve water quality and heatwave management, contributing to better health, which improves quality of life (SDG 3: Good health and wellbeing). Restoration of natural habitats and ecosystems for mitigation of climate change impacts preserves biodiversity and the multiple ecosystem services they provide, thus addressing SDGs such as 14 (Life below water) and 15 (Life on land). Given that climate change adaptation efforts involve community participation and focus on vulnerable populations, such efforts promote social equity and resilience, thus linking to SDG 10 (Reduced Inequalities). Adaptation focusing on strengthening infrastructure resilience such as energy systems, transport, and water services contribute to SDGs 8, 9 (Industry, Innovation, and Infrastructure) and 11 (Sustainable Cities and Communities). Additionally, adaptation measures such as climate-resilient crops and more efficient irrigation systems contribute to food security thus contributing to SDG 2 (Zero Hunger) and 8 through stable food supplies and maintaining livelihoods.

Moreover, within the context of Malta's Sustainable Development Strategy for 2050, climate adaptation (SDG 13) is embedded within Strategic Goal 1: Transitioning Towards a Climate-Neutral Green and Blue Economy and its Strategic Objectives. Namely, Malta aims to achieve this goal though efforts such as the renovation of buildings and energy performance to move towards zero-emission buildings (SDG 7: Affordable and Clean Energy), decarbonising the energy sector (SDG 7) through onshore solar PV installations and offshore renewable's, expanding car-charging infrastructure (SDG 11), waste management with reduced emissions through prevention of landfilling (SDG 12: Responsible Consumption and Production), climate resilience of economic sectors such as fisheries and agriculture (SDGs 14 and 15), investment in technologies facilitating transition towards climate-neutrality (SDGs 8 and 9), supporting international efforts to combat climate change through transboundary collaboration and financial aid for climate and biodiversity action (SDG 17: Partnership for the Goals), and more official development assistance for those countries affected by environmental disasters due to climate change (SDGs 10 and 17).

[54] https://legislation.mt/eli/cap/643/eng
[55] https://sustainabledevelopment.gov.mt/maltas-sustainable-development-strategy-for-2050/

4.3 PROJECTS AND ADAPTATION INITIATIVES

Cross-sectoral adaptation is essential for addressing the intricate challenges of climate change. Encouraging collaboration across different sectors ensures that adaptation strategies are more efficient, sustainable, and resilient, resulting in better outcomes for both society and the environment. Below are examples of sectoral adaptation projects and initiatives that illustrate this collaborative effort.

4.3.1 INCREASING RESILIENCE OF TERRESTRIAL ECOSYSTEMS

In recent months, the **Environment and Resources Authority (ERA)** has been collaborating with environmental Non-Governmental Organisations (NGOs) to implement actions aimed at increasing resilience of terrestrial ecosystems focused on sand dunes and marshlands, which are both important ecosystems for reducing coastal flooding and erosion resulting from climate change. This included sand dune restoration works at *il-Bajja tal-Mixquqa* with the removal of invasive alien species, planting of native species and securing dunes with cordoning. Marshland habitats were extended in areas of *is-Salini* and *Marsaskala,* while the Life Integrated Project (LIFE 16IPE/MT000008) proceeded with the plans to address the problem of coastal erosion for *il-Ballut ta' Marsaxlokk*. This action will result in an improvement in the status of habitats and species dependent on the wetland ecosystem and increase in the resilience of this coastal wetland. Furthermore, Ambjent Malta (AM), in collaboration with ERA and the Civil Protection Department (CPD), initiated the implementation of the Fire Prevention Strategy for the three main woodland areas of *Buskett, Aħrax tal-Mellieħa* and *Miżieb* with the main aim of mitigating the impacts of fires through sustainable practices in line with climate adaptation principles. The main actions that have been implemented were the zoning of these sites and the installation of signs at the Buskett Woodland Area, which seek to foster public engagement in fire prevention.

In terms of marine ecosystems, Malta is implementing actions targeting conservation of seabed habitats, which processes will be enhancing the resilience of marine ecosystems to climate change impacts. Such actions have been identified as part of the management processes for Marine Protected Areas, the Programme of Measures pursuant to the EU Marine Strategy Framework Directive and the River Basin Management processes pursuant to the EU Water Framework Directive. EU funds are being allocated for such purposes, in particular the management of pressures on Posidonia meadows (LIFE16IPE/MT000008) including the identification of management options for anchoring and mooring, followed by the implementation and monitoring of selected options on a pilot basis. Furthermore, through the project recently awarded under the European Maritime, Aquaculture and Fisheries Fund (EMFAF), active restoration of these seagrass meadows will be undertaken in the coming years. Apart from increasing resilience of seabed habitats to climate change impacts, conservation and restoration of seagrass meadows will also safeguard ecosystem services associated with adaptation to climate change, including protection of the coast from erosional processes. In addition, Malta's third River Basin Management process reinforces the terrestrial management processes by calling for restoration of aquatic ecosystems associated with coastal wetlands, a localised habitat which is highly vulnerable to water scarcity as may be exacerbated by climate change.

4.3.2 MALTA'S COMMON AGRICULTURAL POLICY (CAP) STRATEGIC PLAN

The **Ministry for Agriculture, Fisheries and Animal Rights** has been providing financial support under Malta's Common Agricultural Policy (CAP) Strategic Plan through direct payments and schemes aimed at addressing specific vulnerabilities and adaptation needs related to climate change. These initiatives increase resilience while supporting a viable farm income.

In response to climate warming, which affects insect population dynamics, Eco-Scheme 6 promotes the use of certified disease- and pathogen-resistant plant materials and the cultivation of crops requiring less water. This scheme offers financial support to farmers for the cost of certified propagating materials and helps them develop water-efficient crop plans, enhancing their resilience while sustaining viable farm income.

Additionally, the Agri-Environmental-Climate Commitments (AECC) 1 scheme supports biodiversity conservation and climate adaptation by encouraging the integration and maintenance of native Maltese species, such as the Maltese Black Chicken, Maltese Ox, and native trees like the Carob and Mulberry, which are well-adapted to local climatic conditions. This scheme aligns with Malta's National Biodiversity Strategy, providing assistance to farmers to maintain these species, thereby contributing to both biodiversity conservation and climate change mitigation.

4.3.3 SAFEGUARDING CULTURAL HERITAGE THROUGH CLIMATE RESILIENCE AND INNOVATION

The **Superintendence of Cultural Heritage (SCH)** continuously monitors sites impacted by climate change, namely coastal sites, underwater heritage sites, and sites susceptible to other climatic or anthropogenic threats. Preventive measures are recommended, with first aid and preventive conservation applied in certain cases. Moreover, Heritage Malta (HM) also emphasises the importance of collaboration between institutions and civil society to integrate sustainable technologies into heritage preservation. This might involve using renewable energy sources for lighting and climate control in museums, employing 3D printing for replication of artifacts, or using eco-friendly materials for restoration, which Malta is currently undertaking.

4.3.4 ISLAND FOR ISLANDS INITIATIVE

Malta's **'Island for Islands Initiative'** was launched in November 2021 with the aim of supporting small Island states and in particular, Small Island Developing States (SIDS) in tackling, among others, the unique challenges that climate change presents through the sharing of information, lessons learnt, technical know-how and best practices.

This initiative aims to identify Malta as a leading SIDS and small island state partner within the EU and within other multilateral fora such as the UN, the Commonwealth, AOSIS, OACPS, OECS, the Archipelagic and Islands (AIS) Forum and IRENA, through the IRENA SIDS Lighthouses Initiative. Through the Commonwealth Small States Centre of Excellence based in Malta, Malta has been organising a series of capacity building webinars for SIDS officials in various topics related to climate change.

Within the Commonwealth, Malta is leading the Water Management action group of the Living Lands Charter which helps developing countries including SIDS safeguard global land resources. Malta also consistently holds focused side events on matters of relevance to SIDS at

major international conferences such as UNFCCC COP meetings which serve to share experiences and offer scalable solutions to SIDS facing green transition and climate resilience challenges. Malta is currently undertaking a project with the OACPS and the University of Malta's Islands and Small States Institute focused on climate vulnerabilities and resilience, which is a primary concern for small island states and small island developing states. Through bilateral cooperation projects funded though Malta's ODA, Malta is currently assisting Antigua and Barbuda on small island water management systems.

Malta has been awarding scholarships at Master and PhD levels specifically to nationals of ODA-eligible SIDS since 2021 through a partnership between the Ministry for Foreign and European Affairs and Trade and the University of Malta's Islands and Small State Institute. Between 2021 and 2023, 6 scholarships for studies at Master's level were awarded to nationals from Fiji, Mauritius, Grenada, Niue, St Vincent and the Grenadines and Jamaica, while one national from Belize was awarded a scholarship to pursue studies at PhD level. These scholarships covered research on matters related to climate change. This scholarship partnership was awarded the 2023 UN SIDS Partnership Award in the 'Social' category. The next three-year programming period will provide for 2 PhD scholarships and 9 Master scholarships.

4.3.5 MAINSTREAMING OF CLIMATE ADAPTATION FOR HORIZONTAL COORDINATION

The **Technical Support Instrument: Climate-MATCH project**, commissioned by the Public Works Department (PWD) and the Ministry for Environment, Energy and Public Cleanliness (MEEC) under the TSI2023 flagship project funding, aims to integrate climate policy and adaptation action mapping across various sectors of the Maltese Government. In collaboration with the EUCC (Coastal and Marine Union), the University of Malta is developing a holistic framework to understand and assess heritage assets at risk from coastal-climate related hazards, focusing on their structural behaviour and vulnerability. Coastal heritage is used as a case study to apply the policy framework and management methods developed in the project's initial components, which are led by teams from Aktis Hydraulics and IHCatabria.

The project is divided into three components, each with their own objectives:

1. **Climate-CAPPING:** Coherent Adaptation Policy and Planning with Integrated Knowledge and Governance for Climate Change (horizontal component), aims to establish a comprehensive framework that connects various planning instruments to support a unified adaptation policy. This policy is designed to integrate knowledge and governance for climate change across different levels. The initiative seeks to define the basis for adaptation efforts, evaluate their integration into policy and planning, and examine the use of data in decision-making. It highlights the identification of needs, gaps, and opportunities, and calls for international expertise to improve learning and communication with entities like the EU and UNFCCC. Key recommendations include assessing Malta's current and future adaptation strategies, linking policy instruments with national plans, encouraging cross-sector discussions, transitioning from reporting to actionable decisions, engaging all entities in large-scale actions, establishing a regular forum for exchange, forming Steering Committees to align entities on adaptation actions, centralising entities and coordinating indicators, enhancing collaboration for data sharing, and building capacity and training across sectors. The next steps involve evaluating the institutional framework, governance, knowledge

provision, and legislative processes to develop a holistic policy and planning framework that promotes national harmonisation for climate adaptation.

2. **Coastal-PRISM:** Preparation towards Risk Interdisciplinary Surveillance and Management in Coastal areas, is designed to enhance risk management in coastal areas by improving technical and cooperation capacities through interdisciplinary methods. It introduces a Coastal Risk Conceptual Framework that focuses on hazard, vulnerability, and risk assessments, particularly for coastal erosion, flooding, and their socioeconomic impacts, while also considering additional environmental hazards. A shared understanding of the risk assessment approach among project components and users is identified as crucial for success. The initiative also proposes a Coastal Information Hub Blueprint, which includes methods for data acquisition, integration, and continuous update, along with a roadmap for implementation. The objectives are to centralise and standardise data to promote science-based decision-making. Additionally, a Capacity Building Program is designed to support the framework's uptake by identifying needs, assessing capabilities, and detailing training activities. Governance is addressed through an Information Management Framework, which defines roles and responsibilities for the Coastal Forum MoU. The document also emphasises the need to consider a range of additional hazards and at-risk receptors in the Coastal Information Hub, highlighting the importance of a clear implementation roadmap, resource optimisation, and strong commitment from leading institutions for success.

3. **CHeriSH:** Coastal Heritage and Safeguards against Hazards funded by the EU's Structural Reform Support Programme, takes a specialised approach to analyse the structural vulnerability of coastal heritage assets in Malta. This vertical component focuses on the structural behaviour and vulnerability of various heritage assets at risk from coastal-climate changes and other hazards in a multi-risk environment. The project is divided into five components, with CHeriSH being one of them, and includes tasks such as the inception report, analysis of structural behaviour and vulnerability, and the final results. The CHeriSH component aims to improve policy formulation and technical support at the national level by understanding the asset values exposed to risk from climate impacts. The deliverables include a classification of structural building typologies, definition of vulnerability indicators, data collection and analysis, and a final report with conclusions and recommendations. Additionally, the project emphasises the need for stakeholder engagement and communication throughout the process to ensure a comprehensive and inclusive approach to safeguarding coastal heritage against hazards.

4.4 IMPACTS, RISKS, AND VULNERABILITIES: THE MALTESE VULNERABILITY AND RISK ASSESSMENT REPORT (VRA)

The Low Carbon Development Strategy (LCDS) mandates the creation of a '**Vulnerability Risk Assessmen**t' (VRA). The VRA aimed at creating a tool for policymakers, has been in development for the past three years, reaching its conclusion in 2024. One dimension of the VRA found in Phase I of the project is the impact chain assessment. The objectives of this impact chain assessment are to firstly identify climate impacts on the Maltese Islands, summarise climate change scenarios, describe climate impact chains for sectors, consider indirect sensitivities between sectors, and present ratings on potential climate impacts.

4.4.1 METHODOLOGY OF THE VRA

The methodology of the **VRA Phase I** assessment was conducted at a sectoral level, focusing on Nomenclature of Economic Activities (NACE) Level 2 sectors. Each sector was broken down by asset type to understand how climate change could impact it. Only the most important assets, as determined by expert judgment, were identified for each asset type. The process involved:

1. Assessing each sector's current sensitivity to climate-related hazards: The sensitivity of each sector indicates its potential to be affected by the variability of climate-related hazards, either directly or indirectly because of other sectors. The assessment referred to the list of climate-related hazards from Intergovernmental Panel on Climate Change (IPCC) AR6, where they are termed "climate-impact drivers," using those relevant to Malta for this assessment.
2. Evaluating each sector's current adaptive capacity: Each sector's adaptive capacity was assessed at the sectoral level in relation to the sensitivities identified. Identification of the capacity of a sector to adapt to sensitivities focused on elements like economic resources, institutions, technology, information and skills, infrastructure, and equity.
3. Deducing the vulnerability of each sector: Through the assessment of each sector's sensitivity and adaptive capacity, the vulnerability of each sector was deduced. Vulnerability here is thus the propensity or predisposition to be adversely affected by climate change, encompassing sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
4. Identifying projections of climate-related hazards for all Shared Socio-Economic Pathways (SSPs) and timeframes: Assessing the magnitude and frequency of these hazards, taken from the IPCC AR6 and tailored to the local context. This involved extensive desktop research and reviewing over 200 sources of data.
5. Assessing sectors' exposure to climate-related hazards: Impacts on Maltese sectors may occur if vulnerable assets are exposed to projected climate-related hazards. The potential level of exposure was assessed and rated based on the location and extent of assets exposed.

All these components allowed for an impact assessment to be carried out. Climate impact is thus a product of vulnerability and exposure to a hazard. Vulnerability results from sensitivity and an associated lack of adaptive capacity. This is shown clearly through the below figure.

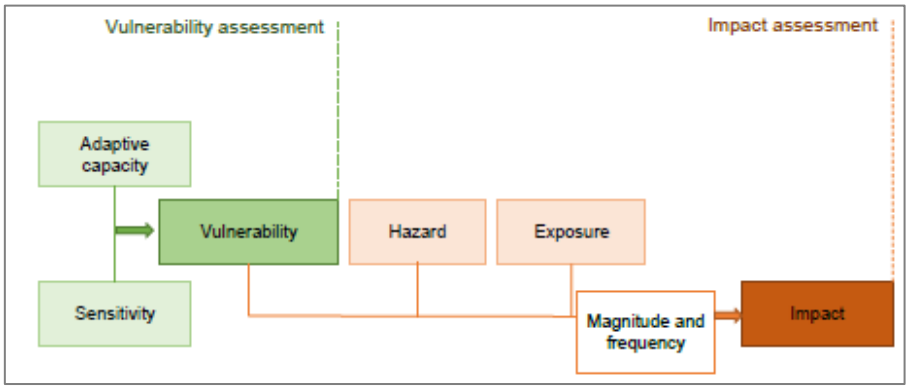


Figure 69: Interactions of Module 1 Components

Adding to this, each sector was assigned a rating from one to five at each step, indicating its sensitivity, adaptive capacity, hazards magnitude and frequency, impact, and exposure. These ratings were used to define:

A. The current level of vulnerability of NACE Level 2 sectors.

B. The exposure of NACE Level 2 sectors to hazards given their magnitude and frequency.

C. The potential level of impact on NACE Level 2 sectors.

It is important to note that the baseline projection ratings correspond to a situation where the Government's current policy trajectory is sustained in an unchanged socio-economic context. Beyond the NACE Level 2 sectors, the IPCC's Shared Socioeconomic Pathways (SSPs) were also used to inform scenario projection ratings of sensitivity, adaptive capacity, and exposure to climate-related hazards for each NACE sector. This is done by considering the consequences of changes in SSP elements for baseline projection ratings. The SSPs used in this assessment include:

SSP 1 Sustainability: The sustainable and "green" pathway describes an increasingly sustainable world. Global commons are being preserved; the limits of nature are being respected. The focus is more on human well-being than on economic growth. Income inequalities between states and within states are being reduced. Consumption is oriented towards minimizing material resource and energy usage.

SSP 2 Middle of the Road: Income trends in different countries are diverging significantly. There is cooperation between countries, but it is moderately expanded in comparison to today. Global population growth is moderate, levelling off in the second half of the century. Environmental systems are facing degradation.

SSP 3 Regional Rivalry: A revival of nationalism and regional conflicts pushes global issues into the background. Policies increasingly focus on questions of national and regional security. Investments in education and technological development are decreasing. Inequality is rising. Some regions suffer drastic environmental damage.

SSP 4 Inequality: The chasm between globally cooperating developed societies and those stalling at a lower developmental stage with low income and a low level of education is widening. Environmental policies are successful in tackling local problems in some regions but not in others.

SSP 5 Fossil-Fuelled Development: Global markets are increasingly integrated, leading to innovations and technological progress. Social and economic development, however, is based on intensified exploitation of fossil fuel resources, particularly coal and an energy-intensive lifestyle worldwide. The world economy is growing and local environmental problems, such as air pollution, are being tackled successfully.

This methodology allowed for visual impact chains to be created, showing the potential chain through which climate impacts may occur in each NACE Level 2 sector, as shown through the figure below.

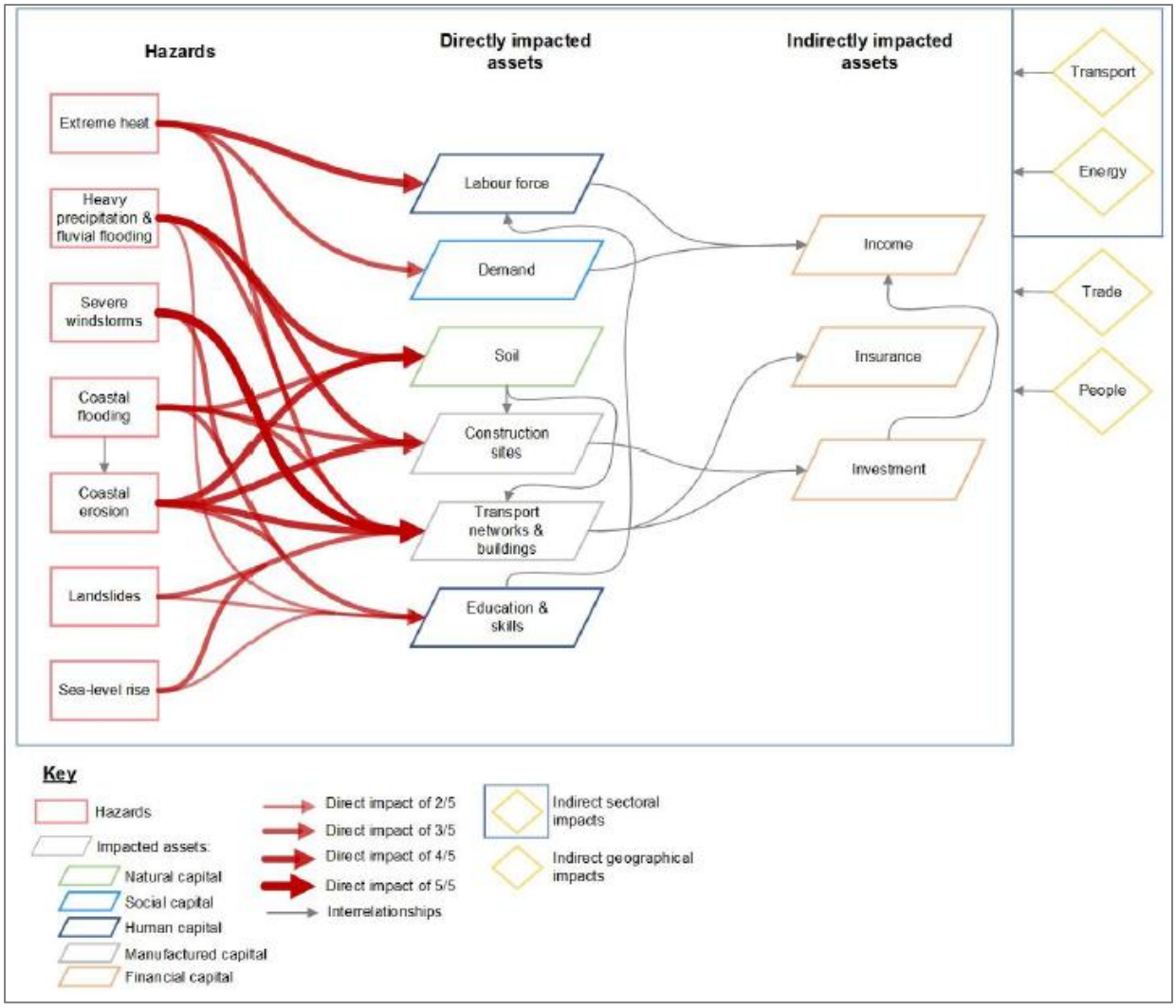


Figure 70: Chain of Impact: Construction of Buildings, Civil Engineering and Specialised Construction Activities

From left to right, each element of the map represents: (i) the climate-related hazards which can impact the sector's assets, (ii) the assets that can be directly impacted by these hazards, and (iii) the assets that can be indirectly impacted by these hazards. The level of potential impact is represented by the thickness of arrows rather than their number. It is determined by a sector's sensitivities, its adaptive capacity to address these sensitivities and exposure to climate-related hazards.

Phases IIa and IIb of the VRA considered the implications of the Phase I results to estimate the potential impact on Malta.

During each phase of the assessment, preferential use was made of Malta-specific quantitative and qualitative data, and national experts (including key government ministries) and key stakeholders were consulted to refine and validate the results. Figure 4 provides an overview of the components of each phase of the assessment.

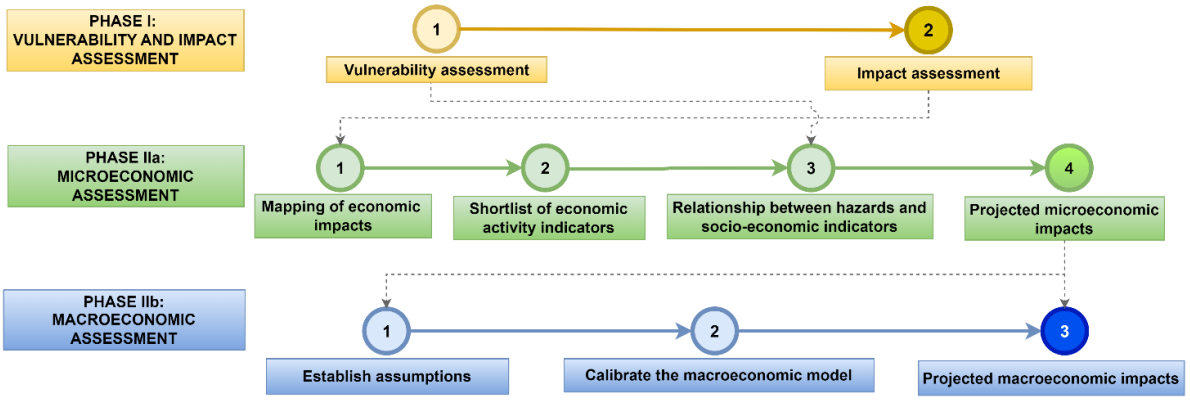


Figure 71: Overview of the Methodology of the VRA

4.5 ADAPTATION BARRIERS

4.5.1 THE LOW CARBON DEVELOPMENT STRATEGY (LCDS)

One of the primary challenges in designing adaptation strategies is the uncertainty and lack of sufficient knowledge regarding the spatial (where) and temporal (when) patterns of climate change (CC) impacts. This uncertainty limits the accurate design of effective adaptation measures. To address this, the Ministry for the Environment, Energy and Public Cleanliness has commissioned a vulnerability and risk assessment. This assessment aims to identify the climate vulnerabilities of the country and its sectors, thereby filling the knowledge gaps in spatial and temporal patterns and understanding their effects on society and economic activities.

Furthermore, Malta faces significant challenges due to the lack of reliable CC forecasts. The available European and South Mediterranean forecasts are too generalised to provide relevant data for Malta's specific needs. Additionally, the local research on CC impacts is insufficient, creating a gap in the data and information necessary for effective policy making.

Moreover, adaptation measures must be designed for a dynamic and ever-changing community. Uncertainties in future socio-economic trends and policy responses make it challenging to develop effective strategies. Therefore, continuous monitoring and updating of the strategies will be necessary to align with the evolving socio-economic conditions of the country.

In addition, the benefits of adaptation measures depend on their implementation and uptake. Uncertainty in policy responses makes it challenging to assess future benefits against costs, which is essential for proposing policies.

Adaptation measures typically involve immediate implementation costs, with benefits that emerge over the long term. Therefore, a long-term approach is necessary, which the government plans to adopt in collaboration with scientists and academics. However, short-term responses are also required to address the immediate impacts of climate change.

Finally, adaptation measures need to be implemented across various sectors due to the widespread impact of climate change on economic activities. However, different sectors may have conflicting priorities regarding which policies to implement and in what order. The government aims to integrate climate change adaptation measures into all policies to maximise synergies.

4.5.2 VULNERABILITY RISK ASSESSMENT

The study highlights that the main climate-related hazards Malta is projected to face are changes in mean precipitation, extreme heat, and mean surface temperature. The sectors most vulnerable to these hazards and with the potential for the greatest impacts include sectors such as Energy, Water supply and waste, Construction, Transport and storage, and Information and communication. Increasing the resilience of these sectors to climate change is a priority, as any impact on them could affect many other sectors. Furthermore, the report identifies that, current policies in Malta are helping to reduce sensitivities, increase adaptive capacities, and reduce exposure to climate-related hazards for several NACE Level 2 sectors. However, the sectors most vulnerable to future climate-related hazards and with the potential for the greatest impacts are identified under the assumption that current policy measures are implemented, Malta's policy goals are achieved, and the socioeconomic outcomes of SSPs are realised. As such, these sectors require further policy development to increase their resilience in the future. ~~These conclusions are put discussed further through the below figures:~~

CHAPTER 5 SUPPORT PROVIDED AND MOBILISED

5.1 INTRODUCTION

This Chapter outlines the financial assistance, technology transfer initiatives, and capacity-building programs enabled by Articles 9, 10, and 11 of the agreement provided by Malta in the years 2021 and 2022.

5.2 NATIONAL CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS

Despite not being classified as an Annex II country under the United Nations Framework Convention on Climate Change (UNFCCC), Malta has been actively contributing to global efforts to combat climate change. This is particularly noteworthy given Malta's small geographical size and limited natural resources.

Malta's contributions are primarily focused on providing financial aid and capacity-building support to developing countries. These efforts are aimed at helping these nations enhance their resilience to climate change impacts and transition towards sustainable development.

The financial support Malta provides is planned and allocated within the country's annual budget. Various Ministries and public entities in Malta are involved in these initiatives, ensuring that the funds are directed towards effective climate action projects.

A key aspect of Malta's approach is its preference for grant-based assistance. This means that the finance provided does not need to be repaid, and is concessional in nature, which can be particularly beneficial for developing countries, who may be facing economic challenges and difficulties in accessing other forms of funding.

Given Malta's limited administrative capacity to manage large-scale international aid programs directly, the country often channels its contributions through established multilateral organizations. One of the primary channels used is the Green Climate Fund (GCF), which is a global platform designed to support the efforts of developing countries in responding to the challenge of climate change.

Noting that small island developing states (SIDS) are often disproportionately affected by climate change, Malta focuses its additional contributions not made through multilateral channels on aiding these vulnerable parties, in line with Malta's "Island for Islands" initiative.

5.2.1 BUDGETING

International climate finance mobilized through public finances is carefully planned and executed in alignment with national budgets. At the beginning of each fiscal year, funds are allocated based on the priorities and needs identified by various Ministries, authorities, and public entities. These allocations also take into account the current realities and challenges on the ground to ensure that the financial resources are used effectively.

The Ministry of Finance plays a crucial role in this process by overseeing the creation of the national budget each year. Within the Ministry, the Budget office is responsible for managing the entire budgeting process. This office ensures that there is timely and efficient coordination with all relevant ministries, departments, and public entities.

To ensure transparency and public engagement, a pre-budget document is released in July each year. This document outlines the proposed budget and invites feedback from various

stakeholders. The final budget, which incorporates this feedback and final adjustments, is announced around October each year.

5.2.2 DESCRIPTION OF SYSTEMS AND PROCESSES USED FOR TRACKING OF SUPPORT PROVIDED AND MOBILISED

Malta's main multilateral contribution goes to the Green Climate Fund. Noting that the contribution is given without specific earmarking, Malta tracks the GCF's operations through the fund's yearly reports to the UNFCCC detailing its activities and progress towards achieving its objectives.

Malta's capacity-building efforts are tracked through the academic success of participating individuals from SIDS in the University of Malta's Islands and Small States Institute. There is currently no formal structured follow up with the recipients to track how these scholarships have impacted the communities/individuals/governments.

5.2.3 COMPARABILITY AND ACCURACY OF INFORMATION

As a European Union Member State, Malta reports annually on financial and technological support provided to developing countries under the Governance Regulation[56], in accordance with the UNFCCC biennial reporting guidelines for Developed Country Parties [tables 7, 7(a) and 7(b)] in line with Decision 9/CP.21 on Methodologies for the reporting of financial information by Parties included in Annex I to the Convention. Reporting through these established standardised channels enhances clarity, transparency, and comparability of the reported information.

5.2.4 EXISTING CHALLENGES AND LIMITATIONS

Despite these systems, Malta faces several challenges in reporting financial support:

- Data fragmentation across sectors of government can lead to inconsistencies in tracking mobilized funds.
- Malta's limited administrative capacity has made targeted interventions and tracking for mobilising private sector funding unfeasible.
- Evolving regulatory landscape requires continuous adaptation and learning from reporters, who also carry additional responsibilities. This can hinder timely reporting and compliance. The need for enhanced capacity building among public institutions to manage these changes is critical.

5.2.5 INFORMATION ON CIRCUMSTANCES AND INSTITUTIONAL ARRANGEMENTS FOR THE PROVISION OF TECHNOLOGY DEVELOPMENT AND TRANSFER AND CAPACITY-BUILDING SUPPORT

Malta's "*Island for Islands*" initiative, launched at the UNFCCC COP26 conference in November 2021, aims to assist SIDS in tackling the unique and severe impacts of climate change by sharing technical know-how, best practices, and lessons learned from Malta's own experiences. Additionally, Malta's capacity-building efforts are evident in its focus on capacity-building for SIDS nationals. Malta has also co-chaired the UN's Steering Committee on Partnerships for SIDS, supporting their implementation of the SAMOA Pathway and Sustainable Development Goals. In response to COVID-19, Malta hosted online webinars and

[56] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action

collaborated with local ministries and international organisations on key topics such as COVID-19 lessons, tourism resilience, blue economy partnerships, and renewable energy.

Malta remains committed to capacity-building in education through scholarships at the Master's and PhD levels for nationals of ODA-eligible SIDS. Since 2021, Malta has offered scholarships at the Master's and PhD levels through the University of Malta's Islands and Small States Institute. This scholarship program, which was awarded the SIDS Partnership Award by the UN in 2023, provides critical opportunities for students from ODA-eligible SIDS to further their education and contribute to the development of their communities and countries. The program was recently expanded with a second three-year agreement, offering a total of 2 PhD and 9 Master's scholarships for the 2024-2027/8 academic years. Additionally, Malta is a key partner of the Diplo Foundation, funding scholarships for applicants from developing countries, including SIDS.

5.3 UNDERLYING ASSUMPTIONS, DEFINITIONS, AND METHODOLOGIES

This section outlines the assumptions, definition and methodologies used by Malta for tracking and reporting on the provision of finance, technology and capacity-building.

Table Y1 provides a description of the assumptions, definitions and methodologies used when reporting on climate finance provided. The same assumptions, definitions and methodologies are used to report on:

- financial support;
- technology development and transfers;
- and capacity-building support

Element	Description
Chosen Reporting Years	2021. 2022
Conversion between domestic currency and United States dollars	The currency exchange rates used throughout the climate finance chapter and its CTF tables are average annual conversion rates and were sourced from the OECD website (https://www.oecd.org/en/data/indicators/exchange-rates.html) 2021: 1 USD to 0.85 EUR. 2022: 1 USD to 0.95 EUR.
Status	Being 100% grant based, Malta uses the terms "Committed" and "Provided" interchangeably as figures are only reported once transferred to the recipient party.
Channel	Malta distinguishes between bilateral and multilateral channels, using the following OECD DAC definitions: Multilateral: Flows for which the governing boards of the multilateral organisations have the unqualified right to allocate funds as they see fit within the limits prescribed by the organisations' mandate.

Element	Description
	Bilateral: Direct bilateral funding, as well as funding via multilateral organisations earmarked for specific uses, are reported as bilateral flows
Funding sources	Malta categorises the funding source of its climate finance as official development assistance (ODA) and direct public funds.
Financial Instruments	Malta's assistance has been 100% grant based.
Identification of the type of support	Malta follows EU definitions: • Mitigation: An activity should be considered as related to climate change mitigation if it contributes to the objective of stabilising GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system; the activity would do so by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration (adapted from the operational definition and criteria for eligibility used in the OECD DAC (Policy Markers). • Adaptation: An activity should be regarded as adaptation-related if it intends to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks by maintaining or increasing adaptive capacity and resilience. This encompasses activities ranging from information and knowledge generation to capacity development, planning and implementing climate change adaptation actions (adapted from the operational definition and criteria for eligibility used in the OECD DAC Policy Markers). Furthermore, Cross-cutting is defined as any general non-core budget grant/finance provided for Climate action that includes both Mitigation and Adaptation elements according to the above definitions.
Sectors and subsectors	Finance provided in the chosen reporting years went to core/general budgets and thus no reporting on sectors and subsectors occurred. In 2023, we started reporting figures on Bilateral funding provided for activities classified via DAC CRS codes "11420", "14015" and "43060".
Identification of capacity building and/or technology	Malta uses the EU definitions to identify initiatives, programmes and projects that contribute to technology development and transfer as well as capacity building:

Element	Description
development objectives	• **Climate-relevant technology development and transfer**: A broad set of processes covering exchanges of know-how and experience, and providing equipment, for mitigating and adapting to climate change among various stakeholders such as governments, private sector entities, financial institutions, non-governmental organisations (NGOs) and research/education institutions. The broad and inclusive term 'transfer' comprises the process of learning to understand, use and replicate the technology, including the capacity to the most suitable technology and adapt it to local conditions and integrate it with indigenous technologies (adapted from the IPCC definition of climate-relevant technology transfer). • **Climate-relevant capacity building**: Capacity building is a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions, particularly in developing countries, to enable them to assess, adapt, manage and develop technologies. Capacity building must be country-driven, addressing the specific needs and conditions of the countries concerned and reflecting their national sustainable development strategies, priorities and initiatives (adapted from the UNFCCC definition of capacity building activities).
Climate-specific	Malta categorises support provided as climate-specific if it goes towards either an established Multilateral Climate-Fund, or in the case of Bilateral Finance for actions which have the primary purpose determined to be Mitigation or Adaptation according to the above definitions.
Avoiding Double-Counting	Being 100% grant based, Malta only reports on financial flows out of its national budgets which are delineated and attributed in its national finances.
Definition of public and private climate finance	Malta only reports public finance provided directly from national funds, thus approaches to determining private finance as mobilised by public interventions and other information relating to support provided and mobilized through public interventions is not applicable.
Determination of new and additional	Financial resources reported in Malta's First Biennial Transparency Report are considered 'new and additional resources,' meaning that they were committed after and not included in Malta's most recent Biennial Report under the UNFCCC (i.e. the new and additional resources were committed in either 2021 or 2022).
Progression from previous levels in the provision and mobilisation of finance under the Paris Agreement.	This is the first time that support under the Paris Agreement is reported. This support constitutes a progression from previous levels of support reported in Biennial Reports under the UNFCCC. Malta has doubled its support from 2021 to 2022.

Element	Description
Approach to reporting multilateral finance	Malta provides most of its Multilateral Finance as a grant towards established funds such as the. Grants to the Green Climate Fund is provided without specific allocation and going towards the funds' general/core budget, thus the Inflow amounts are reported.

5.4 PROVIDING AND MOBILISING FINANCIAL SUPPORT

This section outlines Malta's total public climate finance support provided to developing countries through bilateral and multilateral channels in 2021 and 2022. Climate finance provided through bilateral channels is reported in Section X.4.1, climate finance provided through multilateral channels is reported in section X.4.2. No additional Climate finance is being reported.

From 2013 to 2022, Malta has provided over €1.2 million of climate finance contributions. Malta has repeatedly increased yearly climate finance contributions over these last ten years, with the amount provisioned in 2022 increasing by 667% from the first contributions in 2013, as well as doubling from the contributions in 2021. Aid provided through Multilateral channels was yet again doubled in 2023 and is projected to remain constant in the coming years.

5.4.1 BILATERAL SUPPORT PROVIDED

Despite its limitations in administrative capacity, Malta has a history of providing climate finance through bilateral channels. From 2013 to 2017, Malta has provided over €330,000 of climate finance through bilateral channels. From 2013-2016 support to developing countries was provided in the forms of grants for Mitigation or Adaptation projects in Ethiopia, Uganda, Guatemala, and Eritrea as part of Malta's contribution in the Fast Start Finance pledge. In 2017, funds were utilised to fund scholarships for higher education in climate-related fields, as well as a project to improve access to water in Bouar, Central African Republic through the St. Jeanne Antide Foundation.

While no Bilateral finance contributions are reported in the chosen reporting years, efforts undertaken during this period resulted in over €110,000 in Bilateral contributions in 2023 that went towards scholarships in higher education in climate-related fields, the development of a Climate Multidimensional Vulnerability and Resilience Index ("COVRI") in collaboration with the Organisation for African Caribbean and Pacific States (OACPS), and part-financing of a water-conservation project in Tunisia.

5.4.2 MULTILATERAL SUPPORT PROVIDED

Malta has aimed to maintain a consistent trend of climate finance contributions through established multilateral organizations. From 2013 to 2022, Malta has provided over €890,000 in climate finance through Multilateral channels. One of the primary channels used is the Green Climate Fund (GCF), which is a global platform designed to support the efforts of developing countries in responding to the challenge of climate change.

In 2021. Malta provided €100,000 in climate finance through Multilateral channels in the form of its contribution to the Green Climate Fund (GCF).

In 2022, Malta doubled its allocated contribution for the GCF, provisioning €200,000 in climate finance through Multilateral channels. The allocated contribution for the Green Climate Fund was doubled yet again in 2023 to €400,000 and is projected to remain consistent in the near

future. Moreover, in 2023, additional contributions were made through Multilateral Channels for disaster risk prevention.

Malta's contributions to the GCF are given without earmarking or specific allocation and thus they go towards the fund's general/core budget. As such, Malta considers these climate contributions as going towards climate efforts which are cross-cutting in nature in line with the GCF's operations.

CHAPTER 6 IMPROVEMENTS IN REPORTING

Paragraph 7 of the MPGs specifies that this chapter should address "information on areas of improvement in relation to its reporting pursuant to chapters II, III, IV, V, and VI." These areas can be identified either by the Party itself or by the technical expert review team. The significance of this chapter is expected to grow in the second and subsequent BTRs.

Since this is Malta's first BTR and it has not yet undergone review, no specific areas of improvement have been identified by the technical expert review team for inclusion in this chapter at this stage. However, the country has built on its experience from previous reporting cycles, gaining valuable insights and lessons learned. This experience reflects Malta's strong commitment to continually enhancing its national reporting processes and outputs.

The preparation of a submission is a multifaceted process that extends far beyond the straightforward tasks of data collection, emissions and removals estimation, report drafting, data entry into the Enhanced Transparency Framework (ETF) reporting tool, and final submission. It is supported by additional critical steps, including rigorous quality assurance and control mechanisms, meticulous documentation of all activities carried out during the preparation of the inventory, and the systematic archiving of historical documentation to ensure transparency and traceability.

In accordance with decision 18/CMA.1 (annex, paragraph 150), the national inventory report of anthropogenic emissions by sources and removals by sinks of GHGs submitted by each Party shall undergo a technical expert review consistent with the MPGs. As a Member State of the European Union, Malta undergoes additional reviews at the EU level prior to the final submission to the UNFCCC. These EU-level reviews serve as an important intermediary step, ensuring alignment with EU-wide reporting standards and fostering consistency across EU Member States. This dual-layer review process not only enhances the overall quality and robustness of Malta's submissions but also reinforces its commitment to transparency and adherence to both EU and global climate reporting frameworks.

Other reporting processes, similarly, adopt this approach. They incorporate robust quality assurance and control procedures, detailed documentation of actions and, where applicable, peer reviews. This alignment across various reporting streams highlights Malta's comprehensive commitment to producing transparent, accurate and reliable climate-related submissions.

Data gathering represents another essential component of this comprehensive process, where ongoing efforts are vital to ensure the sourcing of accurate, reliable, and timely information. Data is collected from a wide array of public and private entities. To date, the approach has primarily relied on accessing publicly available official data or fostering informal, direct relationships with organizations and individuals within them. While these methods have been effective to a degree, they lack the formal structure required for long-term sustainability and consistency.

Recognizing this, the relevant authority has identified a need to establish more robust and formalized channels for data gathering. This includes implementing formal written agreements with key data providers to ensure the consistent and timely provision of high-quality data. Such

agreements will not only enhance the reliability of the data but will also facilitate a more structured and efficient process for future inventory cycles.

Through these efforts, Malta demonstrates its dedication to adhering to the principles of the Paris Agreement while striving for continual improvement in transparency and reporting quality. By embracing peer review feedback, enhancing data collection mechanisms, and refining internal processes, Malta is setting a solid foundation for robust and transparent climate action reporting.

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CHAPTER 7 ANNEXES TO THE BTR

Note: Annexes I and II contain common information for the EU and MS BTRSs.

ANNEX 1: COMMON TABULAR FORMATS ON INFORMATION NECESSARY TO TRACK PROGRESS

Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates[a]

	Description
Target(s) and description, including target type(s), as applicable[b, c]	**Economy-wide net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.** **The term 'domestic' means without the use of international credits.** **Target type: Economy-wide absolute emission reduction.**
Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable	**Single year target, 2030.**
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable	**Base year: 1990.** **Net greenhouse gas emissions level in 1990:** **4 700 168 kt CO_2eq.**
Time frame(s) and/or periods for implementation, as applicable	**2021-2030**
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable	**Geographical scope: EU Member States (Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden) including EU outermost regions (Guadeloupe, French Guiana, Martinique, Mayotte, Reunion, Saint Martin (France), Canary Islands (Spain), Azores and Madeira (Portugal)).** **Sectors covered, as contained in Annex I to decision 5/CMA.3:** **Energy** **Industrial processes and product use** **Agriculture** **Land Use, Land Use Change and Forestry (LULUCF)** **Waste** **International Aviation: Emissions from civil aviation activities as set out for 2030 in Annex I to the EU ETS Directive are included only in respect of CO_2 emissions from flights subject to effective carbon pricing through the EU ETS. With respect to the geographical scope of the NDC these comprise emissions in 2024-26 from flights between the EU Member States and departing flights to Norway, Iceland, Switzerland and United Kingdom.** **International Navigation: Waterborne navigation is included in respect of CO2, methane (CH_4) and nitrous Oxide (N_2O) emissions from maritime transport voyages between the EU Member States.** **Gases:** **Carbon Dioxide (CO_2)** **Methane (CH_4)**

	Nitrous Oxide (N_2O) **Hydrofluorocarbons (HFCs)** **Perfluorocarbons (PFCs)** **Sulphur hexafluoride (SF_6)** **Nitrogen trifluoride (NF_3)** **The included LULUCF categories and pools are as defined in decision 5/CMA.3.**
Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable	**The EU's at least 55% net reduction target by 2030 is to be achieved through domestic measures only, without contribution from international credits.** **The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Any updates or clarifications of previously reported information, as applicable[d]	**The information on the NDC scope contains clarifications/further details compared to the information provided in the updated NDC of the EU.**

[a] Each Party shall provide a description of its NDC under Article 4, against which progress will be tracked. The information provided shall include required information, as applicable, including any updates to information previously provided (para. 64 of the MPGs).

[b] For example: economy-wide absolute emission reduction, emission intensity reduction, emission reduction below a projected baseline, mitigation co-benefits of adaptation actions or economic diversification plans, policies and measures, and other (para. 64(a) of the MPGs).

[c] Parties with both unconditional and conditional targets in their NDC may add a row to the table to describe conditional targets.

[d] For example: recalculation of previously reported inventory data, or greater detail on methodologies or use of cooperative approaches (para. 64(g) of the MPGs).

1. STRUCTURED SUMMARY: Description of selected indicators

Indicator(s) selected to track progress[a]	*Description*
EU NDC	**Annual total net GHG emissions consistent with the scope of the NDC in CO_2eq.**
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate[b]	**The reference level is total net GHG emissions of the EU in the base year (1990). The reference level value for the EU is 4 699 405 kt CO_2eq.**
Updates in accordance with any recalculation of the GHG inventory, as appropriate	**This is the first time the reference level is reported, hence there are no updates.** **The value of the reference level may be updated in the future due to methodological improvements to the EU GHG inventory and to the determination of international aviation and navigation emissions in the NDC scope.**
Relation to NDC[c]	**The indicator is defined in the same unit and metric as the target of the NDC. Hence it can be used directly for tracking progress in implementing and achieving the NDC target.**

2.STRUCTURED SUMMARY: Definitions needed to understand NDC

	Definitions[a]
Definition needed to understand each indicator:	
Annual total net GHG emissions	**Total net GHG emissions correspond to the annual total of emissions and removals reported in CO_2 equivalents in the latest EU GHG inventory. The totals comprise all sectors and gases listed in the table entitled 'Reporting format for the description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates'**
Any sector or category defined differently than in the national inventory report:	
{Sector} **Not applicable**	
{Category} **Not applicable**	
Definition needed to understand mitigation co-benefits of adaptation actions and/or economic diversification plans:	
{Mitigation co-benefit(s)} **Not applicable**	
Any other relevant definitions:	
Not applicable	

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs. (3) The Party could add rows for each additional sector, category, mitigation co-benefits of adaptation actions and/or economic diversification plans, indicator and any other relevant definitions.

[a] Each Party shall provide any definitions needed to understand its NDC under Article 4, including those related to each indicator identified in para. 65 of the MPGs, those related to any sectors or categories defined differently than in the national inventory report, or the mitigation co-benefits of adaptation actions and/or economic diversification plans (para. 73 of the MPGs).

3.STRUCTURED SUMMARY: Methodologies and accounting approaches – consistency with Article 4, paragraphs 13 and 14, of the Paris Agreement and with decision 4/CMA.1

Reporting requirement	*Description or reference to the relevant section of the BTR*
For the first NDC under Article 4:[a]	
Accounting approach, including how it is consistent with Article 4, paragraphs 13–14, of the Paris Agreement (para. 71 of the MPGs)	**Net GHG emissions, calculated from emissions and removals from the GHG inventory of the EU and supplemented with data on international aviation and navigation collected in the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES), are used to quantify progress towards implementing and achieving of the NDC in respect of the NDC**

	target. This approach promotes environmental integrity, transparency, accuracy, completeness, comparability and consistency and ensures the avoidance of double counting, as described below. Existing methods and guidance under the Convention are taken into account, as described below.
For the second and subsequent NDC under Article 4, and optionally for the first NDC under Article 4:[b]	
Information on the accounting approach used is consistent with paragraphs 13–17 and annex II of decision 4/CMA.1 (para. 72 of the MPGs)	**The European Union accounts for anthropogenic emissions and removals corresponding to its NDC consistent with paragraphs 13–17 and annex II of decision 4/CMA.1, as detailed below.**
Explain how the accounting for anthropogenic emissions and removals is in accordance with methodologies and common metrics assessed by the IPCC and in accordance with decision 18/CMA.1 (para. 1(a) of annex II to decision 4/CMA.1)	**The accounting for anthropogenic emissions and removals is based on the data contained in the EU GHG inventory, which is compiled in accordance with the 2006 IPCC Guidelines. The accounting for emissions from international aviation and navigation in the scope of the NDC is based on activity data, emission factors and methods which are in line with the IPCC guidelines. The accounting approach is also in accordance with decision 18/CMA.1 because the EU GHG inventory conforms with the provisions of chapter II of the Annex to decision 18/CMA.1.**
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1)	**The GHG data used for accounting is based on the GHG inventory of the EU. The methodology used for accounting consists of a balancing of GHG emissions and removals, which is consistent with the methodologies used in the GHG inventory of the EU.**
Explain how overestimation or underestimation has been avoided for any projected emissions and removals used for accounting (para. 2(c) of annex II to decision 4/CMA.1)	**Not applicable. Projected emissions and removals are not used for accounting.**
For each NDC under Article 4:[b]	
Accounting for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement:	
Each methodology and/or accounting approach used to assess the implementation and achievement of the target(s), as applicable (para. 74(a) of the MPGs)	**The methodology used to assess the implementation and achievement consists of a comparison of the reduction of net GHG emissions from the GHG inventory national total, including a share of GHG inventory international aviation and navigation emissions in line with the NDC scope, with the NDC target.** **The EU will account for its cooperation with other Parties in a manner consistent with guidance adopted by the CMA.**
Each methodology and/or accounting approach used for the construction of any baseline, to the extent possible (para. 74(b) of the MPGs)	**Progress is tracked by comparing annual net emissions with net emissions in the base year. No baseline is constructed.**

If the methodology or accounting approach used for the indicator(s) in table 1 differ from those used to assess the implementation and achievement the target, describe each methodology or accounting approach used to generate the information generated for each indicator in table 4 (para. 74(c) of the MPGs)	**Not applicable. The methodology/accounting approach used for the indicator in table 1 is the same as the methodology/accounting approach used to assess the implementation and achievement the target.**
Any conditions and assumptions relevant to the achievement of the NDC under Article 4, as applicable and available (para. 75(i) of the MPGs)	**Not applicable. The NDC is unconditional.**
Key parameters, assumptions, definitions, data sources and models used, as applicable and available (para. 75(a) of the MPGs)	**Net GHG emissions are the key parameter used for tracking progress in implementing and achieving the NDC. The GHG inventory of the EU is the data source used. Details on assumptions, definitions and models used for determining net GHG emissions can be found in the National Inventory Document of the EU.**
IPCC Guidelines used, as applicable and available (para. 75(b) of the MPGs)	**2006 IPCC Guidelines; and 2019 refinement to the 2006 IPCC Guidelines for some source categories.**
Report the metrics used, as applicable and available (para. 75(c) of the MPGs)	**100-year time-horizon global warming potential (GWP) values from the IPCC Fifth Assessment Report.**
For Parties whose NDC cannot be accounted for using methodologies covered by IPCC guidelines, provide information on their own methodology used, including for NDCs, pursuant to Article 4, paragraph 6, of the Paris Agreement, if applicable (para. 1(b) of annex II to decision 4/CMA.1)	**Not applicable.**
Provide information on methodologies used to track progress arising from the implementation of policies and measures, as appropriate (para. 1(d) of annex II to decision 4/CMA.1)	**Progress arising from the implementation of policies and measures is expressed in a reduction of GHG emissions or increase of GHG removals. The methodology used to assess such progress is based on the estimation of GHG emissions and removals in the GHG inventory of the EU and on data on international aviation and navigation monitored in the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES).**
Where applicable to its NDC, any sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, taking into account any relevant decision under the Convention, as applicable (para. 75(d) of the MPGs)	**Sector-, category- and activity-specific assumptions, methodologies and approaches applicable to the NDC are described in the national inventory document of the EU and are consistent with IPCC guidance.** **Emissions from international aviation and navigation in the scope of the NDC are determined based on activity data from the JRC-IDEES, using emission factors and methodologies consistent with IPCC guidance.**
For Parties that address emissions and subsequent removals from natural disturbances on managed lands, provide detailed information on the approach used and how it is consistent with relevant IPCC guidance, as appropriate, or indicate the relevant section of the national GHG inventory report containing that information (para. 1(e) of annex II to decision 4/CMA.1, para. 75(d)(i) of the MPGs)	**The EU does not disaggregate emissions and removals on managed land into those considered to result from human activities and those considered to result from natural disturbances.**

For Parties that account for emissions and removals from harvested wood products, provide detailed information on which IPCC approach has been used to estimate emissions and removals (para. 1(f) of annex II to decision 4/CMA.1, para. 75(d)(ii) of the MPGs)	**The EU accounts for emissions and removals from harvested wood products as an integral part of net GHG emissions and removals in the scope of the NDC. GHG emissions and removals from harvested wood products are determined in accordance with the production approach, as defined in Annex 12.A.1 to Volume 4 of the 2006 IPCC Guidelines for National GHG Inventories.**
For Parties that address the effects of age-class structure in forests, provide detailed information on the approach used and how this is consistent with relevant IPCC guidance, as appropriate (para. 1(g) of annex II to decision 4/CMA.1, para. 75(d)(iii) of the MPGs)	**The EU does not address the effects of age-class structure in forests in the accounting approach for its NDC.**
How the Party has drawn on existing methods and guidance established under the Convention and its related legal instruments, as appropriate, if applicable (para. 1(c) of annex II to decision 4/CMA.1)	**The EU has drawn on existing methods and guidance established under the Convention by using an NDC target which is an advancement of the quantified economy-wide emission reduction target for 2020, which was communicated and tracked under the Convention.**
Any methodologies used to account for mitigation co-benefits of adaptation actions and/or economic diversification plans (para. 75(e) of the MPGs)	**The NDC does not consist of mitigation co-benefits of adaptation actions and/or economic diversification plans. Hence these co-benefits were not accounted for, and no related methodologies were used.**
Describe how double counting of net GHG emission reductions has been avoided, including in accordance with guidance developed related to Article 6 if relevant (para. 76(d) of the MPGs)	**GHG emissions and removals from the EU's GHG inventory, complemented with JRC-IDEES data for determining the share of emissions form international aviation and navigation in the NDC scope, are used for tracking the net GHG emission reductions. Emissions and removals are reported in line with IPCC guidelines, with the aim of neither over- nor underestimating GHG emissions.** **GHG emissions and removals are reported by the EU and its Member States in their respective GHG inventories. For tracking progress towards implementing and achieving the EU NDC, only those net GHG emission reductions are counted which are reported at EU level.** **For cooperative approaches under Article 6, corresponding adjustments are made in a manner consistent with guidance adopted by the CMA.**
Any other methodologies related to the NDC under Article 4 (para. 75(h) of the MPGs)	**Not applicable.**
Ensuring methodological consistency, including on baselines, between the communication and implementation of NDCs (para. 12(b) of the decision 4/CMA.1):	
Explain how consistency has been maintained in scope and coverage, definitions, data sources, metrics, assumptions and methodological approaches including on baselines, between the communication and implementation of NDCs (para. 2(a) of annex II to decision 4/CMA.1)	**The scope, coverage, definitions, data sources, metrics and approaches are consistent between the communicated NDC and its implementation, as described in the BTR.**

Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1) and explain methodological inconsistencies with the Party's most recent national inventory report, if applicable (para. 76(c) of the MPGs)	**The GHG inventory of the EU is the primary source for the GHG data used for accounting. The share of GHG inventory emissions from international aviation and navigation in the scope of the NDC have been determined separately based on JRC-IDEES data, using emission factors and methodologies consistent with IPCC guidance. There are no methodological inconsistencies with the most recent national inventory report.**
For Parties that apply technical changes to update reference points, reference levels or projections, the changes should reflect either of the following (para. 2(d) of annex II to decision 4/CMA.1):	
Technical changes related to technical corrections to the Party's inventory (para. 2(d)(i) of annex II to decision 4/CMA.1)	**No technical changes related to technical corrections to the GHG inventory were applied to update reference points, reference levels or projections.**
Technical changes related to improvements in accuracy that maintain methodological consistency (para. 2(d)(ii) of annex II to decision 4/CMA.1)	**No technical changes related to improvements in accuracy were applied to update reference points, reference levels or projections.**
Explain how any methodological changes and technical updates made during the implementation of their NDC were transparently reported (para. 2(e) of annex II to decision 4/CMA.1)	**Methodological changes and technical updates are reported in the chapter entitled 'recalculations and improvements' of the National Inventory Document of the EU.** **GHG emissions from international aviation and navigation in the scope of the EU NDC are reported for the first time in this BTR (see Annex 3 to the BTR).**
Striving to include all categories of anthropogenic emissions or removals in the NDC and, once a source, sink or activity is included, continuing to include it (para. 3 of annex II to decision 4/CMA.1):	
Explain how all categories of anthropogenic emissions and removals corresponding to their NDC were accounted for (para. 3(a) of annex II to decision 4/CMA.1)	**The indicator used for tracking progress towards implementing and achieving the NDC target comprises all categories of anthropogenic emissions and removals corresponding to the NDC.**
Explain how Party is striving to include all categories of anthropogenic emissions and removals in its NDC, and, once a source, sink or activity is included, continue to include it (para. 3(b) of annex II to decision 4/CMA.1)	**The scope of the NDC of the EU covers all categories of emissions and removals reported in the GHG inventory, in line with IPCC guidelines. Member States report some specific source categories as 'not estimated' when the estimates would be insignificant as defined in paragraph 32 of the annex to decision 18/CMA.1. Information on these categories is provided in Common Reporting Table 9 of the respective Member States' GHG inventory submission.** **Besides including all sectors listed in decision 18/CMA.1, a share of emissions from international aviation and navigation are also included in the NDC scope.**
Provide an explanation of why any categories of anthropogenic emissions or removals are excluded (para. 4 of annex II to decision 4/CMA.1)	**All categories of anthropogenic emissions and removals contained in the national total of the EU GHG inventory are included in the NDC.**

Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC	
Provide information on any methodologies associated with any cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 (para. 75(f) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Provide information on how each cooperative approach promotes sustainable development, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Provide information on how each cooperative approach ensures environmental integrity consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Provide information on how each cooperative approach ensures transparency, including in governance, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Provide information on how each cooperative approach applies robust accounting to ensure, inter alia, the avoidance of double counting, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	**The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.**

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs.

[a] For the first NDC under Article 4, each Party shall clearly indicate and report its accounting approach, including how it is consistent with Article 4, paras. 13–14, of the Paris Agreement (para. 71 of the MPGs).

[b] For the second and subsequent NDC under Article 4, each Party shall provide information referred to in chapter III.B and C of the MPGs consistent with decision 4/CMA.1. Each Party shall clearly indicate how its reporting is consistent with decision 4/CMA.1 (para. 72 of the MPGs). Each Party may choose to provide information on accounting of its first NDC consistent with decision 4/CMA.1 (para. 71 of the MPGs).

4.Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement[a]

	Unit, as applicable	Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)		Target level[b]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
			2021	**2022**			
Indicator(s) selected to track progress of the NDC or portion of NDC under Article 4 of the Paris Agreement (paras. 65 and 77(a) of the MPGs):							
Annual total GHG emissions and removals consistent with the scope of the NDC	**kt CO_2eq**	4 699 405	302720650	3 205 223	**(55% below base year level)**	**2030**	**The most recent level of the indicator is 31.7 % below the base year level.**
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC (para. 77(b) of the MPGs)	**kt CO_2eq**		3 272 650	3 205 223			
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable (para. 77(c) of the MPGs)	**NA**		**NA**	**NA**			
Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 of the Paris Agreement, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of the NDC, shall provide (para. 77(d) of the MPGs):							

If applicable, an indicative multi-year emissions trajectory, trajectories or budget for its NDC implementation period (para. 7(a)(i), annex to decision 2/CMA.3)	**kt CO_2eq**		**To be reported in subsequent BTR**	**To be reported in subsequent BTR**			
If applicable, multi-year emissions trajectory, trajectories or budget for its NDC implementation period that is consistent with the NDC (para. 7(b), annex to decision 2/CMA.3)	**NA**		**NA**	**NA**			
Annual anthropogenic emissions by sources and removals by sinks covered by its NDC or, where applicable, from the emission or sink categories as identified by the host Party pursuant to paragraph 10 of annex to decision 2/CMA.3 (para. 23(a), annex to decision 2/CMA.3) (as part of para. 77 (d)(i) of the MPGs)	**kt CO_2eq**		**3 272 650**	**3 205 223**			
Annual anthropogenic emissions by sources and removals by sinks covered by its NDC or, where applicable, from the portion of its NDC in accordance with paragraph 10, annex to decision 2/CMA.3 (para. 23(b), annex to decision 2/CMA.3)	**kt CO_2eq**		**3 272 650**	**3 205 223**			
If applicable, annual level of the relevant non-GHG indicator that is being used by the Party to track progress towards the implementation and achievement of its NDC and was selected pursuant to paragraph 65, annex to decision 18/CMA.1 (para. 23(i), annex, decision 2/CMA.3)	**NA**		**NA**	**NA**			
Annual quantity of ITMOs first transferred (para. 23(c), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	**kt CO_2eq**		**To be reported in**	**To be reported in**			

			subsequent BTR	**subsequent BTR**			
Annual quantity of mitigation outcomes authorized for use for other international mitigation purposes and entities authorized to use such mitigation outcomes, as appropriate (para. 23(d), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	**NA**		**NA**	**NA**			
Annual quantity of ITMOs used towards achievement of the NDC (para. 23(e), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	**kt CO_2eq**		**To be reported in subsequent BTR**	**To be reported in subsequent BTR**			
Net annual quantity of ITMOs resulting from paras. 23(c)-(e), annex to decision 2/CMA.3 (para. 23(f), annex to decision 2/CMA.3)	**kt CO_2eq**		**To be reported in subsequent BTR**	**To be reported in subsequent BTR**			
If applicable, the cumulative amount of ITMOs, divided by the number of elapsed years in the NDC implementation period (para. 7(a)(ii), annex to decision 2/CMA.3)	**NA**		**NA**	**NA**			
Total quantitative corresponding adjustments used to calculate the emissions balance referred to in para. 23(k)(i), annex to decision 2/CMA.3, in accordance with the Party's method for applying corresponding adjustments consistent with section III.B, annex to decision 2/CMA.3 (Application of corresponding adjustments) (para. 23(g), annex to decision 2/CMA.3)	**kt CO_2eq**		**To be reported in subsequent BTR**	**To be reported in subsequent BTR**			
The cumulative information in respect of the annual information in para. 23(f), annex to	**kt CO_2eq**		**To be reported in**	**To be reported in**			

decision 2/CMA.3, as applicable (para. 23(h), annex to decision 2/CMA.3)			**subsequent BTR**	**subsequent BTR**			
For metrics in tonnes of CO2 eq. or non-GHG, an annual emissions balance consistent with chapter III.B (Application of corresponding adjustment), annex, decision 2/CMA.3 (para. 23(k)(i), annex to decision 2/CMA.3) (as part of para. 77 (d)(ii) of the MPGs)	**kt CO_2eq**		**To be reported in subsequent BTR**	**To be reported in subsequent BTR**			
For metrics in non-GHG, for each non-GHG metric determined by participating Parties, annual adjustments resulting in an annual adjusted indicator, consistent with para. 9 of chapter III.B (Corresponding adjustments), annex to decision 2/CMA.3, and future guidance to be adopted by the CMA (para. 23(k)(ii), annex to decision 2/CMA.3)	**NA**		**NA**	**NA**			
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA in a subsequent BTR or initial report, when applicable.						

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs. (3) The Party could add rows for each additional selected indicator.

[a] This table could be used for each NDC target in case Party's NDC has multiple targets.

[b] Parties may provide information on conditional targets in a documentation box with references to the relevant page in their biennial transparency report.

ANNEX 2: METHODOLOGY APPLIED FOR THE IDENTIFICATION OF GHG EMISSIONS FROM INTERNATIONAL AVIATION AND NAVIGATION IN THE SCOPE OF THE EU NDC

The scope of the EU NDC goes beyond national GHG emissions and removals in the scope of the national GHG inventory; it also includes specific emissions from international aviation and navigation. This annex describes the methodology for identifying these emissions.

International aviation and maritime emissions are estimated by using the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES).[57] It allows to split the international transport CO_2 emissions reported in the GHG inventory into intra-EU/extra-EU and intra-EEA/extra-EEA categories and the ongoing flights from the EU to UK and Switzerland, backwards in time (i.e. for the time period back to 1990).[58] In this annex, EEA stands for European Economic Area, which comprises the 27 EU Member States, Iceland, Liechtenstein and Norway.

For international transport, JRC-IDEES applies a decomposition methodology that reconciles the scopes of available primary statistics and harmonises historical data on international aviation and maritime emissions, energy use, and transport activity. The resulting annual dataset covers 1990-2021 and distinguishes domestic, intra-EU/intra-EEA, and extra-EU/extra-EEA activity for each EU Member State, Norway and Iceland. In aviation, JRC-IDEES distinguishes passenger and freight modes, with three geographical categories of flight origin/destinations for each mode: domestic, intra-EEA + UK, and extra-EEA + UK. Intra-EU, the UK, and EEA categories are also used internally during calibration but aggregated for reporting. For each mode/category combination, JRC-IDEES estimates activity (as passenger-km or tonnes-km), energy use and CO_2 emissions, aircraft stock (expressed as representative aircraft), load factors, and aircraft efficiencies. As country-specific activity statistics are not available, the decomposition first allocates EU-level activity data from the Transport Pocketbook[59] of the European Commission's Directorate-General for Mobility and Transport to each country and flight category.

For passenger modes, this allocation calculates average load factors using Eurostat data on total passengers and flights. These load factors and total flight numbers are combined with average flight distances from EUROCONTROL, the pan-European organisation dedicated to air traffic management, to yield an initial estimate for passenger transport activity. For intra-EU activity, a uniform scaling factor is then applied across Member States to match total EU-level Transport Pocketbook data. Freight activity follows a similar process, using a 'representative flight' concept with a common load factor across all Member States to account for mixed passenger-freight flights.oNext, the decomposition estimates fuel use from EUROCONTROL data, by deriving a distance-dependent average aircraft efficiency, then applying it to the country-specific ensemble of flights and routes. The final step scales the estimates to meet Eurostat energy balances for total domestic and international consumption back to 1990 values, maintaining intra-EEA/extra-EEA fuel use ratios derived from EUROCONTROL. JRC-IDEES additionally reports resulting differences with submissions by Parties to the UNFCCC. The above

[57] European Commission, Joint Research Centre, Rózsai, M., Jaxa-Rozen, M., Salvucci, R., Sikora, P., Tattini, J. and Neuwahl, F., JRC-IDEES-2021: the Integrated Database of the European Energy System – Data update and technical documentation, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/614599.

[58] The JRC-IDEES analytical database is designed to support energy modelling and policy analysis, by combining primary statistics with technical assumptions to compile detailed energy-economy-emissions historical data for each key energy sector. For aviation, EEA emissions includes emissions related to the UK but not to Switzerland, where total CO_2 emissions for the scope are additionally estimated from EUROCONTROL data.

[59] Statistical pocketbook 2023, https://transport.ec.europa.eu/facts-funding/studies-data/eu-transport-figures-statistical-pocketbook/statistical-pocketbook-2023_en.

process is followed throughout the entire decomposition period (1990-2021). Data gaps are estimated from the existing indicators as follows:hThe process iterates backwards towards 1990, starting from the oldest years in which data is available in each Member State.oAverage flight distance is kept constant for early years without EUROCONTROL data (generally before 2004).

Next, the decomposition estimates fuel use from EUROCONTROL data, by deriving a distance-dependent average aircraft efficiency, then applying it to the country-specific ensemble of flights and routes. The final step scales the estimates to meet Eurostat energy balances for total domestic and international consumption back to 1990 values, maintaining intra-EEA/extra-EEA fuel use ratios derived from EUROCONTROL. JRC-IDEES additionally reports resulting differences with submissions by Parties to the UNFCCC. ThIf the load factor (passengers per flight) cannot be calculated due to a lack of passenger and/or flight data, it is estimated from the trend of the existing time series.

- Missing numbers of flights are calculated from the load factor and the passengers carried.
- If no passenger data is available, the total mileage is estimated from the energy consumption, and combined with average flight distance to estimate the number of flights. The number of flights is then combined with the load factor to estimate the total passengers carried.
- For early years without data, constant values are assumed for the factors used to *i)* scale intra-EU activity to the Transport Pocketbook, *ii)* adjust the estimated fuel use to EUROCONTROL data for specific routes, and *iii)* scale this adjusted fuel use to Eurostat energy balances (e.g. before 1995 for Transport Pocketbook data; before 2004 for EUROCONTROL data).

For international maritime transport, JRC-IDEES estimates data both for intra-EU/extra-EU and intra-EEA/extra-EEA geographical categories. The emission estimates in the GHG inventory already include CO_2, CH_4, and N_2O gases. Transport activity (tonnes-km) is estimated from Eurostat data on gross weight of transported goods, using port-level and country-level data for intra-EU and extra-EU categories, respectively. Intra-EU activities are then scaled to match the Transport Pocketbook totals, accounting for domestic coastal shipping (calibrated separately in JRC-IDEES). Next, transport activity is combined with data reported under the monitoring, reporting and verification system for maritime transport under the EU ETS ('THETIS MRV'[60]), namely EU-level mileage data and country-specific vessel sizes to estimate load factors (tonnes per movement). The load factors and resulting annual mileage (km) are calibrated to meet EU-level THETIS MRV mileage. The annual mileage is in turn combined with THETIS MRV average efficiency to yield a total technical energy consumption, with corresponding emissions derived from default emissions factors. This energy consumption is scaled to Eurostat energy balances so as to minimise discrepancy to total intra-EU THETIS MRV emissions. As with aviation, JRC-IDEES reports corresponding differences to submissions under the UNFCCC. Early years with data gaps are estimated from existing indicators as follows:

- The process iterates backwards towards 1990, starting from the oldest years in which data is available in each Member State.
- Average distance of voyages is kept constant for early years without Eurostat activity data (generally before 1997-2000).

60 THETIS MRV, https://mrv.emsa.europa.eu/#public/eumrv.

- If the load factor (tonnes per movement) cannot be estimated due a lack of activity data, it is kept constant.
- If activity data is not available, it is estimated from Eurostat energy consumption.
- Missing mileage data is derived from the activity and load factor estimates.
- For early years without data, constant values are assumed for the factors used to i) scale intra-EU activity to the Transport Pocketbook, ii) scale estimated mileage to meet EU-level THETIS MRV mileage, and iii) scale domestic and intra-EU CO_2 emissions estimated from energy consumption so as to match total THETIS MRV CO_2 emissions.
- Finally, the ratios between the estimated MRV emissions and the CO_2 emissions for the reported transport activity (for intra-EU/EEA and extra-EU/EEA categories) between 2018 and 2021 are used to calculate the MRV compliant estimates back to 1990 levels.

For the year 2022, the international navigation and aviation emissions under the EU NDC scope have been estimated by applying the same share of those emissions on the total international navigation and aviation emissions (as reported in the GHG inventory) as in 2021).

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