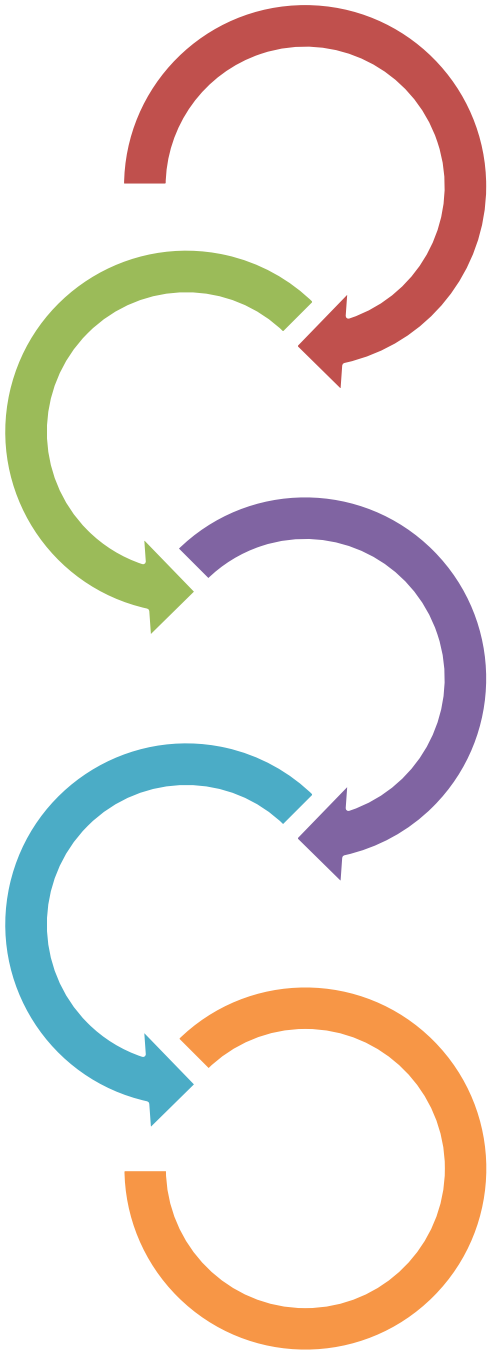
Cyprus' Fourth Biennial Report to the UNFCCC



Republic of Cyprus
Ministry of Agriculture, Rural Development and Environment
Department of Environment

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Title of report	**Cyprus' Fourth Biennial Report to the UNFCCC**
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Contents

1. Introduction

This report constitutes the Fourth Biennial Report of Cyprus, as required under Article 18(1) of Regulation (EU) No 525/2013 and Decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC). Cyprus' Fourth Biennial Report includes information on greenhouse gas emissions and trends, on the progress made in achieving its quantified economy wide emission reduction target under the UNFCCC, and on policies and measures in place to meet mitigation targets and promote climate change adaptation.

The greenhouse gas emissions of Cyprus have an increasing trend since 1990 with an average rate of 3%, following the improvement of the economy. The greenhouse gas emissions' inventory system has not changed since the last biennial submission.

2. Greenhouse gas emissions and trends

This Section summarises information on Cyprus' historical greenhouse gas (GHG) emissions since 1990. The GHG emission data presented in this Biennial Report is consistent with the GHG emissions reported by the EU to the UNFCCC Secretariat in 2019[1], and correspond to the totals in the CRF tables under the UNFCCC.

Geographical coverage

Cyprus submits an inventory for the areas of the Republic of Cyprus that are under the effective control of the Republic of Cyprus. There have been no changes in geographical coverage compared to Cyprus' Fourth Biennial Report (4BR). The time series considered is 1990 to 2017.

Sectoral scope

The sectoral scope of the emissions in this Report is aligned with the reporting requirements under the Convention[2], unless stated. Indirect emissions of CO2 are included in all the emission data quoted in this Report. International aviation emissions are not included in the totals, unless otherwise indicated.

2.1. Summary information on GHG emission trends

The emission data presented here is based on Cyprus' national greenhouse gas inventory covering the period 1990 to 2017, submitted to the UNFCCC on 25 October 2019[3]. The inventory is in line with the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention (Decision 24/CP.19) and with Regulation (EU) No 525/2013.

2.1.1. Trends in total GHG emissions

Cyprus' emissions during the period 1990-2017 increased by 58% excluding land use, land-use change and forestry (LULUCF) (Figure 1). Emissions per capita increased by 7% for the same period, from 9.6 t/capita, to 10.2 t/capita, while it is important to note that there was peak in 2007 of 12.7 t/capita (Figure 1).

[1] https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019
[2] UNFCCC, 2013 http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2
[3] https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019

The significant drop noticed after 2008 is mainly due to the economic crisis and increase of production of energy from renewable sources. This decrease however is counterbalanced by the CO2 emissions from road transport and hydrofluorocarbons (HFC) emissions from consumption of halocarbons which increased considerably between 1990 and 2017.

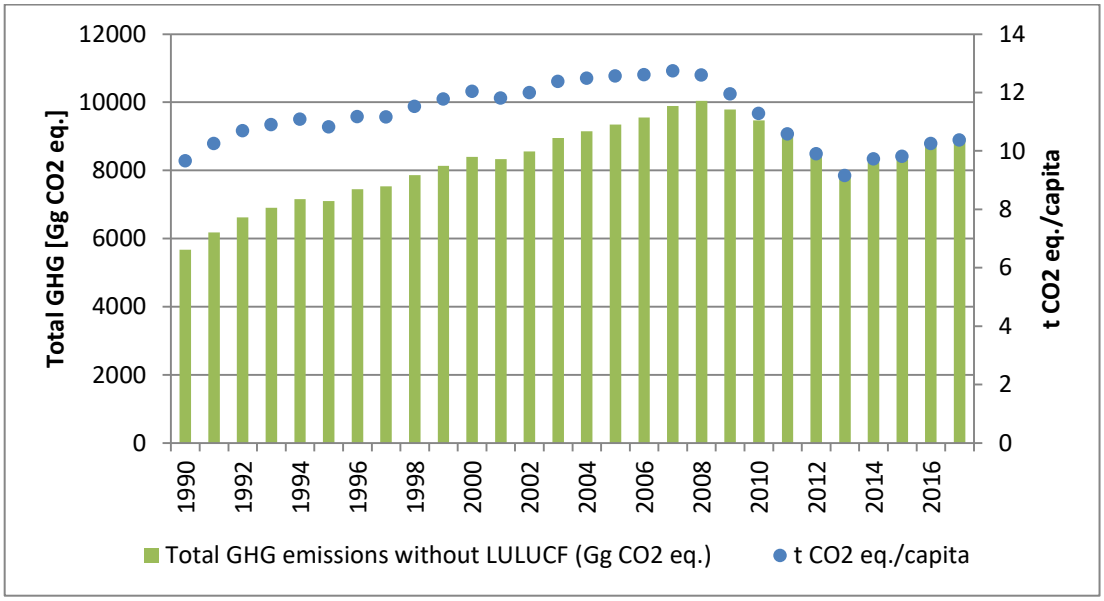
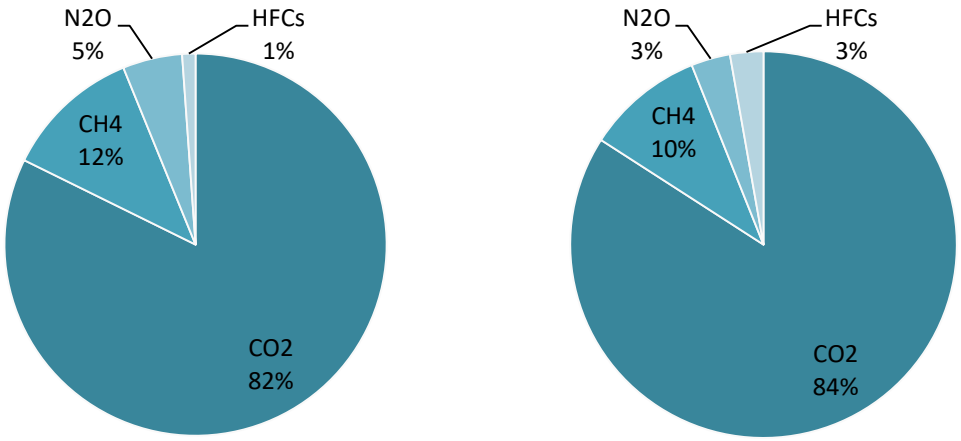


Figure 1.Trend of total GHG emissions without LULUCF and emissions per capita

2.1.2. Trends in emissions by gas

Table 1 gives an overview of the main trends in GHG emissions and removals for 1990 to 2017 in Cyprus. The most important GHG by far is CO2, accounting for 84.1% of total emissions in 2017, excluding LULUCF (see Figure 2). In 2017, CO2 emissions without LULUCF were 8,429.2 thousand tonnes, which was 58.1% above 1990 levels.



1990: 5669 Gg CO2 eq. **2017**: 8963 Gg CO2 eq.

Figure 2. Percentage of total 1990 and 2017 emissions by gas (as CO2 equivalent), excluding LULUCF

Table 1. Trends in emissions by gas 1990-2017

Gg CO2 eq.	1990	1995	2000	2005	2010	2015	2016	2017	1990-2017 (%)
CO_2 without LULUCF	4665.61	5889.45	7140.26	8021.49	8082.33	6956.59	7362.10	7538.49	61.61
CO_2 with LULUCF	4413.35	5611.89	7199.52	7644.20	7592.29	6383.92	7421.65	7003.97	58.70
CH_4 without LULUCF	654.58	744.37	787.63	815.04	826.97	833.03	863.76	881.96	34.74
CH_4 with LULUCF	654.63	744.78	794.83	815.25	828.10	833.18	875.77	882.35	34.78
N_2O without LULUCF	285.75	373.29	345.44	313.36	318.08	280.48	287.82	293.05	2.56
N_2O with LULUCF	285.77	373.44	347.96	313.43	318.47	280.53	292.03	293.19	2.60
HFCs	63.88	91.92	120.21	194.12	245.65	250.45	245.28	249.56	290.65
PFCs	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	0.00
SF_6	0.03	0.06	0.08	0.12	0.15	0.16	0.17	0.17	541.56
NF_3	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total (without LULUCF)	5668.85	7099.09	8393.62	9344.12	9473.17	8320.73	8759.13	8963.24	58.11
Total (with LULUCF)	5417.66	6822.09	8462.60	8967.11	8984.65	7748.25	8834.89	8429.23	55.59

2.1.3. Trends in GHG emissions from main source and sink categories

Table 2 gives an overview of GHG emissions in the main source categories for 1990 to 2017. The most important sector by far is energy (which includes emissions from combustion and fugitive sources), accounting for 73.8% of total emissions in 2017, excluding LULUCF. During the same year, in the energy sector, 50% of the emissions come from the Energy industries and 32% come from transport. Industrial activities and other product use (IPPU), agriculture and waste contribute 14.2%, 5.5% and 6.5% respectively.

Table 2. Trends in GHG emissions from main source and sink categories

Gg CO2 eq.	1990	1995	2000	2005	2010	2015	2016	2017	1990-2017 (%)
1. Energy	3969.76	5132.14	6376.29	7136.00	7495.37	6080.77	6480.13	6619.35	66.74
2. IPPU	841.14	956.68	997.87	1178.66	933.62	1221.35	1225.40	1269.52	50.93
3. Agriculture	471.23	580.14	552.35	532.98	531.62	457.27	481.54	494.73	4.99
4. LULUCF	-251.19	-277.01	68.99	-377.01	-488.52	-572.48	75.76	-534.01	112.59
5. Waste	386.73	430.14	467.10	496.47	512.56	561.33	572.06	579.64	49.88
6. Other	0	0	0	0	0	0	0	0	0
Total (without LULUCF)	5668.85	7099.09	8393.62	9344.12	9473.17	8320.73	8759.13	8963.24	58.11
Total (with LULUCF)	5417.66	6822.09	8462.60	8967.11	8984.65	7748.25	8834.89	8429.23	55.59

2.2. Summary information on national inventory arrangements

Details on the national inventory arrangements are available in section 1.2 (page 28) of the National GHG Inventory Report 2019[4].

2.2.1. Institutional, legal and procedural arrangements

The Department of Environment of the Ministry of Agriculture, Rural Development and Environment (DoE), is the governmental body responsible for the development and implementation of environmental and climate policy in Cyprus, as well as for the provision of information concerning the state of the environment in Cyprus in compliance with relevant requirements defined in international conventions, protocols and agreements. Moreover, the DoE is responsible for the co-ordination of all involved ministries, as well as any relevant public or private organisation, in relation to the implementation of the provisions of the Kyoto Protocol, according to the Law 29(III)/2009 with which Cyprus ratified the Kyoto Protocol.

In this context, the DoE has the overall responsibility for the national GHG inventory, and the official consideration and approval of the inventory prior to its submission (Contact person: Dr. Nicoletta Kythreotou[5]). Figure 3 provides an overview of the organisational structure of the National Inventory System. The entities participating in the National Inventory System are: (a) the DoE designated as the national entity responsible for the national inventory, which keeps the overall responsibility, and an active role in the inventory planning, preparation and management, including technical and scientific responsibility for the compilation of the annual inventory[6]; (b) governmental ministries and agencies through their appointed focal persons, ensure the data provision. International or national associations, along with individual public or private industrial companies contribute to data providing and development of methodological issues as appropriate.

The legal framework defining the roles-responsibilities and the co-operation between the DoE Inventory team and the designated contact points of the competent Ministries was formalized by Council of Ministers' Decision adopted 15/11/2017 entitled "Structure and operation of the National Greenhouse Gases Inventory System - Roles and Responsibilities". The above-mentioned Decision includes a description of each entity's responsibilities, concerning the inventory preparation, data providing or other relative information. This formal framework has improved the collaboration between the entities involved, assuring

[4] Available at https://unfccc.int/sites/default/files/resource/cyp-2019-nir-15%20May19.zip

[5] Dr. Nicoletta Kythreotou , Environment Officer A', Department of Environment, Ministry of Agriculture, Rural Development and Environment, Offices' address: 20-22 28th Oktovriou Ave., Engomi, 2414, Nicosia, Cyprus, Postal address: Department of Environment, 1498 Nicosia, Cyprus, Tel. +357 22 408 947, Fax. +357 22 774 945, www.moa.gov.cy/environment

[6] For 2017, there is a contract with an external expert for scientific and technical support to the inventory team of the DoE and the QA of the GHG inventory. As of 2018, according to the Council of Ministers' Decision of 15/11/2017, the technical and scientific responsibility for the compilation of the annual inventory for all sectors will be assigned, on a contract basis, to an independent consultant by DoE.

the timely collection and quality of the activity data required and solving data access restriction problems raised due to confidentiality issues.

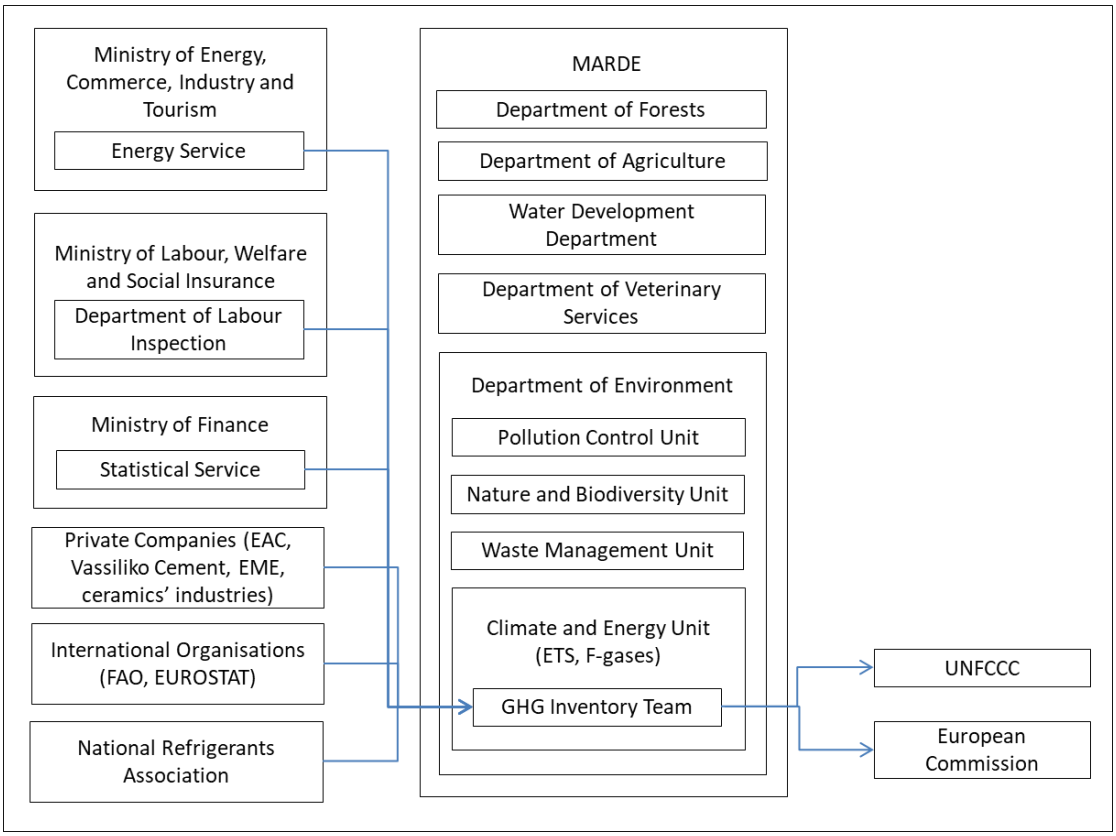


Figure 3. Overview of the organisational structure of the National Inventory System

2.2.2. Overview of inventory planning, preparation and management

The preparation of Cyprus' GHG emissions inventory is primarily based on the application of the 2006 IPCC Guidelines.

The preparation of the Cyprus' GHG emissions inventory is the responsibility of the Climate Action Unit of the Department of Environment of the Ministry of Agriculture, Rural Development and Environment.

The preparation of the Cyprus' GHG emissions inventory is based on the application of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The compilation of the inventory is completed in three main stages (Figure 4).

- Stage 1: The first stage consists of data collection and checks for all source / sink categories. The main data sources used are the National Statistical Service, the national energy balance, the government ministries / agencies involved, along with the verified reports from installations under the EU ETS. Quality control of activity data include the comparison of the same or similar data from alternative data sources (e.g. National Statistical Service, EU ETS reports and energy balance) as well as time-series assessment in order to identify changes that cannot be explained. In cases where problems and / or inconsistencies are identified, the agency's representative, responsible for data providing, is called to explain the inconsistency and / or help solving the problem.

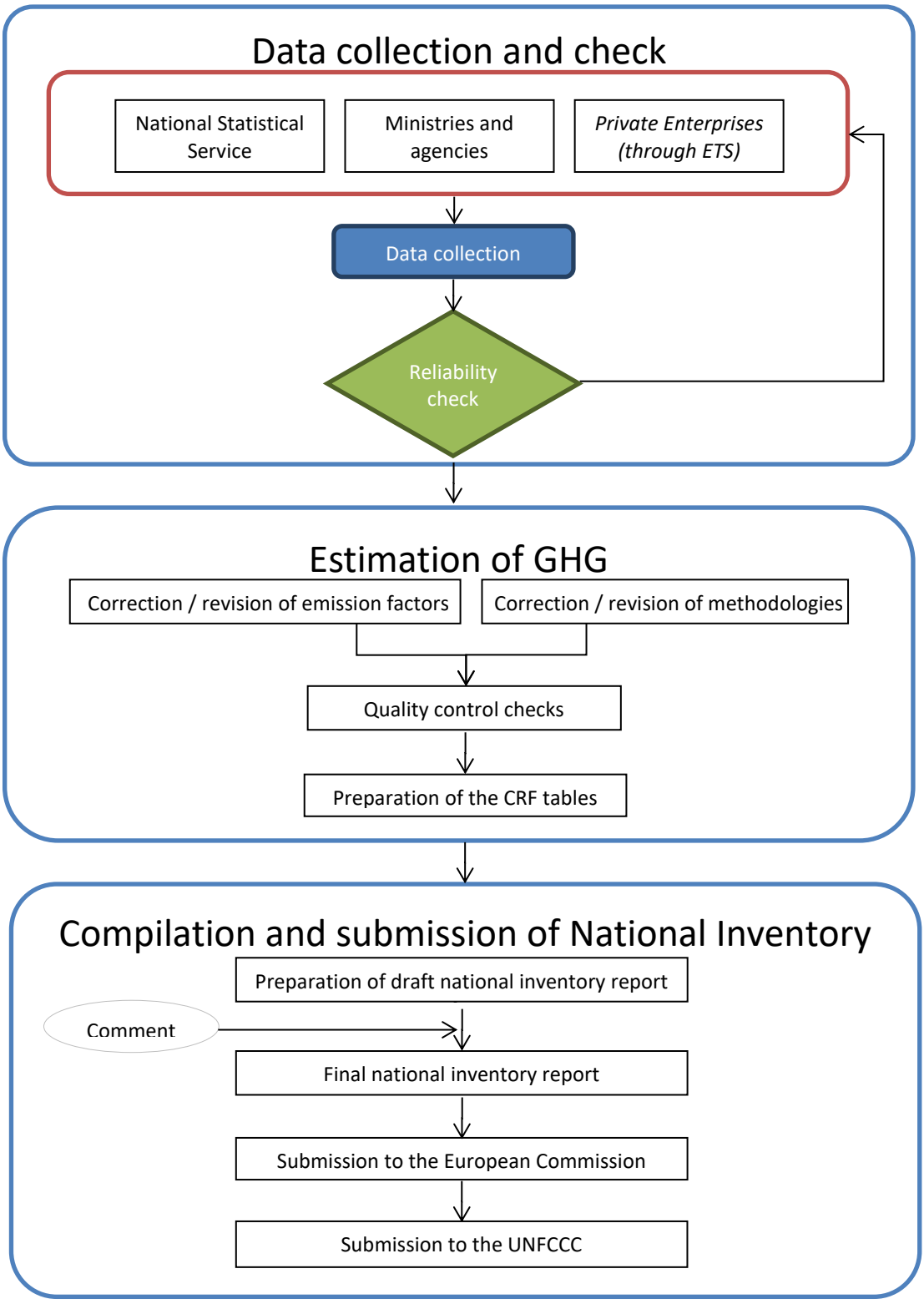


Figure 4. GHG emissions inventory preparation process in Cyprus

- Stage 2: Once the reliability of input data is checked and certified, emissions / removals per source / sink category are estimated. Emissions estimates are then transformed to the format required by the CRF Reporter. This stage also includes the evaluation of the emission factors used and the assessment of the consistency of the methodologies applied in relation to the provisions of the IPCC Guidelines, the IPCC Good Practice Guidance and the LULUCF Good Practice Guidance. Quality control checks, when at this stage, are related to time-series assessment as well as to the identification and correction of any errors / gaps while estimating emissions / removals and entering the data in the CRF Reporter.
- Stage 3: The last stage involves the compilation of the NIR and its internal check. During this period, the Inventory Team has to revise the report according to the observations and recommendations of the QA. On the basis of this interaction process, the final version of the report is compiled. The Director of the Department of Environment approves the inventory and then the contact points submit the NIR to the European Commission for compliance with Regulation (EU) No 525/2013 and thereafter to the UNFCCC secretariat.

As shown in the timetable (Figure 5), the government ministries and agencies and the individual private or public industrial companies referred previously should have collected and delivered to the Inventory Team[7] the respective activity data needed for the inventory (for year X-2) and any changes in activity data for the period 1990 to year X-2, within the time period of May to November of year X-1 (X is the submission year of CRF tables and NIR referred to X-2 GHG emissions inventory).

The information that is related to the annual GHG emissions inventory (activity data, emission factors, analytic results, compilation in the required analysis level of the CRF tables) is stored in MS Excel spreadsheets. Moreover, the final results (NIR and CRF tables) are available in the DoE website[8].

2.2.3. Quality assurance, quality control and verification plan

A QA/QC plan is an internal document to organise and implement all activities across all of the emissions inventory activities including:

- stakeholder engagement (stakeholders = e.g. suppliers of data, reviewers, recipients, other inventory compiling institutes (e.g. NFR))
- data collection
- data management
- inventory compilation
- consolidating the inventory estimates (e.g. into a single national database)
- reporting.

The QA/QC plan is a fundamental element of an inventory management system. The plan needs to clearly identify all important activities used by the inventory compiler and ensure that the minimum data quality objectives required under any relevant reporting obligations

[7] and the technical consultants (in the future)

[8] http://www.moa.gov.cy/moa/environment/environmentnew.nsf/All/21395032E3B9BB6CC2257FF0003813DD?OpenDocum ent

are met.

The development and the implementation of an inventory QA/QC plan represents a key tool for meeting the objectives of National Systems under Article 5 Paragraph 1 of the Protocol as described in Decision 20/CP.7.

Quality management is essential in order to comply with the requirements of (a) producing transparent, consistent, comparable, complete and accurate emissions estimates, (b) establishing a reliable central archiving system concerning all necessary information for GHG emissions inventories development and (c) compiling national reports according to the provisions of the CMP adopted decisions.

In this framework, a QA/QC system was first prepared in 2012, and is revised after 2016 and 2017 ERT recommendations.

2.2.4. Changes in the national inventory arrangements since previous annual GHG inventory submission

In 2018 for the preparation of the 2019 GHG inventory submission, the estimation of the emissions from the sectors of 2F has been outsourced to a local expert. This is the only change compared to the National Communication 7 submitted in 2018.

3. Quantified economy-wide emission reduction target

This section explains the EU 2020 emission reduction target under the UNFCCC and the target compliance architecture set up within the EU in order to meet that target. It also gives an overview of other EU emission reduction targets that are helping achieving the quantified economy-wide emission reduction target under the UNFCCC.

3.1. The EU target under the Convention

Cyprus, as a Member State of EU, is under the joint quantified economy-wide emission reduction target of EU and its Member States. This section explains this target and the target compliance architecture set up within the EU in order to meet that target.

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system'[9], or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization (FCCC/CP/2010/7/Add.1).

The definition of the EU target for 2020 under the Convention is documented in the revised note provided by the UNFCCC Secretariat on the 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention' (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011)[10]. The EU provided additional information relating to its quantified economy-wide emission reduction target in a submission as part of the process of clarifying the developed-country Parties' targets in 2012 (FCCC/AWGLCA/2012 /MISC.1)[11].

The EU's accounting rules for the target under the UNFCCC are more ambitious than the rules under the Kyoto Protocol, for example, including outgoing flights and adding an annual compliance cycle for emissions under the Effort Sharing Decision (ESD; see Section 4.2.2) or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions

[9] First steps to a safer future: Introducing the United Nations Framework Convention on Climate Change: https://unfccc.int/process-and-meetings/the-convention/whatis-the-united-nations-framework-convention-on-climate-change

[10] http://unfccc.int/resource/docs/2011/sb/eng/inf01r01.pdf

[11] http://unfccc.int/resource/docs/2012/awglca15/eng/misc01.pdf

Trading System (EU ETS) (FCCC/TP/2013/7). Accordingly, the following assumptions and conditions apply to the EU's -20% commitment under the UNFCCC:

- The EU Convention pledge does not include emissions/removals from land use, land use change and forestry; however, this sector is estimated to be a net sink over the relevant period. EU GHG inventories include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the Kyoto Protocol[12].
- The target covers the following gases: CO2, CH4, N2O, HFCs, PFCs and SF6;
- The target refers to 1990 as a single base year for all covered gases and all Member States. Emissions from outgoing flights are included in the target;
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target (see Section 3.2.2): in the EU ETS, the use of international credits was allowed up to specific levels set in the EU ETS Directive, amounting to over 1500 million CER and ERU entitlements in the period up to 2020. Quality standards also apply to the use of international credits in the EU ETS, including not allowing the use of credits from LULUCF projects and certain industrial gas projects. International credits will no longer be used for EU ETS compliance in the system's fourth trading period (2021-2030). In the ESD sectors, the annual use of international credits is currently limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1% from projects in least developed countries (LDCs) or small island developing states (SIDS), subject to conditions. From 2021 onwards, as with the EU ETS, international credits will no longer be used for compliance under the ESD.
- The global warming potentials (GWPs) used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. For the implementation until 2020, GWPs from the IPCC AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

The following assumptions and conditions apply to the EU's 20 % target under the UNFCCC (QEERT):

- The EU Convention pledge does not include emissions/removals from Land Use, Land Use Change and Forestry, but it is estimated to be a net sink over the relevant period. EU inventories also include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the Kyoto Protocol.
- The target covers the gases CO2, CH4, N2O, HFCs, PFCs and SF6.
- The target refers to 1990 as a single base year for all covered gases and all Member States.
- Emissions from international aviation to the extent it is included in the EU ETS are included in the target.

[12] The LULUCF Decision (Decision 529/2013) requires preparing and maintaining annual LULUCF accounts according to the rules set out in the Kyoto Protocol;
however, these accounts do not contribute to the achievement of the EU Convention pledge.

- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target: in the ETS, the use of international credits is capped (up to 50 % of the reduction required from EU ETS sectors by 2020). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the ESD sectors, the annual use of international credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions.
- The Global Warming Potentials (GWPs) used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. In accordance with the CMP Decision to revise the GWPs to those from the IPCC Fourth Assessment Report (AR4) revised GWPs from AR4 were adopted for the EU ETS. The revised GWPs were taken into account for the revision of the ESD target. For the implementation until 2020, GWPs from AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

The QEERT target is also described in CTF Tables 2(a-f).

3.2. The EU target compliance architecture

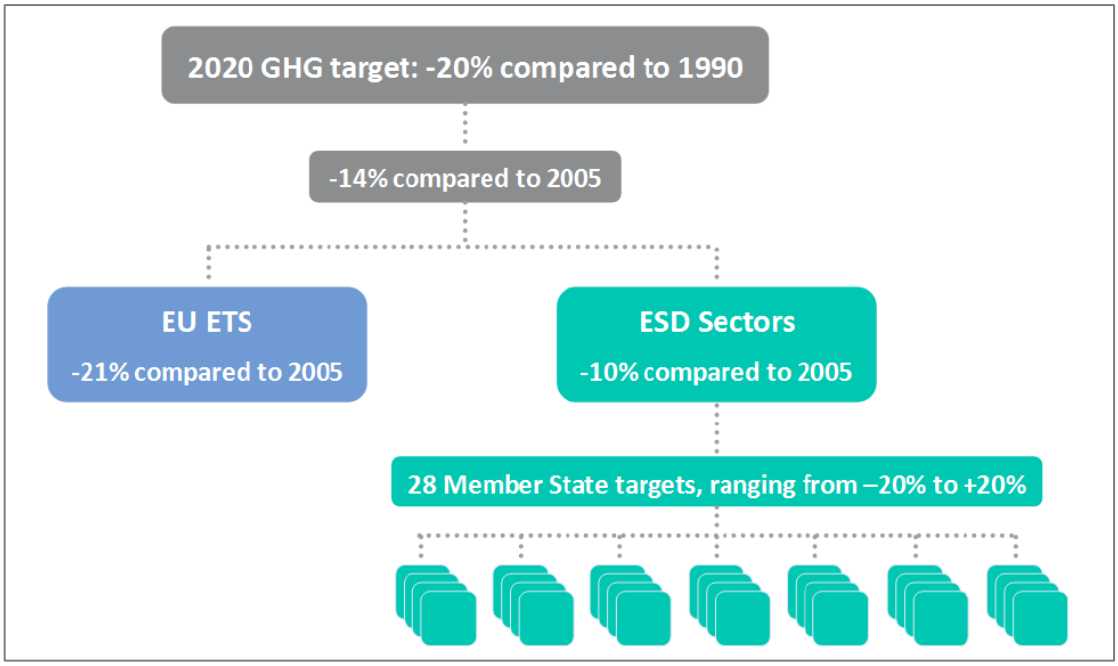
3.2.1. The 2020 Climate and Energy Package

In 2009 the EU established internal rules under its "2020 climate and energy package"[13] – these underpin the EU implementation of the target under the Convention. The package introduced a clear approach to achieving the 20 % reduction of total GHG emissions from 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels. This 14 % reduction objective is divided between the ETS and ESD sectors. These two sub-targets are:

- a 21 % reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation);
- a 10 % reduction target compared to 2005 for ESD sectors, shared between the 28 Member States (MS) through individual national GHG targets.

The distribution of the total target across the ETS and ESD is shown in Figure 5.

[13] http://ec.europa.eu/clima/policies/package/index_en.htm



Source: European Commission

Figure 5. EU GHG targets under the 2020 climate and energy package

Under the EU ETS Directive as revised for the system's current trading period from 2013 to 2020 (Directive 2009/29/EC), a single ETS cap covers EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), and there are no further by 1.74 % annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012).

The three non-EU countries participating in the EU ETS are also subject to a similarly defined cap and the same annual decrease in allowance allocation. For further additional information on recent changes in the EU ETS, see Section 4.2.1.

The vast majority of emissions within the EU, which fall outside the scope of the EU ETS, are addressed under the Effort Sharing Decision (ESD) (Decision 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for de minimis aviation emissions, international maritime emissions, and emissions and removals from land use, land use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: transport (cars, lorries), buildings (in particular heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, agriculture and waste. Such sources accounted for 58% of total GHG emissions in the EU in 2017[14].

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each Member State (see Figure 6). Under the Effort Sharing Decision, national emission targets for 2020 are set, expressed as

[14] European Environment Agency (2019); Trends and projections in Europe 2019. Tracking progress towards Europe's climate and energy targets; https://www.eea.europa.eu/publications/trends-and-projections-in-europe-1/at_download/file

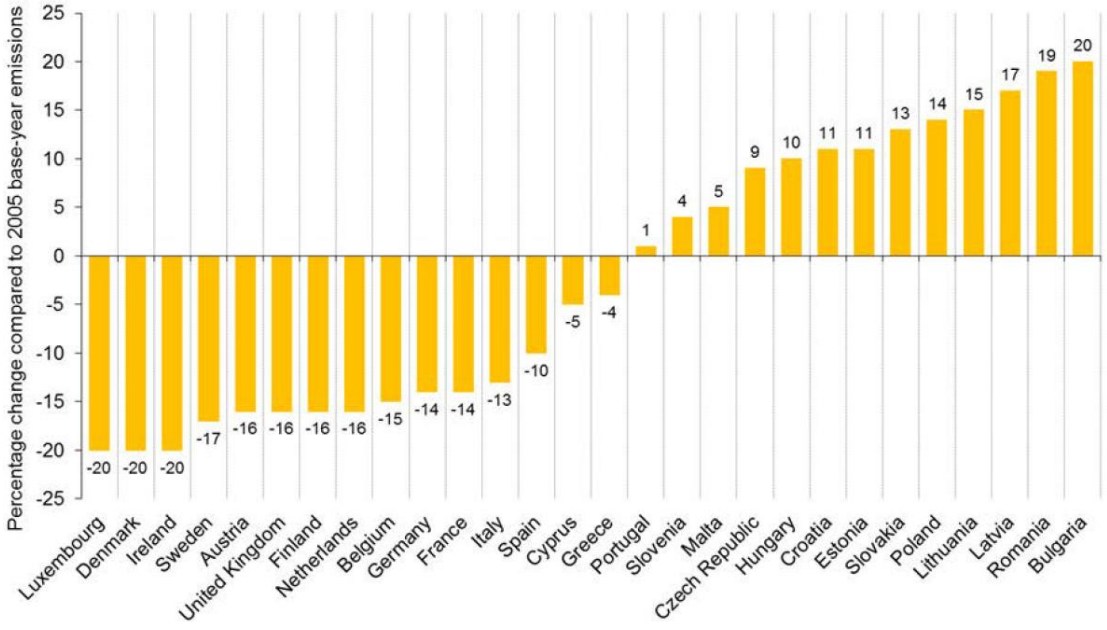
percentage changes from 2005 levels. These changes have been transferred into binding quantified annual emission limits for the period from 2013 to 2020 (Commission Decisions 2013/162/EU and 2013/634/EU), denominated in annual emission allocations (AEAs). At country level, 2020 targets under the ESD range from -20% to +20%, compared to 2005 levels. ESD targets for 2020 for each EU Member State are shown in Figure 6.

The target levels have been set on the basis of Member States' relative Gross Domestic Product (GDP) per capita. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, transfers of AEAs between Member States and use of international credits (credits from Joint Implementation and Clean Development Mechanism).

ESD targets are designed in a strict manner: Every year, once MS emissions are reviewed according to strict criteria (described in Chapter III of the Commission Implementing Regulation 749/2014), the European Commission issues an implementing decision on MS ESD emissions in the given year. MS exceeding their annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face inter alia a penalty – a deduction from their emission allocation of the following year (excess emissions, multiplied by 1.08).

For more details about the Effort Sharing Decision, see Section 4.2.2.

The 2020 ESD target of Cyprus is to reduce emissions by 5% compared to 2005 levels. The binding quantified annual reduction targets for the period from 2013 to 2020, or the Annual Emission Allocations (AEAs) of Cyprus are presented in Table 3.



Source: Decision No 406/2009/EC, Annex 2

Figure 6. National 2020 GHG emission limits under the ESD, relative to 2005 emissions levels

Table 3. Annual Emission Allocations (AEAs) of Cyprus for the year 2013 to 2020 calculated applying global warming potential values from the fourth IPCC assessment report[15]

Year	AEAs (t CO2 eq.)
2013	5 919 071
2014	5 922 555
2015	5 926 039
2016	5 929 524
2017	4 196 633
2018	4 122 837
2019	4 049 042
2020	3 975 247

3.2.2. Accounting for Market-based Mechanisms under the 2020 QEERT target

In general, in the EU the use of flexible mechanisms can take place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets.

The amended EU ETS Directive 2009/29/EC (Article 11a(8)) sets the upper limit for credit use for the period from 2008 to 2020 at a maximum of 50% of the reduction effort below 2005 levels. This is further specified into installation-level limits in the Commission Regulation on international credit entitlements (RICE) (EU No 1123/2013)[16]. Since some entitlements are expressed as a percentage of verified emissions over the entire period, the exact overall maximum amount will only be known at the end of the third trading period (2013-2020).

Since 2013, it is no longer possible to track the use of flexible mechanisms in the EU ETS directly via information on EUTL public website because CERs and ERUs are no longer surrendered directly but are exchanged into EUAs. These exchanges will become public on an installation level after three years[17]; however aggregated data at EU-level are available at the BR CTF Table 4 of EU.

As mentioned above, the ESD allows Member States to make use of international credits for meeting their annual targets, but with certain limitations. In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005. Member States that do not use their 3 % limit for the use of international credits in any specific year can transfer the unused part of their limit to another Member State or bank it for their own use until 2020. Cyprus is among the EU Member States that fulfil additional criteria and may use credits from projects in least developed countries (LDCs) and small island developing states (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are neither bankable nor transferable.

[15] According to COMMISSION DECISION (EU) 2017/1471 of 10 August 2017 amending Decision 2013/162/EU to revise Member States' annual emission allocations for the period from 2017 to 2020

[16] The amount of entitlements per installation / aircraft operator can be found at https://ec.europa.eu/clima/ets/ice.do;EUROPA_JSESSIONID=XEfRdZUbkbuF_jMZaZsGFIz0AvkaqZ42N7l7kSansqwTX-IpOW2Z!-869459281

[17] Annex XIV of European Commission. Commission Regulation (EU) No 389/2013. 2013. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R0389

So far, Cyprus has not used and does not plan of using any international credits for complying with their obligations under the ESD.

3.2.3. Other EU emission reduction targets

In addition to the EU target under the Convention, the EU also committed to a legally binding quantified emission limitation reduction commitment for the second commitment period of the Kyoto Protocol (2013 - 2020).

A further target has been pledged to the Convention through the EU's Nationally Determined Contribution submitted under the Paris Agreement, and has been adopted by the EU under the 2030 Climate and Energy Framework[18]. The emission reduction target is a pledge to reduce emissions by at least 40% (compared to 1990 levels) by 2030, enabling the EU to move towards a low-carbon economy and implement its commitment under the Paris Agreement. In order to achieve this target:

- The EU emissions trading system (ETS) sectors will have to cut emissions by 43% (compared to 2005) by 2030. This has been agreed under the revised EU ETS Directive (2018/410)[19];
- Effort sharing sectors will need to cut emissions by 30% (compared to 2005) by 2030 – this has been translated into individual binding targets for Member States, as agreed under the Effort Sharing Regulation (2018/842)[20]. While the Effort Sharing Regulation does not cover the LULUCF sector as such, it does allow Member States to use up to 280 million credits from the land-use sector over the entire period 2021-2030 to comply with their national targets;
- Emissions and removals from the LULUCF sector are included for the first time in the EU climate target through the so-called LULUCF Regulation (2018/841)[21]. Each Member State will have to ensure that the LULUCF sector does not create debits, once specific accounting rules are applied. This is known as the "no debit" rule.

[18] Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions. A policy framework for climate and energy in the period from 2020 to 2030. /*COM/2014/015 final*/. 2014. https://eur-lex.europa.eu/legalcontent/
EN/TXT/?uri=CELEX:52014DC0015

[19] DIRECTIVE (EU) 2018/410 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814 https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32018L0410&from=EN

[20] REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0842&from=EN

[21] REGULATION (EU) 2018/841 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0841&from=EN

The revised Renewable Energy Directive (2018/2001)[22] and the amended Energy Efficiency Directive (2018/2002)[23] set separate EU level targets on renewable energy and energy efficiency in 2018. For renewable energy, a binding target of at least 32 % of final energy consumption by 2030 was set. Concerning energy efficiency, it is a headline target of at least 32.5 %. Both the renewable energy target and the energy efficiency target include a review clause by 2023 for an upward revision.

Beyond these periods and targets, on 28 November 2018, the European Commission presented and adopted its strategic vision for 2050. Under the Long Term Strategic Vision on GHG Emissions Reduction, the European Commission showed long-term pathways and called for a climate-neutral Europe by 2050. It is expected that the long-term strategy is adopted and submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as required under the Paris Agreement.

In Table 4, all GHG relevant targets for the EU and their key facts are displayed in an overview. On the left, the table includes the international commitments under the Kyoto Protocol, the UNFCCC and the Paris Agreement. On the right, the EU commitments under the 2020 Climate and Energy Package and the 2030 Climate and Energy Framework are listed.

[22] DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN

[23] DIRECTIVE (EU) 2018/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 amending Directive 2012/27/EU on energy efficiency, https://eur-lex.europa.eu/legal-content /EN/TXT/HTML/?uri=CELEX:32018L2002&from=EN

Table 4. Overview of EU targets

	International commitments				EU domestic legislation				
	Kyoto Protocol		UNFCCC	Paris Agreement	Climate and Energy Package		Climate and Energy Framework		
					EU ETS	ESD	EU ETS	ESR	LULUCF
Target year of period	First commitment period (2008-2012)	Second commitment period (2013-2020)	2020	2030	2013-2020		2021 – 2030		
Emission reduction target	-8 %	-20 %	-20 %	At least -40%	-21 % compared to 2005 for ETS emissions	Annual targets by MS. In 2020 -10 % compared to 2005 for non-ETS emissions	-43% for EU ETS sectors	-30% for ESR sectors (translated into individual binding targets for MSs)	No-debit target based on accounting rules
Further targets	-	-	Conditional target of -30 % if other Parties take on adequate commitments	-	Renewable Energy Directive: 20 % share of renewable energy of gross final energy consumption; Energy Efficiency Directive : Increase energy efficiency by 20 %		A binding renewable energy target for the EU for 2030 of at least 32% of final energy consumption, including a review clause by 2023 for an upward revision of the EU level target. A headline target of at least 32.5% for energy efficiency to be achieved collectively by the EU in 2030, with an upward revision clause by 2023.		
Base year	1990 KP Flexibility rules (Art 3(5)) regarding F-Gases and Economies in Transition	1990, but subject to flexibility rules. 1995 or 2000 may be used as the base year for NF_3	1990	1990	1990 for overall emission reduction target; 2005 for renewable energy and energy efficiency target; as well as for targets broken down into ETS and non-ETS emissions		2005		Subject to accounting rules
Aviation	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation excluded	Aviation in the scope of the EU ETS included. In practice total outgoing flight emissions considered	Aviation in the scope of the EU ETS included. In practice total outgoing flight emissions considered	Outgoing flights included	Excluded	Outgoing flights included	Excluded	Not applicable
Use of international credits	Use of KP flexible mechanisms subject to KP rules	Use of KP flexible mechanisms subject to KP rules	Subject to quantitative and qualitative limits	No contribution from international credits	Subject to quantitative and qualitative limits, see section 3.2.2.1	Subject to quantitative and qualitative limits, see section 3.2.2.1	No contribution from international credits		
Carry-over of units from preceding periods	Not applicable	Subject to KP rules including those agreed in the Doha Amendment	Not applicable	Not applicable	EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period	No carry-over from previous period			
Gases covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	CO_2, N_2O, CF_4 and C_2F_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, N_2O, CF_4 and C_2F_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, CH_4, N_2O (emissions of HFCs, PFCs, SF_6 do not occur in the sector)
Sectors included	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP1	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP2	Energy, IPPU, agriculture, waste, aviation in the scope of the EU ETS	Energy, IPPU, Agriculture, Waste, LULUCF	Power & heat generation, energy-intensive industry sectors, aviation (Annex 1 of ETS directive)	Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste	As under Climate and Energy Package	As under Climate and Energy Package[16]	Land-use, land-use change and forestry
GWPs used	IPCC SAR	IPCC AR4	IPCC AR4	IPCC AR4	IPCC AR4				

[24] The ESR allows the use of land-use credits under certain conditions and up to a total limit over the period 2021-2030 as a flexibility option

4. Progress in achievement of quantified economy-wide emission reduction targets and relevant information

4.1. Introduction

Policies and measures for the Member States of the European Union (EU) are developed at both the Union and national levels. At the EU level, they stem from legislative proposals from the European Commission, which are subsequently approved or amended by the European Parliament and the Council of the EU. These EU laws are applicable to all Member States, but some of them, referred to as Directives, only set objectives and minimum standards that may then be implemented in different ways by Member States. National policies translate the relevant pieces of legislation into practice. Additionally, EU Member States can adopt national climate policies and measures on top of those required under EU legislation.

4.2. EU policies and measures

This section focuses on the key cross-cutting policies and measures implemented to achieve the EU level targets, namely the EU Emissions Trading System (EU ETS) and Effort Sharing legislation (ESD, ESR). It then describes some key cross-cutting initiatives, such as EU funding instruments. Details on the EU ETS and ESD are provide in the EU 4BR.

4.2.1. The EU Emissions Trading System (EU ETS)

The EU ETS is based on the 'cap and trade' principle, and has been operational since 2005. It limits emissions from nearly 11,000 energy intensive installations (power stations and industrial plants) and over 500 aircraft operators operating between European Economic Area (EEA) countries, and it covers around 40% of the EU greenhouse gas emissions. In Cyprus the ETS contributes approximately 50% to the total national emissions.

Putting a price on greenhouse gas emissions is important to harness market forces and achieve cost-effective emission reductions. In parallel to providing a carbon price, which incentivises emissions reductions, the EU ETS, in its third trading period, is supporting the reduction of greenhouse gas emissions by providing €2.1 billion for the deployment of innovative renewables and carbon capture and storage, via the sale of 300 million emission allowances from the New Entrants' Reserve (the so-called NER 300 programme).

The 3BR described the legislative proposal for the revision of the EU ETS for phase four in line with the 2030 Climate and Energy Framework. Since the 3BR, the revised EU ETS Directive establishing the framework of the EU ETS for the period 2021-2030 (Directive (EU) 2018/410) entered into force on 8 April 2018[25]. The preparation of implementing legislation based on the revised EU ETS Directive is ongoing, with the aim of having all necessary implementing provisions adopted by January 2021.

In Cyprus, the trading system for the period 2008-2012 comprises of 13 installations (3 power plants, 2 cement plants and 8 ceramics plants). The installations have currently reduced to 9 (3 power plants, 1 cement plant and 5 ceramics plants).

Between 2013 and 2018, emissions in the sectors covered by the EU ETS have decreased by 11.8%. In Cyprus, during the same period emissions in the ETS increased by 13%. To increase the pace of emissions cuts in phase four, the overall number of emission allowances will decline at an annual rate of 2.2% from 2021 onwards, compared to 1.74% during the period 2013-2020. This increase implies a steady reduction of some million allowances annually, compared to 38 million currently, and is consistent with a 43% reduction in GHG emissions from ETS covered sectors by 2030, compared to 2005 levels.

The Market Stability Reserve (MSR), a mechanism set in place for reducing the imbalance on the carbon market, has been substantially reinforced by the revision. Between 2019 and 2023, the rate at which allowances will be placed in the MSR will be doubled to 24% in order to restore the balance of emission allowances in the carbon market more swiftly. Moreover, from 2023 onwards, the number of emission allowances held in the MSR will be limited to the auction volume of the previous year.

The MSR became operational in January 2019. In preparation for this, the Commission has published as from mid-May 2017 the surplus of allowances for the preceding year. In May 2019, the surplus was published for the third time, corresponding to 1.65 billion allowances. On the basis of the 2018 surplus and the revised legislation, the auction volumes from September to December 2019, and from January to August 2020, will be reduced by close to 397 million allowances, corresponding to 24% of the surplus.

Member States may voluntarily cancel allowances from the total auction volume available to them in case of closure of electricity generation capacity resulting from additional national measures. If power plants are closed without the Member State concerned opting to cancel allowances, the MSR rules will capture the effect, by increasing the reserve feeds or by later releases of allowances from the reserve.

The existing free allocation framework has been broadly maintained for phase four to ensure predictability and transparency for European industry, addressing the competitiveness concerns in a more focused and targeted way than before. Free allocation will continue to be based on benchmark values derived with reference to the performance of the 10% most

[25] DIRECTIVE (EU) 2018/410 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814

efficient installations in the EU, updated to reflect the technological progress since the previous exercise, and including procedures to take account for changes in production levels.

Several low-carbon funding mechanisms will help industrial sectors and the power sector meet the innovation and investment challenges of the transition to a low-carbon economy in phase four. In particular, an Innovation Fund will support the demonstration of innovative renewable energy and low-carbon innovation in industry, as well as carbon capture, utilisation and storage, with resources corresponding to the market value of at least 450 million allowances at the time of auctioning, as well as any unspent funds from the NER300 programme. A Modernisation Fund will provide at least 310 million allowances to support modernisation of energy systems and just transition in ten lower income EU Member States.

4.2.1.1. Aviation under the EU ETS

The aviation sector has been part of the EU ETS since 2012. The original legislation covers all flights in and out of the European Economic Area (EEA). However, for 2012-2016, in order to support the development of a global measure by the International Civil Aviation Organisation (ICAO) for reducing aviation CO2 emissions, the EU provided a derogation limiting obligations solely to flights within the EEA and to flights within the EEA outermost regions.

In light of the adoption of a Resolution by the 2016 ICAO Assembly on the global measure "Carbon Offsetting and Reduction Scheme for International Aviation" (CORSIA), pending the ICAO's adoption of the relevant CORSIA instruments and subsequent decisions by the EU on the possible implementation of CORSIA in the EU, and to provide continued momentum to the international process, the EU decided in 2017 to extend the current derogation from EU ETS obligations for flights to and from third countries until 31 December 2023, subject to review53. The review should consider how to implement the ICAO global measure in Union law through a revision of the EU ETS legislation. The review would take due account of the necessary consistency with EU climate objectives and commitments under the Paris Agreement.

In October 2018, the ICAO Council adopted the Standards and Recommended Practices (SARPs) for CORSIA. As of 1 January 2019, aircraft operators will be required to monitor and report their emissions for CORSIA. To this end, the EU has put in place a legally binding monitoring, reporting and verification (MRV) framework based on the CORSIA SARP and the existing MRV framework under the EU ETS.

The inclusion of intra-EEA flights in the EU ETS has delivered around 100 Mt of CO2 reductions between 2012 and 2018. While some reductions are likely to be within the aviation sector, encouraged by the EU ETS's economic incentive for limiting emissions or use of aviation biofuels, the majority of reductions are expected to have occurred in other sectors.

Cyprus for 2019 was allocated with 7 active aircraft operators with approximate emissions 30 Gg CO2.

The Innovation Fund, established by and funded through the EU ETS, will also support the aviation sector through funding of innovation projects in low-carbon technologies and processes; the production of e-fuels and synthetic kerosene to replace carbon intensive refinery products; and in the production of e-fuels, hydrogen and synthetic kerosene where these are forms of energy storage.

4.2.2. The Effort Sharing Decision (2013-2020), the Effort Sharing Regulation and the LULUCF Regulation (2021-2030)

The EU Effort Sharing Decision (2013-2020)[26] covers direct emissions from the non-ETS sectors such as buildings, transport (excluding aviation) and agriculture (excluding land use, land use change and forestry) for the period 2013-2020. It sets binding national emission targets for 2020, expressed as percentage changes from 2005 levels, and a trajectory of annual limits between 2013 and 2020 for each Member State. By 2020, these national targets will collectively deliver a reduction of around 10% in total EU emissions from the sectors covered compared with 2005 levels. Under the decision, EU Member States report annually their greenhouse gas emissions for the period 2013-2020. The European Commission reviews the emissions and checks that Member States comply with their annual limits (so-called annual emission allocations, AEAs). The next annual compliance check for the year 2018 will be carried out in 2020.

Cyprus' binding national emission target for 2020 is -5% compared to 2005. The annual emission allocations are presented in Table 3 (section 3.2.1).

The decision provides for a number of flexibilities to help Member States to manage annual variations in emissions within the period, including banking and borrowing. For example, if a Member State's emissions are below its annual emissions allocation (AEA) in a given year, the surplus can be carried over and used to contribute towards its allocation in subsequent years. However, if emissions from a Member State exceed its annual emissions allocation for a given year, even when its use of flexibilities has been accounted for, it will be subject to a penalty and will have to take corrective action in order to comply with the ESD. In such a case, the Member State in question will have to achieve the missing emission reductions in the next year, multiplied by a factor of 1.08 as a penalty. It will also have to submit a corrective action plan to the Commission detailing how it intends to get back on track towards meeting its 2020 target. In addition, it will temporarily lose the right to transfer any allocations to other Member States.

The progress of Member States in meeting the emissions reduction targets set in the Effort Sharing Decision (ESD) is assessed under the Monitoring Mechanism Regulation (Regulation No 525/2013)[27], and as part of the European Semester. National Effort Sharing emissions in 2017 were 2% above 2005 levels[28].

[26] DECISION No 406/2009/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

[27] REGULATION (EU) No 525/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other

The EU 3BR described the legislative proposals for the revision of EU legislation covering the non-ETS emissions in line with the 2030 Climate and Energy Framework. The two main developments since the 3BR are the adoptions of the Effort Sharing Regulation on binding annual emission reductions by Member States from 2021 to 2030 and the LULUCF Regulation in 2018. The Effort Sharing Regulation sets national emissions reduction targets for 2030 (and trajectories with annual limits in 2021-2030) for all Member States, ranging from 0% to - 40% from 2005 levels[29]. The Effort Sharing Regulation keeps many of the flexibilities and the need for annual compliance in 2021-2030 as currently under the Effort Sharing Decision. There is a new option for some Member States to use a limited amount of allowances from the EU ETS. There are also some flexibilities with the new LULUCF Regulation, which defines for the first time an EU target for the land use, land use change and forestry sector, and includes the so-called "no-debit rule". In total, Member States can use up to 280 million tons of LULUCF credits for effort sharing compliance and can use effort sharing AEAs to cover LULUCF debits. The allocation for Cyprus is 0.6 million tons of LULUCF credits[30].

4.2.3. Other cross-cutting policies and measures

To respond to challenges and investment needs related to climate change, the EU has agreed that at least 20% of its budget for 2014-2020 – as much as €180 billion − should be spent on climate change related action. To achieve this increase, mitigation and adaptation actions are integrated into all major EU spending programmes. Current estimates show that the EU budget annual allocation to climate action has exceeded the 20% target in 2016 and will remain close to it over 2017-2020. It is set to deliver slightly above €200 billion. Negotiations on EU budget 2021-2027 are ongoing.

The available financial tools are European Structural and Investment Funds (ESIF), European Fund for Strategic Investments, InvestEU Programme, LIFE programme, Horizon 2020, Updated Bioeconomy Strategy and European Covenant of Mayors for Climate and Energy. Further details on these are available in the EU 4BR (section 4.2.3).

information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC

[28] as agreed for AEA allocation (Commission Decision (EU) 2017/1471 of 10 August 2017 amending Decision 2013/162/EU to revise Member States' annual emission allocations for the period from 2017 to 2020)

[29] More information can be found on the European Commission's website https://ec.europa.eu/clima/policies/effort/regulation_en

[30] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

4.3. EU Sectoral policies and measures

4.3.1. Energy

The Energy Union Strategy was published in February 2015, and the Commission publishes regular reports on the progress achieved in its five dimensions, the most recent of which was in April 2019. As outlined in the 3BR, the Commission's 'Clean Energy for All Europeans' package was published in November 2016. One of its proposed instruments was the Regulation on the Governance of the Energy Union and Climate Action, which entered into force on 24 December 2018. Its goals are:

- To implement strategies and measures which ensure that the objectives of the Energy Union, including in particular the EU's 2030 energy and climate targets, and the long-term EU greenhouse gas emissions commitments are consistent with the Paris Agreement;
- To stimulate cooperation between Member States in order to achieve the objectives and targets of the Energy Union;
- To promote long-term certainty and predictability for investors across the EU and foster jobs, growth and social cohesion;
- To reduce administrative burden, in line with the principle of better regulation. This was done by integrating and streamlining most of the current energy and climate planning and reporting requirements of EU countries as well as the Commission's monitoring obligations;
- To ensure consistent planning, reporting and monitoring by the EU and its Member States under the UN Framework Convention on Climate Change and the Paris Agreement, replacing the existing climate monitoring and reporting system from 2021 onwards.

As part of this process, Member States are required to prepare and adopt integrated national energy and climate plans (NECPs), covering ten-year periods starting from 2021 to 2030, EU and national long-term strategies, as well as integrated implementation reports. Draft NECPs for all Member States, as well as the Commission's assessment and recommendations, can be found on the European Commission website[31].

Further details on EU energy policies are available in the EU 4BR.

Cyprus' final NECP has been prepared and submitted to the European Union in late January 2020. Further details are available is section 4.4.

4.3.2. Transport

EU-level transport policies contribute to the fulfilment of EU's 2020, 2030 and 2050 ambition. With the global shift towards a low-carbon, circular economy already underway, the Commission's low-emission mobility strategy, adopted in July 2016, aims to ensure Europe stays competitive and able to respond to the increasing mobility needs of people and

[31] https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans

goods. Europe's answer to the emission reduction challenge in the transport sector is an irreversible shift to low-emission mobility. By mid-century, greenhouse gas emissions from transport will need to be at least 60% lower than in 1990 and be firmly on the path towards zero emissions of air pollutants from transport that harm our health need to be drastically reduced without delay. The strategy integrates a broader set of measures to support Europe's transition to a low-carbon economy and supports jobs, growth, investment and innovation. The strategy will benefit European citizens and consumers by delivering improvements in air quality, reductions in noise levels, lower congestion levels and improved safety. Consumers will benefit from less-energy consuming cars, from better infrastructure for alternative fuels, better links between modes of transport and better safety and fewer delays thanks to the roll-out of digital technologies.

Main elements of the strategy

The Communication identifies three priority areas for action:

- Increasing the efficiency of the transport system by making the most of digital technologies, smart pricing and further encouraging the shift to lower emission transport modes,
- Speeding up the deployment of low-emission alternative energy for transport, such as advanced biofuels, electricity, hydrogen and renewable synthetic fuels and removing obstacles to the electrification of transport
- Moving towards zero-emission vehicles. While further improvements to the internal combustion engine will be needed, Europe needs to accelerate the transition towards low- and zero-emission vehicles.

Cities and local authorities will play a crucial role in delivering this strategy. They are already implementing incentives for low-emission alternative energies and vehicles, encouraging active travel (cycling and walking), public transport and bicycle and car-sharing /pooling schemes to reduce congestion and pollution.

Further details on the relevant policies and available funding are available on the Commission website[32] and the EU 4BR. Details on the actions implemented at national level are presented in section 4.4.

4.3.3. Industry / industrial processes

Greenhouse gas emissions arising from industrial processes in the mineral, chemical and metal industry are covered under the EU Emissions Trading System. Further controls on emissions are applied through other sectoral policies and measures.

To control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs), the EU has adopted two legislative acts: the 'MAC Directive' (2006/40/EC)[33] on air conditioning systems used in small motor vehicles, and the 'F-gas

[32] https://ec.europa.eu/clima/policies/transport_en

[33] DIRECTIVE 2006/40/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive

Regulation' ((EC) 842/2006 replaced by (EU) 517/2014)[34] which covers all other key applications in which F-gases are used. These policies are estimated to lead to cumulative emission savings of 1.5 Gt CO2eq. by 2030 and 5 Gt CO2eq. by 2050. Following 13 years of increasing emissions of F-gases, emissions have declined in 2015, 2016 and 2017 compared to the previous year. This sends a signal that the policy measures are effective.

The action taken by the EU and its Member States under the F-gas Regulation will enable the EU to comply with the Kigali amendment to the Montreal Protocol on a global phase-down of hydrofluorocarbons (HFCs). The EU has ratified the Kigali amendment, which entered into force on 1 January 2019. The consumption of HFCs in the EU is already well below the limit set by the Kigali amendment.

In terms of progress, a comprehensive report on the effects of the F-gas Regulation will be published by the end of 2022. The European Environment Agency publishes every year a report on fluorinated greenhouse gases, the latest is available on the EEA website[35]. Thanks to the phase-down foreseen in Regulation 517/2014, no more than 63% of the amount of HFCs was placed on the market during 2018 in comparison to the 2009-2012 baseline (in tonnes of CO2 equivalent). While the baseline includes only bulk gases, in 2017, HFCs imported in pre-charged equipment were also included under the phase-down limit. Thus, the reduction related to placing on the market of bulk gases only has been almost halved since the phase-down started in 2015.

Details on the actions implemented at national level are presented in section 4.4.

4.3.4. Agriculture

Agricultural activities can result in methane emissions from livestock digestion processes and storage of animal manure; and the use of organic and mineral nitrogen fertilisers can lead to nitrous oxide emissions. The Effort Sharing Decision and Regulation cover these emissions. On the other hand, agricultural lands can sequester and store carbon, thus contributing to climate change mitigation (this contribution is recognised in the LULUCF sector). Finally, agricultural activities supply biomass, which can be used as a renewable energy source and replace fossil-based materials and fuels. Thus, biomass can contribute to CO2 savings that are allocated to the energy and industrial sectors as well as in construction and other sectors of bio-economy. While there is no emission reduction target specifically for the agricultural sector, the Common Agricultural Policy has integrated climate objectives and provides funding to support practices that are beneficial for the climate. Details on the Common Agricultural Policy are available in the EU 4BR (section 4.3.4.1). Details on the actions implemented at national level are presented in section 4.4.

70/156/EEC https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0012:0018:EN:PDF

[34] REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0517&from=FR

[35] https://www.eea.europa.eu/publications/fluorinated-greenhouse-gases-2018/

4.3.5. LULUCF

Through the EU LULUCF Regulation, adopted in May 2018, greenhouse gas emissions and removals from LULUCF sector are included in the 2030 Climate and Energy Framework. The Regulation promotes the implementation of the Paris Agreement, which points to the critical role of the land use sector. Sustainable forest management is key in this context. The Regulation sets a binding commitment for each Member State to balance the sector's accounted emissions with an equivalent amount of removals of CO_2 from the atmosphere, through action in the sector (the so-called no-debit rule). The new rules provide a framework to incentivise a more climate-friendly land use, without imposing new restrictions or red tape on individual actors. This framework should encourage Member States to develop practices on agricultural land and forests that support climate action, to provide clear and transparent rules to ensure that emissions from harvests are correctly accounted, and to highlight the climate benefits of wood products, which can store carbon sequestered from the atmosphere and substitute for emission-intensive materials and fuels.

The LULUCF Regulation:

- Brings a LULUCF commitment into the EU climate policy for the first time;
- Establishes rules to measure the changes in carbon emissions and removals from this sector;
- Requires an improvement in the accuracy of the LULUCF inventories;
- Ensures that the CO2 impact of bioenergy and biomaterials produced from domestic sources is fully accounted.

The Regulation also allows some flexibility for Member States. For instance, if a Member State has net emissions from land use and forestry, they can use allocations from the Effort Sharing Regulation to satisfy the "no debit" commitment. Moreover, Member States can buy and sell net removals from and to other Member States. This can encourage Member States to increase CO_2 removals beyond their own commitment. On the other hand, a Member State may choose to enhance removals or reduce emissions in the LULUCF sector, thereby helping compliance in the Effort Sharing Regulation.

4.3.6. Waste management / waste

Policies and measures related to solid waste disposal, biological treatment of waste, waste incineration and open burning of waste, as well as wastewater treatment and discharge, are climate-relevant. Important GHGs in this sector are methane (CH4), which mainly arises from the treatment and disposal of solid waste, and nitrous oxide (N2O) which originates from wastewater. In addition, a substitution of primary raw materials by secondary raw materials coming from recycling allows for significant GHG savings due to lower demand for energy needed to extract raw materials and turn them into products.

The revised Waste Package (consisting of five waste directives, including the Waste Framework Directive[36] (WFD) was adopted in May 2018. For municipal waste, the recycling

[36] https://ec.europa.eu/environment/waste/framework/framework_directive.htm

targets are set at 55% in 2025, 60% in 2030 and 65% in 2035 and the cap on landfilling of municipal waste is set at 10% by 2035.

The assessment of the impacts found that, depending on the options implemented, between 13 and 62 million tons of GHG emissions could be avoided in 2030 at EU level[37].

Details on the EU policies are available in the EU 4BR (section 4.3.6), while actions implemented at national level are presented in section 4.4.

4.4. National mitigation actions and their effects

4.4.1. National Integrated Energy and Climate Plan

The National Energy and Climate Plan (NECP), which was recently adopted by Cyprus (Council of Ministers Decision 15.1.2020), constitutes a strategic plan for Cyprus on Climate and Energy issues and comprises a detailed roadmap for achieving concrete Energy and Climate Goals by 2030. The NECP presents and analyses Policy Priorities and Measures in a wide range of economic and development activities for the next decade.

The implementation of the energy policy while attaining the climate and environmental targets requires a radical transformation of the energy system over the next decade and, therefore, the implementation of significant investments in energy infrastructure as well as in energy efficiency. Major investments have been planned and scheduled in renewable energy, in the transformation of the network and the introduction of smart meters in power distribution, in power transmission networks, in importing and using natural gas for increasing energy efficiency in power generation, in the energy efficiency in households, businesses, public sector and water sector, in transport infrastructures and sustainable mobility as well as in technological research.

The national targets for the next decade are looked into in detail in this national climate and energy plan (NECP) on a mid-term basis, up to 2030, and should serve as a basis for an ambitious long-term strategy aiming towards the minimisation of greenhouse gas emissions by 2050. Therefore, the decarbonisation dimension is the first and foremost component of the NECP structure.

Figure 7 shows the quantitative targets in the context of attaining the national energy and climate objectives for 2030. The key policy priorities of the national climate and energy plan, which are deemed necessary for attaining these objectives, are presented in Table 5.

[37] https://eur-lex.europa.eu/resource.html?uri=cellar:0c4bbc1d-02ba-11e4-831f-01aa75ed71a1.0001.02/DOC_6&format=PDF, see table 2 in part 2/6

Table 5. Policies to reduce greenhouse gas emissions

Name of policy	Sector Category
Promotion of natural gas as an intermediate fuel for the decarbonisation of the energy system	Electricity
Promotion of renewable energy sources	Energy – all
Improvement in energy efficiency in all sectors	Energy – all
Reduction of emissions in the transport sector	Transport
Reduction of fluorinated gas emissions	Industry
Reduction of emissions in the agricultural sector	Agriculture
Reduction of emissions in the waste sector	Waste
Reduction of emissions from the businesses	All non-ETS
Increase of absorptions by LULUCF	LULUCF

Reducing greenhouse gas emissions and environmental objectives

- Emissions in the non-ETS sectors to be reduced by 20.9% compared to 2005. The non-ETS national target is going to be achieved by the use of flexible mechanisms provided by the ESR.
- Emissions from land use, land use change or forestry are offset by at least an equivalent removal of CO_2 from the atmosphere
- Emissions in ETS sectors to be reduced by 24.9% compared to 2005
- Attaining quantitative targets for reducing national emissions of specific air pollutants

Increasing the share of RES in energy consumption

- Share of RES in gross final energy consumption to reach 23%
- Share of RES in gross final electricity consumption can reach at least 26%
- Share of RES in heating and cooling to reach 39%
- Share of RES in the transport sector to reach 14%

Impoving Energy Efficiency

- Final Energy Consumption of 2.0 Mtoe in 2030, representing 13% reduction in final energy consumption*
- Primary Energy Consumption of 2.4 Mtoe in 2030, representing 17% reduction in primary energy consumption*
- Achieving cumulative energy saving of 243.04 ktoe during 2021-2030

** compared to the respective projection for Cyprus in the 2007 in the EU PRIMES 2007 Reference Scenario*

Figure 7. National energy and environmental objectives for the period 2021-2030 in the context of EU policies

All these policy priorities and the specific measures resulting from their implementation are part of an integrated plan for the optimal attainment of the national energy, environmental, socio-economic and development objectives, which requires consistency, horizontal combination and coordination in monitoring the priorities and implementing the measures. A key requirement for attaining the objectives set out in the context of NECP is to understand that the progress made in each individual sector automatically affects that made in the other sectors, and consequently the impact of the measures that are finally planned and implemented does not relate to or affects just one topic and section of the NECP, but has an impact on the overall development of the energy system.

Businesses

A new financial support scheme is currently in development that is planned for implementation for 2020 to 2022, to encourage business to take measures towards their reduction of greenhouse gas emissions. The scheme started as an initiative, "Business4Climate"[38] through which the Cyprus Employers and Industrialists Federation, the Cyprus University of Technology and the Department of Environment of the Ministry of Agriculture, Rural Development and Environment, aimed to commit businesses to more actively involved in climate action by reducing their greenhouse gas (GHG) emissions by 8% until 2030 through a voluntary commitment. Currently there are 64 signatories.

Energy

Policies to reduce emissions from conventional power plants contribute to reducing greenhouse gas emissions in the coming period. The most important policy measure relevant to electricity production concerns import and utilisation of natural gas for electricity production.

Promoting RES is a top policy priority to move towards the decarbonisation of the economy. All measures for the penetration of RES in electricity generation, in heating and in transport contribute to this objective.

The implementation of energy efficiency improvement measures, which have been included in the policies for improving energy efficiency in all sectors, also contribute to reducing greenhouse gas emissions.

Transport

The Amendment of the Motor Vehicles and Road Traffic Law (Law 100(I)/2013) for revision of the vehicle taxes and annual circulation taxes, a measure that relates to the tax imposed on vehicles with a view to reducing CO2 emissions, which has been in force since 2014. The latest amendment was decided on 29 March 2019 and has revised the method of calculating the motor vehicle registration fees beyond the CO2 parameter. More specifically, higher fees are now charged for vehicles emitting more than 120 g/km. Furthermore, an additional fee is included based on the 'Euro' technical specifications of vehicles. This action further promotes the use and purchase of low emission vehicles, including zero emissions vehicles.

At the same time, incentives for the purchase and use of low/zero emission vehicles including the old vehicle scrapping scheme and financial incentives for the purchase of electric vehicles have been announced in late 2019. This scheme will have a total cost of €3 million and will come into force in 2020.

Moreover, the Integrated Fleet Management System (Central Government vehicles) includes the installation of an Integrated Fleet Management System by the Department of Electrical and Mechanical Services, on approximately 1800 government owned vehicles. The system was installed in 2017 and its total cost was €1.7 million. This measure aims amongst other benefits, to utilise the vehicle refuelling data to compare and high fuel consumption vehicles and replace them where necessary.

[38] http://www.oeb.org.cy/en/drasis/business4climate/

For the promotion of the use of electric cars, the Electricity Authority of Cyprus has deployed a total of 19 recharging stations accessible to the public in Cyprus. Furthermore, the Department of Electromechanical Services is proceeding with the installation of 10 double fast-charging stations in highways and public roads. This action will be completed in 2020 and its total cost is approximately €1 million. 3 additional charging stations will be installed by the Public Works Department in 2020 through the European Programme EnernetMob.

Regarding public transport, new bus concessions are planned to be put in force in 2020 and will further improve the system. The increase of the use of buses that have low or zero GHG emissions will be implemented for the contract period 2020-2030. Furthermore, the new bus contracts include specific requirements for the use of electric buses and provision for conversion of operator's bus fleet to use Compressed Natural Gas (CNG), when such fuel source is available in Cyprus and the prerequisites for doing so exist.

Additionally, towards the improvement of the efficiency of the public transport system, the Ministry of Transport, Communications and Works, has installed a telematic system that manages the bus services and records data. The related website and mobile application contain a detailed map of the routes and the timetable of buses in order to facilitate passengers in real time. This action was completed in 2018 and its cost was approximately €7 million, including maintenance for 5 years.

Concerning biofuels their use was 2.5% at the end of September 2019, and is currently at 5% (December 2019). These percentages will be increased in 2020 in order to meet the obligatory targets. A support scheme is currently under development by the Ministry of Agriculture, Rural Development and Environment for the promotion of local production of biofuels. It is expected to be ready for implementation in 2020 for the period 2020-2022.

LPG vehicles were seen as a possible short-term solution, as the construction of 25 LPG fuel stations was planned within the next years and conversions from petrol cars are often cost efficient. Currently, there are only 8 LPG fuel stations moment and the impact of LPG on the RES goals is negligible. A further development of the technology is not foreseen in the long term – as more efficient technologies using RES such as e-mobility take over. Moreover, the import of natural gas and future plans to exploit the reserves of natural gas, located in its economic exclusive zone, could support the promotion of CNG/LNG vehicles instead of LPG vehicles. The cost for this action is covered by private investments.

Fluorinated gases

The New EU F-gas Regulation adopted in 2014 and applies from 1 January 2015, aims among others in preventing emissions of F-gases from existing equipment by requiring leakage checks, proper serving and recovery of the gases at the end of the equipment's life. For the full implementation of this regulation in Cyprus a proper recovery system needs to be setup and used in Cyprus. Given the high GWP of the F-gases, and their increasing contribution to the national emissions, it is considered crucial for proper recovery to be implemented within the following years.

Under the provisions of Article 9 of Regulation 517/2014/EC, on fluorinated greenhouse gases, without prejudice to existing Union legislation, Member States shall encourage the development of producer responsibility schemes for the recovery of fluorinated greenhouse gases and their recycling, reclamation or destruction. Cyprus has recently adopted and

harmonized the above Regulation into Cypriot Law 62(I)/2016 and 46(I)/2017. The next step is to adopt a national Law regarding a producer's responsibility scheme. The main provision of this Law, which is currently discussed at the parliament, follows the "polluter pays" principle and each producer has to participate in an appropriate scheme for management of f-gases that have been recovered for any reason.

At the same time, certified technicians will be encouraged to return to the scheme any fluorinated gases the have recovered, for a pre-decided profit, through the development of a financial support scheme which is currently designed. Its implementation is expected to start in 2021 for the period 2021-2022. The goal is to achieve 5% recovery by 2030.

Agriculture

The Common Agricultural Policy (CAP) promotes sustainable food production, sustainable farm management and environmentally and climate-friendly practices and methods. The measures that implemented aim at preventing desertification, improving water management, reducing the intensity of natural resources, optimising the use of agricultural land, reducing the use of fertilisers and improving animal waste management, where special emphasis is given to the promotion of anaerobic digestion for the treatment of animal waste.

In addition, the Rural Development Programme promotes forestry, which also increases the absorption from the LULUCF sector.

Currently, the contribution of measures other than anaerobic digestion to the country's overall emissions/absorption balance cannot and have not been estimated.

Anaerobic digestion technology may help to address two congressional concerns that have some measure of interdependence: development of clean energy sources and reduction of greenhouse gas emissions. Anaerobic digestion, as a way of converting biomass to energy, has been practiced for hundreds of years. It is a technology that helps to reduce waste, generate energy and cut down on carbon emissions. The general performance of anaerobic digesters and the diversity of wastes which they can treat have been increasing steadily as a result of new reactor design, operating conditions, or the use of specialised microbial consortia, during the last decades. In Cyprus there are currently operating more than 10 anaerobic digesters, of which the majority is at large animal farms. All available studies show that there is a great potential in Cyprus to further promote anaerobic digestion for the treatment of waste with high organic content.

Even though anaerobic digestion is not clearly stated in the European or national legislation, the technology is preferred by large animal farms to comply with the terms stated on the wastewater and air emissions permits. The technology is strongly promoted by the Department of Environment, especially for the large installations that fall under the Industrial Emissions directive. Relevant national legislation that encourages the promotion of anaerobic digestion is (a) the Control of Water Pollution (Waste Water Disposal) Regulations 2003, Κ.Δ.Π. 772/2003; (b) the Control of Water Pollution (Sensitive Areas for urban waste water discharges) Κ.Δ.Π. 111/2004. It is a voluntary measure which is expected

to increase. Therefore it is considered important to further promote the use of anaerobic digestion for the treatment of animal waste (target for 2030: 11.5% for cattle waste, 5% for sheep and goat waste, 22.8% for poultry waste and 66% for pig waste).

Waste

A package of policy measures are contributing towards reducing the quantities of biodegradable waste in solid waste treatment facilities. Measures are promoted for the separate collection of bio-waste, recycling and energy recovery through anaerobic digestion. These measures are primarily aimed at the reduction of the quantities of biodegradable waste in solid waste treatment facilities, not only for electricity and thermal energy generation (e.g. biogas production), but also for recycling. The above measures, which have already been launched in the framework of the National Municipal Waste Management Strategy, will be intensified in the period 2021-2030, as National Planning is currently being revised under the EU circular economy package and the new waste Directives.

With the EU Waste Framework Directive being the main guiding force, in conjunction with the need to improve the waste management infrastructure of the country to ensure the appropriate management of waste in line with EU obligations and targets, Cyprus has developed and is implementing, as part of its Strategy, the National Municipal Waste Management Plan of 2015-2021 which is currently undergoing a major revision. The implementation of the Plan is the responsibility of the Department of Environment.

The National Municipal Waste Management Plan of 2015-2021 (MWMP) contains quantitative and qualitative targets and enumerates specific measures and actions to be taken in order for the EU targets to be reached. One of the quantitative target is that no more than 95,000 tonnes of biodegradable waste to be disposed in landfills (represents the 35% target of the 1999/31/EC directive). Also the Legal Measures will be focused on the:

- Development of local waste prevention and management schemes
- Mandatory obligation for the establishment of separate collection systems by local authorities,
- Establishment of extended producer responsibility (EPR) for streams other than packaging waste,
- Establishment of a landfill tax/levy,
- Banning the disposal of certain waste streams from entering into landfills (e.g. green waste, high calorific value waste, etc.)

The following measures have so far been implemented:

a) One Sanitary Landfill and one Residual Sanitary Landfill (supplementing MBT unit at Koshi) were constructed and operated (both meet the requirements of directive 99/31/EC). The MBT unit has been in operation since 2010 serving the Larnaca - Ammochostos districts. The Plant was designed in a way that a high separation of recycled and biodegradable material is achieved. Another I.W.M.P (Integrated Waste Management Plant) serving the Limassol district came into operation in 2017.
b) The construction of the Green Points Network (22 collection points for various household waste streams– bulky waste, green, textile, furniture, WEEE, etc.) has been completed and all Green Points are now in operation.

c) Currently, there is a system for the separate collection of packaging waste from households, operated by the collective system which has been established under the Packaging Directive. The system carries out door-to-door collection in most urban centres, with a number of smaller communities serviced by central collection points. Draft Regulations have been prepared, as set out in the National Strategy for the Management of Municipal Waste, with a view to their adoption in 2020, which define the obligations of local authorities for the management of municipal waste. The Regulations will provide for the preparation of local waste management plans and waste prevention programmes by the local authorities, the obligatory establishment of separate collection systems for a number of waste streams (specifically paper, glass, plastic and metals, including packaging, wood and synthetic packaging and bulky waste), the obligatory establishment of a separate collection systems for organic waste (including food and garden waste), and the adoption of a pay-as-you-throw scheme.
d) The construction works for the rehabilitation/restoration of the old non approved landfills, which are closed at Paphos and Larnaca - Ammochostos districts, were completed. The preparation of studies/documents regarding the rehabilitation/ restoration of the 20 non sanitary landfills of Nicosia district and the 44 sanitary landfills of Limassol district will be completed within 2018 and after that the construction works will begin.

A comprehensive study was undertaken in 2005 for the elaboration of a Strategic Plan, an Environmental study and a Feasibility study for the restoration and management of landfills. The purpose of the study was to record all landfills, assess their status and level of risk, create a restoration priority list based on pollution risk assessments, and undertake the appropriate environmental studies as well as feasibility studies for the restoration of the prioritised landfills. These studies were a necessary step for the restoration of all landfills recorded.

The last two (2) illegal landfills were closed in February 2019 and plans for the restoration are underway. According to recent data, these two landfills were fed with approximately 155,000 ton and 200,000 ton of municipality waste each year respectively (reference year 2012).

Sixty two (62) non sanitary landfills are planned to be restored appropriately within the following years. According to the preliminary study contacted in 2005, these landfills contain approximately 597,269 m3 of solid waste excluding 2 major landfills that have not been closed yet.

Fifty three (53) landfills have been restored the last five years and are being monitored. During their restoration a total of 4,902,000 m3 of solid waste were reallocated and properly buried using composite liners and leakage collection systems.

The key features of the strategy that have been included in the GHG reduction Policies and Measures are the following:

- Reduction of waste to solid waste disposal sites from sorting at production level (40% from 2021, 55% in 2025, 60% in 2030).
- Reduction of organics to landfills to 15% from 2021.

- Introduction of anaerobic digestion for the treatment of organic wastes treated by (5% from 2021)

An additional measure considered and not included in the solid waste management strategy is biogas recovery from old landfills, during their restoration (20% from 2020).

Education, training and public awareness

Climate change in the context of formal and non - formal education is an issue of interdisciplinary investigation and interconnected with all the issues of environment and sustainable development as a matter of national, regional and international interest. The consideration of climate change in this context relies on the fact that climate change is not a mono-dimensional problem, cut off from the rest of the issues, but could be the apparent cause and consequence of a chain of direct and indirect human effects on all environmental issues.

Access of environmental information to the public is provided through the websites of the relevant Ministries and other governmental agencies. With the ratification of the Aarhus Convention, Cyprus has posed legal obligations for the access of information regarding the state of the Environment. In addition, law no. 119(I)/2004 by which Cyprus incorporated the Directive 2003/4/EC on "public access to environmental information" into national legislation, seeks to increase public access and dissemination of information, contributing to a greater public awareness in decision making and environmental protection. According to this law, "environmental information" includes information related to climate change such as: state of elements (among others air, atmosphere, water, coastal areas, biological diversity, and the interactions among them), factors (e.g. emissions, energy), policies and measures, reports, cost-benefit analyses.

The Cypriot Government gives high priority to public consultation and awareness. Draft legislation related to climate change, energy and environmental issues are open to public consultation before their adoption.

The work on education, training and public awareness is continuous and its contribution has not been assessed with respect to reduction of greenhouse gas emissions. Further details on the issue are available in the 7th National Communication of Cyprus (Chapter 9)[39].

Further details on the policies and measures are available in the Cyprus' NECP[40] and the CTF table 3. Summary of the policies and measures are presented in Table 6 (existing) and Table 7 (additional).

[39] https://unfccc.int/documents/64731

[40] http://www.moa.gov.cy/moa/environment/environmentnew.nsf/all/EE3E8BE9D5282E5CC22584F700273BD9/$file/submission.zip?openelement

Table 6. List of existing policies and measures

Sector	Policies and measures
Non-Energy and Transport	○ Recovery of fluorinated gases (at least 5% by 2030).
	○ Increase of anaerobic digestion for treatment of livestock waste (target for 2030: 23% poultry waste, 5% sheep and goat waste, 66% poultry waste).
	○ Business greenhouse gas emission reduction support program (target for 2030: reduction of at least 8%).
	○ Sorting at the source of solid waste (40% by 2021, 55% by 2025, 60% by 2030).
	○ Decrease in organic waste to landfill to 15% by 2021.
	○ Recovery of biogas from old disposal sites by at least 20% by 2020.
	○ Use of anaerobic digestion for municipal waste treatment since 2021 (at least 5%).
	○ Information / Awareness.
Energy	○ Promotion of natural gas for electricity production
	○ Energy interconnection with neighbouring countries (electricity and natural gas)
	○ Renewable Energy Sources
	- Support for projects below 1MW → Energy Communities (No Electricity Market).
	- Continuation of Net-Metering & Net (+ Virtual) Billing.
	- Promotion of electricity from RES; production of local biofuels and biogas.
	- Promotion of efficient Heat-Pumps utilisation.
	- Solar in business.
	- Information / Awareness.
	○ Improvement in energy efficiency
	- Excise duty on motor fuels beyond the EU minimum
	- Imposing energy efficiency obligations on energy distributors.
	- Financial incentives.
	- Information / Awareness.
Transport	○ Install 10 extra dual electric vehicle recharge points.
	○ Old Car Withdrawal Plan / Incentives to buy electric cars.
	○ Fleet management system for public service vehicles.
	○ New bus contracts / Telematics system installation at bus services.
	○ Review of vehicle taxes and annual traffic taxes.
	○ Use of biofuels in the transport sector
	○ Use of LPG in vehicles.
	○ Information / Awareness.

Table 7. List of additional policies and measures

Sector	Policies and measures
Non-Energy and Transport	○ Further recovery of fluorinated gases (at least 10% by 2030).
	○ Further increase of anaerobic digestion for treatment of livestock waste (target for 2030: 25.7% poultry, 10% sheep and goats, 69% pig farming).
	○ Further recovery of biogas from old disposal sites by at least 30% by 2020.
	○ Special tree planting program
	○ Information / Awareness.
Energy	○ Further promotion of natural gas for energy production
	○ Renewable Energy Sources
	- Speed up digitization of applications for new projects → One Stop Shop
	- In case of Non-Electrical Interconnection
	▪ Promoting Energy Storage by 2023-2024
	▪ Promoting Geothermal and Solar in Business → Increasing Commitments
	- Information / Awareness.
	○ Improvement in energy efficiency
	- Additional investment in savings measures in the residential and tertiary sectors (total €65 mil. per year) and industry (€67 mil. for the decade)
	- Information / Awareness.
Transport	○ Promote sustainable modes of transport
	○ Further use of low or zero emission buses
	○ Further use of vehicles with low or zero emissions
	○ Extensive tree planting on urban and interurban roads
	○ Information / Awareness
Horizontal	○ Fiscally neutral green tax reform

4.4.2. Information on changes its domestic institutional arrangements

The institution responsible for energy issues in Cyprus is the Ministry of Energy, Commerce and Industry, while climate change is the responsibility of the Ministry of Agriculture, Rural Development and Environment and in particular the Department of Environment. The Department of Environment has a team of seven officers allocated to climate issues, working both on adaptation and mitigation issues. The Ministry of Energy, Commerce and Industry is also responsible authority for the preparation of the National Energy and Climate Plan, with almost all the personnel within the Department of Energy contributing to the above effort.

For the purposes of implementing the Regulation on the Governance of the Energy Union and Climate Action [(EU) 2018/1999][41] and in particular to set out the necessary foundation for a reliable, inclusive, cost-efficient, transparent and predictable Governance that ensures the achievement of the 2030 and long-term objectives and targets of the Energy Union in line with the 2015 Paris Agreement on climate change following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (the "Paris Agreement"), through complementary, coherent, and ambitious efforts by the Union and its

[41] 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, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

Member States, while limiting administrative complexity, a new structure for climate and energy governance has been approved by the Council of Ministers (15/11/2017 decision no. 83.709).

The core of this new structure (see Figure 8), the “National Governance System for Climate and Energy” is a Ministerial Committee, consisting of the Minister of Agriculture, Rural Development and Environment, the Minister of Energy, Commerce and Industry, the Minister of Finance and the Minister of Transport, Communications and Works. The Ministerial Committee is co-chaired by the Minister of Agriculture, Rural Development and Environment and the Minister of Energy, Commerce and Industry. This committee has to propose the National Energy and Climate Plan (NECP) to the Council of Ministers which takes the final decision. The proposal of the NECP is prepared by the Technical Committee, which consists of the Permanent Secretaries of the same Ministries. The Technical Committee also monitors the implementation of the NECP and makes proposals for its revisions when necessary. The Technical Committee is co-chaired by the Permanent Secretary of the Ministry of Agriculture, Rural Development and Environment and the Permanent Secretary of the Ministry of Energy, Commerce and Industry. The Technical Committee is consulted by the following seven Expert Working Groups: Decarbonisation, Energy Efficiency, Energy Security, Internal Energy Market, Research, Innovation and Competitiveness, Renewable Energy and Transport. Transport is an additional working group created due to the significant contribution of the sector to the national emissions. Each Working Group has a coordinator. All working groups with the exception of decarbonisation are the responsibility of the Ministry of Energy, Commerce and Industry; decarbonisation is the responsibility of the Department of Environment (Ministry of Agriculture, Rural Development and Environment). The secretariat of the National Governance System for Climate and Energy is held by the Department of Environment.

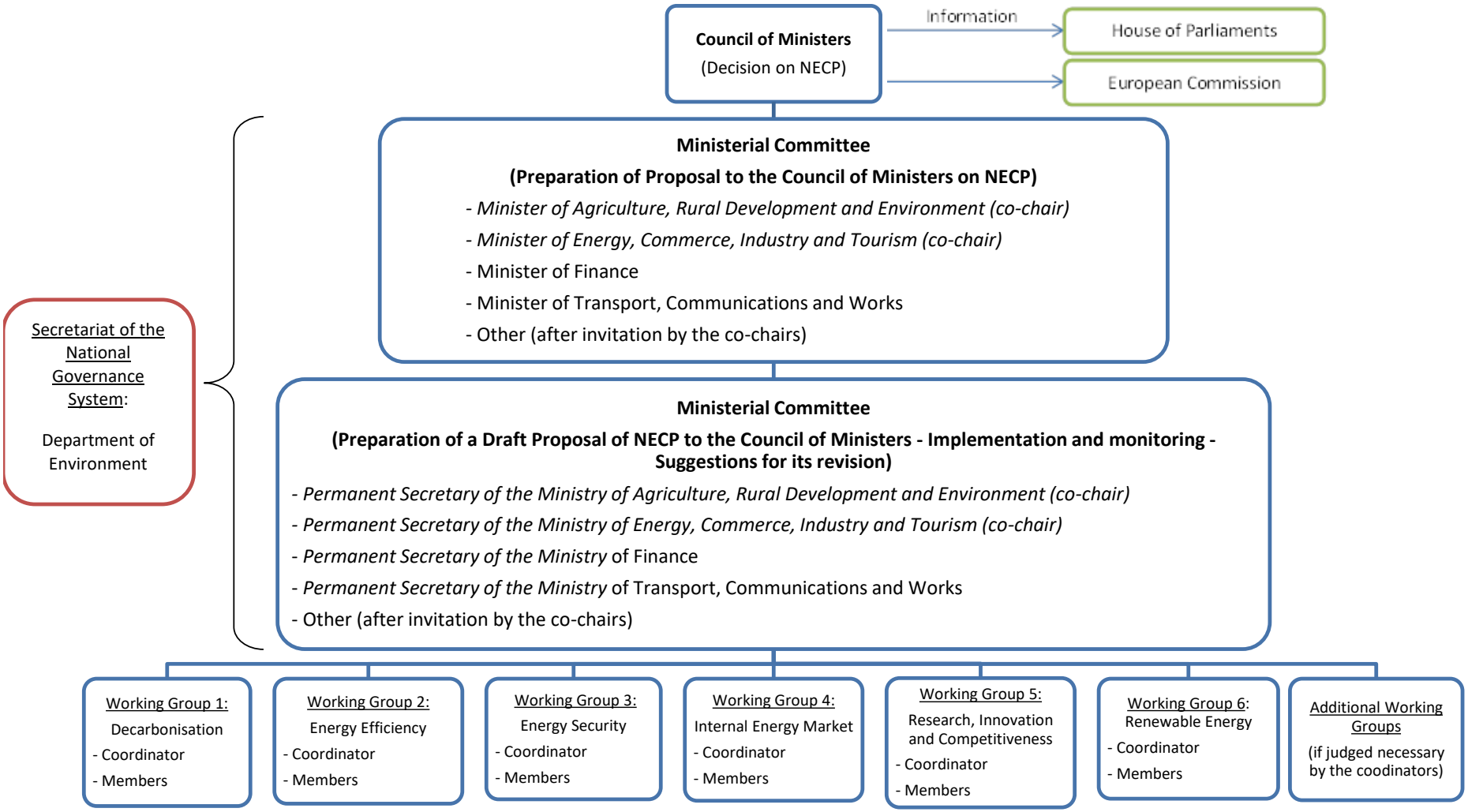


Figure 8. Structure of the national governance system for Climate and Energy

4.4.3. Economic and social consequences

The Impact Assessment of the National Energy and Climate Plan of Cyprus has been based on detailed modelling of the energy system of the country, which was mainly conducted with the OSeMOSYS optimisation model. Final energy demand projections for sectors other than road transport have been derived from a separate demand forecast model that has been used for the assessment of national energy efficiency action plans of Cyprus in the recent past, which were then input to OSeMOSYS. The optimisation results, as shown in Chapter 5.1 of the NECP, along with the associated costs and calculated emissions of GHGs and air pollutants, have been fed into other models in order to assess the macroeconomic and employment impacts of the two scenarios that were explored. Apart from the above energy-related data and results, information about emissions abatement and costs for non-energy-related GHG emissions were obtained from the relevant calculations of national authorities that are included in the NECP of Cyprus.

Taking into account that national authorities have decided to proceed in their energy and climate policy in three stages time steps base on the 3 reporting periods (Stage 1 implement all PPMs till 2022, Stage 2 additional PPMs based on the progress of stage 1 and Stage 3 being an intention to proceed with more ambitious measures in the near future in order to fill the gap towards the -24% CO2 target), the main findings of the Impact Assessment can be summarised as follows:

1. Existing policies and measures (Stage 1 of the national climate policy) are clearly insufficient to lead Cyprus to compliance with its obligations stemming from the Energy Union Governance Regulation. They cannot lead to compliance with the national renewable energy and energy efficiency targets, and they can only lead to 3% reduction in non-ETS emissions in 2030 compared to 2005; this will require purchasing a significant amount of emission allowances to fill the 2030 emissions gap, which, under optimistic assumptions, will cost the Republic of Cyprus at least 131 million Euros[42] in the period up to 2030. Moreover, non-compliance with the 2030 target of 14% renewable energy in transport will lead to additional costs in the WEM scenario, because the gap in renewable share will have to be covered through the Statistical Transfer procedure.

2. The Planned Policies and Measures scenario that will be implemented in stages, is able to make Cyprus meet its goals. If fully implemented, these measures will lead to net economic benefits to the society of more than 500 million Euros'2016 by 2030, accompanied by small positive effects on economic indicators – a 0.3% increase in national GDP and a 0.3% rise in economy-wide employment in 2030. The changes in energy costs to end consumers will be very small and overall will have essentially no adverse impact on the welfare of households and social equity.

[42] This calculation is based on assumptions provided by MARDE about the evolution of ETS allowance prices up to 2030. They are considered to be optimistic because Cyprus will not have the right to 'borrow' emission allowances from ETS installations, and since most EU Member states expect to be in deficit of allowances for meeting their 2030 ESR targets, it is likely that the cost for purchasing allowances to cover the non-ETS emissions gap will be considerably higher.

3. Road transport holds the key to emissions abatement both for 2030 and for the longer term. Investments in sustainable mobility may exceed 1.3 billion Euros throughout the period 2020-2030 and can therefore be considered as costly. However, these investments are expected to fully pay off because of multiple benefits from the reduction of the use of passenger cars, which can yield aggregate economic benefits to society of the order of 2 billion Euros'2016. Coupled with a fast electrification of the passenger car sector, they can enable achieving the 2030 non-ETS emission reduction target and shifting the whole Cypriot economy to a low-carbon path towards 2050.

4. There are essentially no higher investment requirements to realise the PPM scenario, but a re-allocation towards public investments for sustainable transport; these are expected to pay off because fuel import costs throughout the lifetime of these measures may decline considerably due to these investments.

5. However, successful implementation of the package of Planned Policies and Measures is not guaranteed because it requires significant investments for energy renovations in buildings and industry and – most importantly – a substantial commitment to promote public transport and non-motorised transport modes (walking and cycling) as well as a shift to electric cars.

6. Among the list of Planned Policies and Measures, some measures are more cost-effective than others (e.g. roof insulation or installation of heat pumps in buildings and further deployment of rooftop PVs and solar panels for hot water use). However, with very few exceptions, all other measures pass the cost-effectiveness test and can be deployed without delay.

7. Non-energy-related measures can also contribute to emission reductions. Recovery of fluorinated gases seems to be cost-effective, while extensive planting of trees may be a measure with relatively limited potential and high cost up to 2030, but is an important ingredient of decarbonisation policy in the longer term.

8. In the event that the project of electricity interconnection of Cyprus with Greece and Israel is realised, penetration of renewable energy will be considerably higher. This will enable substantial additional investments for decarbonising the electricity system, and will be able to put Cyprus on track to meet its long-term decarbonisation targets. On the other hand, if the project is not materialized substantial investments are needed in Energy Storage to support at least the minimum level of RES penetration that is required for the Cyprus to meet the RES targets for 2030. On the other hand, if the project is not materialized substantial investments are needed in Energy Storage to support at least the minimum level of RES penetration that is required for the Cyprus to meet the RES targets for 2030.

9. On the way to decarbonisation of the energy system, research and innovation can play an important role. Although great technological breakthroughs are unlikely to come from research in Cyprus alone, the existence of a critical mass of researchers in topics such as energy efficiency, renewable energy sources and fuels, and emission abatement measures can accelerate a) the demonstration and deployment of novel technologies in Cyprus, b) the implementation of innovative measures under the particular conditions of

the Cypriot market, and c) the development of expertise for innovative services related to low-carbon technologies.

10. Even if implemented fast and effectively, Planned Policies and Measures are not sufficient for reaching the non-ETS GHG emission reduction target of 24% by 2030, as required from Cyprus in the Effort Sharing Regulation; the reduction can only reach 14.7% in the PPM scenario. In order to achieve full compliance, the government of Cyprus has to choose between three options:

    a. Not proceed with further GHG emission abatement measures and use instead flexibility mechanisms to purchase emission allowances, with the associated costs; these are estimated to reach at least 55 million Euros up to 2030 but as indicated in point 1 above, may reach much higher levels if several EU Member States are in need to purchase emission allowances to fill their own emission abatement gap.

    b. Implement stronger emission abatement policies and measures (e.g. double the number of energy renovations of buildings, increase cogeneration plants or biogas production plants from waste, encourage accelerated replacement of conventional cars with electric ones); however, all these measures are extremely difficult to implement at such a scale within the short time frame available; therefore they cannot be considered as a realistic alternative.

    c. Induce energy conservation measures through the adoption of a fiscally neutral green tax reform, by imposing a gradually increasing carbon tax on all non-ETS sectors. The revenues of such a tax can be recycled in the economy by reducing labour taxes and providing financial support to energy conservation and green transport policies. Such a reform can have substantial economic benefits without harming low-income households or the competitiveness of firms[43].

11. In view of the declared political commitment of the European Union to carbon neutrality by 2050, the measures foreseen in the NECP of Cyprus and the options mentioned above for filling the non-ETS emissions abatement gap have to be assessed in light of the need for deep decarbonisation. It has been shown that it is impossible to attain the 2050 target if there is low ambition about decarbonisation in 2030.[44,45,46] Therefore, purchasing allowances to fill the 2030 emissions gap is both costly and does not lead to a strong decarbonisation path towards 2050; hence it is not the preferred option for the government of Cyprus.

[43] Zachariadis T., A Proposed Green Tax Reform for Cyprus and its Co-Benefits for Urban Sustainability In: *Critical Issues in Environmental Taxation*, Ezcurra M.V., Milne J., Ashiabor H. and Andersen M.S. (Eds.), Edward Elgar, 2019.

[44] Zachariadis T., Michopoulos A., Vougiouklakis Y., Piripitsi K., Ellinopoulos C. and Struss B., Determination of Cost-Effective Energy Efficiency Measures in Buildings with the Aid of Multiple Indices. *Energies* 11 (2018), 191; doi:10.3390/en11010191

[45] Sotiriou C. and Zachariadis T., Optimal Timing of Greenhouse Gas Emissions Abatement in Europe. *Energies* 12 (2019), 1872; doi:10.3390/en12101872.

[46] Vogt-Schilb A. and Hallegatte S., Climate policies and nationally determined contributions: Reconciling the needed ambition with the political economy. WIREs Energy Environ. 2017, 6, e256.

12. In September 2019 the Finance Minister of Cyprus announced that a green tax reform will be put in consultation in 2020 with the aim to adopt the relevant legal framework and implement such a reform in 2021. As this measure is still provisional and no specific details have been agreed, it has not been included by authorities in the Planned Policies and Measures scenario of the NECP. Based on the previous considerations outlined in this section, the gradual implementation of a green tax reform from 2021 onwards (Stage 3) seems to be a necessary additional policy, both for leading Cyprus to achievement of the non-ETS emission reduction target of 2030 and for enabling the transition to a net-zero-carbon economy by 2050.

4.5. Estimates of emission reductions and removals and the use of units from the market-based mechanisms and LULUCF activities

Establishing and implementing the policies and measures described in the section outlining existing measures, it is assessed that the greenhouse gas emissions outside the EU ETS will reduce to 3829 Gg CO2 eq. in 2030 , which corresponds to a reduction of 10.2% compared to 2005. Implementing the additional policies and measures is expected to reduce the GHG to 3374 Gg CO2 eq., which corresponds to a reduction of 20.9% compared to 2005.

With regards to ETS sectors, the emissions are expected to reduce to 4195 Gg CO2 eq. in 2030 with existing measures corresponding to a decrease of 17% compared to the 2005 emissions. With the implementation of the additional measures, the emissions are expected to reduce to 3815 Gg CO2 eq. in 2030, corresponding to a decrease of 25% compared to the 2005. A sharp decrease in the ETS emissions is expected in 2021, with the introduction of natural gas for electricity production.

Overall, the emissions are expected to reduce by 14% with the implementation of the existing measures and by 23% with the implementation of additional measures; i.e. to 8024 Gg CO2 eq. and 7190 Gg CO2 eq. respectively.

At national level it is not foreseen to use of units from the market-based mechanisms; it is however possible to be used by the ETS installations. At national level, there is possibility to buy or sell AEAs to another member state of the EU and there is also a possibility to use the LULUCF flexibility provided by the LULUCF Decision, of a maximum of 0.6 million tonnes CO2 eq. for the period 2021-2030.

5. Projections

5.1. Introduction

This Chapter describes a “with measures” (WM) or “with existing measures” (WEM) scenario concerning the national projections of greenhouse gas emissions by sources and their removal by sinks for the years 2020 and 2030. The “with measures” scenario assumes that no additional emission reduction policies and measures are adopted than the existing ones (implemented and adopted) as specified in the National Energy and Climate Plan (NECP) (section 4.4.1).

A “with additional measures” (WAM) scenario is also reported, which reflects the effect of all implemented / adopted and planned policies and measures. This scenario includes the additional policies and measures as specified in the National Energy and Climate Plan (NECP).

Finally for reasons of comparison, a “without measures” or “business as usual” (BaU) scenario is presented with projects the emissions in case policies and measures are implemented.

The GHG emission projections presented in this chapter are based on the latest official energy projection scenarios that are developed by the Ministry of Energy, Commerce and Industry that are presented in detail in the NECP.

The projections of GHG emissions of the BaU, WEM and WAM scenarios disaggregated by sector and by gas are presented in CTF Table 6(a) to 6(c).

5.2. Updated projections for 2020 and 2030

The latest projections of GHG were completed in December 2019 for the preparation of the final NECP. Projections (Table 8) are available for the years 2020 and 2030 and are compared with the 1990, 2005 and 2017 (latest inventory year available).

Table 8. GHG projections for 2020 and 2030

[Gg CO2 eq.]	***Inventory***			**Without measures**		**With measures**		**With additional measures**	
	1990	**2005**	**2017**	**2020**	**2030**	**2020**	**2030**	**2020**	**2030**
Energy	2727	2727	3572	4773	4169	4736	3539	4733	3263
Transport	1242	1242	1560	1462	1432	2050	2010	2050	1668
Industry/industrial processes	841	841	957	1421	1442	1419	1428	1420	1442
Agriculture	471	471	580	493	520	492	515	492	512
Forestry/LULUCF	-251	-251	-277	-526	-635	-526	-635	-526	-635
Waste management/waste	387	387	430	577	717	493	363	450	305
CO2 with LULUCF	4413	7644	7004	6743	6009	7318	6100	7269	5329
CO2 without LULUCF	4665	8021	7538	7268	6644	7844	6735	7795	5964
CH4 with LULUCF	655	815	882	882	1038	801	686	757	622
CH4 without LULUCF	655	815	882	882	1038	801	686	757	622
N2O with LULUCF	286	313	293	323	331	341	348	341	336
N2O without LULUCF	286	313	293	323	331	252	254	341	336
HFCs	64	194	250	253	267	252	254	253	267
PFCs	0	0	0	0	0	0	0	0	0
SF6	0.03	0.12	0.17	0.17	0.18	0.17	0.17	0.17	0.17
NF3	0	0	0	0	0	0	0	0	0
TOTAL WITH LULUCF	5418	8967	8429	8200	7645	8712	7389	8620	6555
TOTAL WITHOUT LULUCF	5669	9344	8963	8726	8280	9148	7929	9146	7190
compared to 1990				*54%*	*46%*	*61%*	*40%*	*61%*	*27%*
compared to 2005				*-7%*	*-11%*	*-2%*	*-15%*	*-2%*	*-23%*
ETS emissions	2985	5259	4803	4974	4366	5251	4195	5259	3815
non-ETS emissions	2588	3954	4091	4289	4458	3987	3829	3886	3374

5.3. Changes since its most recent national communication in the model or methodologies used

Two main procedures have been used for the preparation of the projections:

- The projections of energy sector are based on the official energy planning (national energy and climate plan) provided by the Ministry of Energy, Commerce and Industry (MECI). These data were "translated" to GHG emissions based on the spreadsheet models used for the estimation of annual GHG inventory.
- Spreadsheet models for the non-energy sectors, in which future changes in activity data are mainly derived from assessments of sectoral experts, while emission factors are based on the 2006 IPCC guidelines and country specific information.
- Actual inventory data till year 2017 have been used in the preparation of the emission projections.

Emissions for all sectors were projected using the same models that were used for the NC7 / BR3, updated to:

- include improvements in inventory reporting;
- include emissions for 2017, as reported in the 2019 NIR submission; and
- update of key assumptions, in order to reflect in the projections the current economic situation, and the most recent forecasts of macroeconomic parameters (e.g. GDP, fuel and carbon prices).

5.3.1. Energy modelling

The updated outlook of primary energy demand in Cyprus combines the final energy demand projections with projections for the power generation sector which were conducted in the frame of Technical Assistance[47] studies that were performed for MECI in 2019. Most of these forecasts have been performed with the OSeMOSYS optimisation energy systems model[48]. OSeMOSYS is an open source modelling system for long-run integrated assessment and energy planning.

To calculate the demand for primary energy in power generation, the efficiency parameters of the power generation system presented in Table 9 that are based on the technical specifications of the existing and future power plants in Cyprus, were used.

[47] Technical Support on Long-Term Energy Modelling (available at http://www.mcit.gov.cy/mcit/energyse.nsf/C1028A7B5996CA7DC22580E2002621E3/$file/JRC LTEM Final Workshop - Cyl results.pdf)

[48] M. Howells, H. Rogner, N. Strachan, C. Heaps, H. Huntington, S. Kypreos, A. Hughes, S. Silveira, J. DeCarolis, M. Bazillian, A. Roehrl, OSeMOSYS: The Open Source Energy Modeling System, Energy Policy 39 (2011) 5850–5870. https://doi.org/10.1016/j.enpol.2011.06.033

Table 9. Key parameters of power generation according to forecasts with the OSeMOSYS optimization model.

	Average efficiency of all power generation	Thermal efficiency of power plants		
	Scenario with Planned Policies and Measures (natural gas end of 2021)	Steam turbine plants using fuel oil (average)	CCGT plant using diesel oil	CCGT plant using Natural Gas
2018	38.8%	39.0%	48.2%	--
2019	39.5%	38.3%	48.2%	--
2020	41.2%	38.1%	48.2%	--
2021	47.4%	38.1%	48.2%	51.5%
2022	53.3%	--	--	51.5%
2023	53.3%	--	--	51.5%
2024	55.3%	--	--	51.5%
2025	55.4%	--	--	51.5%
2026	55.3%	--	--	51.5%
2027	55.3%	--	--	51.5%
2028	55.3%	--	--	51.5%
2029	55.9%	--	--	51.5%
2030	56.6%	--	--	51.5%
2031	57.3%	---	---	51.5%
2032	59.3%	---	---	51.5%
2033	62.1%	---	---	51.5%
2034	62.5%	---	---	51.5%
2035	62.7%	---	---	51.5%
2036	63.1%	---	---	51.5%
2037	63.6%	---	---	51.5%
2038	65.9%	---	---	51.5%
2039	73.8%	---	---	51.5%
2040	73.3%	---	---	51.5%

In the PPM scenario the projections for primary energy consumption of Cyprus for 2020 and 2030 are both lower than the respective projections for Cyprus in the 2007 EU Reference Scenario[49] (the projection for Cyprus in PRIMES 2007 EU Reference Scenario was 2.8 Mtoe for 2020 and 2.9 Mtoe for 2030). It can be concluded that the forecast for national primary energy consumption of no more than 2.4 Mtoe in 2030 is lower by about 17%, than the respective projection for primary energy consumption in 2030 that was projected in the PRIMES 2007 Reference Scenario.

The same applies for the final energy consumption, where in PRIMES 2007 EU Reference Scenario the projection was 2.3 Mtoe in 2030, whilst the respective projection in the PPM Scenario, is 2 Mtoe for 2030. It can be concluded that the forecast for national final energy consumption no more than 2 Mtoe in 2030 is lower of about 13% than respective projection

[49] https://ec.europa.eu/energy/sites/ener/files/documents/trends_to_2030_update_2007.pdf

for Cyprus final energy consumption in 2030 that was projected in the EU PRIMES 2007 Reference Scenario.

The aforementioned assessment is in line with the methodology in the framework of the amendment of the Energy Efficiency Directive, in order to calculate the EU Energy Efficiency target of 32.5% for 2030. Therefore, using the same approach, Cyprus sets its indicative contribution to the EU 2030 energy efficiency target as:

- 17% reduction in primary energy consumption, compared to the respective projection for Cyprus in the 2007 in the EU PRIMES 2007 Reference Scenario and
- 13% reduction in final energy consumption, compared to the respective projection for Cyprus in the 2007 in the EU PRIMES 2007 Reference Scenario.

Compared to the EU-wide target of 1,273 Mtoe of primary energy consumption in year 2030, Cyprus (under PPM Scenario) is expected to account for 0.21% to the EU wide target for primary energy consumption in 2030, which is higher than its current annual contribution of the EU primary energy consumption.

Table 10. Trajectory of primary energy consumption and final energy consumption (Mtoe) with PPM Scenario, 2021-2040

	Primary energy consumption (Mtoe)
2021	2.5
2022	2.4
2023	2.4
2024	2.3
2025	2.3
2026	2.3
2027	2.3
2028	2.4
2029	2.4
2030	2.4
2035	2.3
2040	2.2

Cyprus, taking into account the Commission Recommendation of 18.6.2019[50] (recommendation number 3 on energy efficiency) and in view of the need to increase the level of efforts to reach the Union's 2030 energy efficiency target, increases its ambition towards reducing both final and primary energy consumption in 2030 (indicative contribution to the EU 2030 energy efficiency), as shown in the table below.

Table 11. Comparison of final and primary energy between draft NECP and final NECP

Projections for 2030	Draft NECP	Final NECP	Increase in the level of ambition (reduction %)
Primary Energy Consumption	2.6	2.4	7.7%
Final Energy Consumption	2.2	2.0	9.1%

[50] Commission Recommendation of 18 June 2019 on the draft integrated National Energy and Climate Plan of Cyprus covering the period 2021-2030; document number C/2019/4413; published in the EU official journal C 297, 3.9.2019, p. 48–51; available at https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576057733043&uri=CELEX:32019H0903(13)

Table 12. Sectoral energy demand forecasts in years 2021-2040 - with planned Policies and Measures

Sectoral projections (Mtoe)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Primary Energy Consumption	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.2	2.2
Total final energy consumption	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2	2	2	2	2	2	2	2	2	2	2	2	2
Final energy consumption – industry	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Final energy consumption - households	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Final energy consumption - agriculture	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Final energy consumption – transport	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1	1	1	1	1	1	1
Final energy consumption - services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

Moreover, Cyprus has carried out complete projections and scenarios to allow assessing the expected impacts of the new planned policies, measures and programmes on primary and final energy consumption for each sector, at least until 2040, including an indicative trajectory from 2021 onwards. The results are shown in Table 12.

Under the PPM, Cyprus strengthened the focus on energy efficiency in the transport sector by increasing the span of measures related to this specific sector, considering that it would represent half of the energy consumed in the country in 2030. The list of measures in the transport sector are presented in Chapter 5 (impact assessment) and in paragraph 2.2 v below.

National indicative contributions for primary energy and final energy consumption in 2020

Based on the National Energy Efficiency Action Plan of 2017 (4th NEEAP 2017), Cyprus' national indicative target for energy efficiency was expressed in primary energy consumption of 2.2 Mtoe in 2020.

However, based on the latest modelling results, the anticipated level of national primary energy consumption in 2020 is estimated to be about 2.5 Mtoe.

More specifically, compared to the previous projections used in 4th NEEAP 2017, the latest projections of energy consumption have taken into account the following:

- The updated macroeconomic forecasts of the Ministry of Finance, which were published in September 2018. According to these, a stronger economic growth is foreseen up to 2030. For example, GDP in year 2020 is expected to reach € 21.7 bn (at 2010 prices) whereas the macroeconomic forecast that was used in 2017 reported a GDP of € 20,2bn (at 2010 prices) in 2020.
- The latest developments regarding the use of natural gas for power generation plants. According to the 4th NEEAP 2017, this was expected to happen by the end of 2018, whereas current government plans, supported by relevant contract preparations, show natural gas penetration happening in the last quarter of year 2021.

As stated in the 4th NEEAP 2017, a major reduction in primary energy consumption will be achieved through the switch from oil to natural gas in the power generation sector, which was planned to enter into the national energy mix by the end of 2018, and thus contribute to achieving the projected indicative level of 2.2 Mtoe. However, given that the aforementioned changes and latest developments show that natural gas penetration would happen in the last quarter of year 2021, the primary energy consumption for power generation in 2020 is now projected to reach 0.94 Mtoe, compared with 0.7 Mtoe in the 4th NEEAP 2017.

This explains why the anticipated level of primary energy consumption in 2020 will increase to about 2.5 Mtoe instead of 2.2 Mtoe. It should be noted that, taking into account the measures implemented in order to reduce end-use energy consumption by 2020 and based on the latest modelling results, the national projection included in the 4th NEEAP 2017 for indicative absolute level of final energy consumption of 1.9 Mtoe in 2020, can be achieved.

Methodology and conversion factors used

The methodology to forecast final energy demand is based on a simplified energy model that was developed at the National Technical University of Athens and used by Cyprus University of Technology (CUT). The model calculates future annual energy consumption in each major economic sector of Cyprus (agriculture, cement industry, other industry, households, services, road passenger transport, road freight transport and air transport) as a function of future macroeconomic variables and energy prices. It also calculates fuel shares in each sector, depending on technology costs (investment, operation, maintenance and fuel costs), the penetration potential of various technologies and technical constraints for the uptake of new technologies, and allows for computing of future final energy consumption by sector and fuel. Chapter IV of the study for Energy Efficiency Potential in Cyprus[51] describes the mathematical formulation for calculating aggregate energy demand by sector. Final energy demand was then converted to primary energy demand taking into account the conversion table of Annex IV of 2012/27/EE apart for electricity demand where the efficiency coefficients of Table 2.7 were used.

Energy Efficiency First Principle

The "Energy Efficiency First Principle" has been considered in the preparation of the final NECP by giving priority to policies and measures that improve the efficiency of the energy system and by taking into account that other decarbonisation measures can be considered only after energy efficiency actions are deemed unfeasible or very costly.

The PPM scenario is in line with the Energy Efficiency First Principle, for the following reasons:

- The measures of the PPM scenario are sufficient to comply with the energy efficiency obligations of the country as required in Article 7 of the Energy Efficiency Directive; this means that the appropriate measures have been taken into account.
- As a result of energy efficiency measures, the energy supply of Cyprus will be lower in comparison to that of the WEM scenario. This means that energy efficiency has indeed been given priority in comparison, for example, to stronger deployment of renewable energy.
- All cost-effective policies and measures that are related to energy efficiency have been included in the PPM scenario. As is being shown in the impact assessment, all these measures have a negative or near-zero total lifetime cost and are therefore cost-effective. Further, energy efficiency measures are not recommended to be deployed because they have a very high cost per tonne of carbon abated (e.g. the renovation of very old buildings to become nearly-zero energy buildings), or are considered to be unrealistic (e.g. an increase in the number of energy renovations of buildings up to 2030, which would reach unprecedented levels of refurbishments that would require very high financial and human resources to realize).

[51] http://www.mcit.gov.cy/mcit/EnergySe.nsf/All/B5969066F97FB710C22581D80035DB7F/$file/Study%20results-%20Developing%20a%20national%20Energy%20Efficiency%20Strategy%20up%20to%202050.pdf

- It is particularly important to note that the PPM scenario foresees energy efficiency measures in transport (modal shift towards public and non-motorized transport and electrification of cars) which involve very significant investments, at substantial levels for the size of the Cypriot economy. This underlines how strongly the Energy Efficiency First principle has been taken into account.
- Apart from the cost-effectiveness argument mentioned above, further prioritizing demand-side measures such as energy efficiency improvements, and would put Cyprus at risk of not meeting two main Energy Union objectives which are related to energy supply: the renewable energy target and the reduction in emissions of ETS sectors – which in the case of Cyprus is predominantly power generation. Therefore, measures in the electricity supply that have been foreseen in the PPM scenario are indeed those which are absolutely necessary for Cyprus to meet the above-mentioned commitments.
- As a result of the above considerations, energy efficiency measures in all end uses of the Cypriot economy, as foreseen in the PPM scenario and to the extent that they will be fully deployed, can greatly improve the security of energy supply of the country.
- The only further policy that is worth examining is the implementation of a green tax reform that would involve carbon pricing in non-ETS sectors of the Cypriot economy. Such a reform can indeed stimulate further improvements in energy efficiency and substitution of liquid fossil fuels by low- or zero-carbon energy forms. In September 2019 the Finance Minister announced that a green tax reform will be put in consultation in 2020 with the aim to adopting the relevant legal framework and implementing such a reform in 2021. However, considerations for the adoption of such a reform were still at an early stage by the time of finalising this report, so that it could not be considered as part of the government's Planned Policies and Measures. Decisions on green tax reform will be presented in the next NECP update.

Projects and Developments that could potentially increase energy consumption by 2030

The government is working towards the realization of its exploration program in the Exclusive Economic Zone of the Republic of Cyprus. The below projects, in case one or both are implemented, could potentially increase the primary and/or final energy consumption during the period 2020 – 2030:

- Production from the Aphrodite Field (Information presented is according to the approved Development Plan): Cyprus expects initial natural gas production from the Aphrodite field to begin in 2025. The field is estimated to produce 10 MMscfd (million standard cubic feet per day) for 18 years. There is no information on energy needs for the construction phase (2022 – 2025).
- Vasilikos Liquefied Natural Gas (LNG) Plant (Information regarding the energy needs are according to a 2013 pre-FEED study): At present, there are no sufficient quantities of natural gas to support the supply of an LNG Plant. However, exploration activities are ongoing and in case more gas discoveries are discovered, the LNG Plant may go forward. If the LNG Plant is decided to be materialised, it is not expected to commence operations before 2025. It is further expected that the LNG terminal would require a dedicated generation unit of approximately 200 MW.

As a result, it is estimated that if an LNG plant operates in Cyprus, an increase of at least 10-15% will occur in the projected national primary and final energy consumption by 2030. This will have a negative effect on achieving the national indicative targets for energy efficiency in 2030. Given the aforementioned uncertainties on its implementation and the quantities produced, currently an LNG plant cannot be incorporated in the national scenario with planned polices and measures.

5.4. Supplementarity relating to mechanisms under Article 6, 12 and 17, of the Kyoto Protocol

Within EU, supplementarity obligations under the Kyoto Protocol require that any international credit purchases by Member States must be in addition to emission abatement action taken domestically. The use of flexible mechanisms within the EU takes place by operators in the EU ETS and by governments in their achievement of Kyoto targets.

Cyprus did not have a Kyoto Protocol target for the 1st commitment period.

In general, in the EU the use of flexible mechanisms can take place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets.

The amended EU ETS Directive 2009/29/EC (Article 11a(8)) sets the upper limit for credit use for the period from 2008 to 2020 at a maximum of 50 % of the reduction effort below 2005 levels. This is further specified into installation-level limits in the Commission Regulation on international credit entitlements (RICE) (EU No 1123/2013). Since some entitlements are expressed as a percentage of verified emissions over the entire period, the overall maximum amount will only be known at the end of the third trading period.

Since 2013 it is no longer possible to track the use of flexible mechanisms in the EU ETS directly via information on the EUTL public website because CERs and ERUs are no longer surrendered directly but are exchanged into EUAs. These exchanges will become public on an installation level after three years[52]; however aggregated data at EU-level is available earlier.

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations. In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005. Member States that do not use their 3 % limit for the use of international credits in any specific year can transfer the unused part of their limit to another Member State or bank it for their own use until 2020. Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in Least Developed Countries (LDCs) and Small Island Developing States (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are not bankable and

[52] Annex XIV of European Commission. Commission Regulation (EU) No 389/2013. 2013. http://eurlex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R0389

transferable. Approximately 750 Mt of international credits can be used during the period from 2013 to 2020 in the ESD.

Cyprus will not use credits from flexible mechanisms for its ESD target. EU-ETS operators could use international credits subject to quantitative and qualitative limits.

According to the latest official GHG emission projections of Cyprus, Cyprus is expected to meet its annual ESD target without the use of international carbon credits, on the basis of the domestic policies and measures.

6. Provision of financial, technological and capacity-building support to developing country Parties

6.1. Finance

In 2015 the Republic of Cyprus the Republic of Cyprus, taking up its global responsibility, despite its size and its difficult financial situation at the time, decided to contribute to the Green Climate Fund the sum of €350.000[53]. The transfer of the contribution was completed in 2018. These resources were new and additional.

6.2. Technology development and transfer, capacity-building

Cyprus is located in the Eastern Mediterranean and Middle East region (EMME)[54] that is characterised as a global "climate hot-spot" with particularly high vulnerability to climate change impacts.

The Cyprus Government Initiative[55] builds upon the work that led to the International Conference held in Cyprus, in May 2018, which focused on "Climate Change in the Mediterranean and the Middle East". The Conference which was organized by the Cyprus Institute and placed under the aegis of the President of the Republic of Cyprus, drew international attention, attended by eminent scientists and policy makers (e.g. L. Fabius, P. Taalas, J. Sachs et. al.) from thirty countries as well as leaders of global stature. The principal conclusion of the Conference was that regional concerted action is urgently needed. It is noteworthy that all EMME countries have underlined their serious concerns about regional and national climate change impacts and expressed their willingness to comply with the Paris Agreement. The Cyprus Climate Change Initiative aims at the development of a Regional Action Plan to address the specific needs and challenges countries are facing in the EMME region, to address and ameliorate the impact of climate change and advance mitigation actions in accordance with the Paris Agreement.

[53] equivalent to $ 468,202.37 based on the reference exchange rates established for the Pledging Conference in 2014 (GCF/BM-2015/Inf.01/Rev.01).

[54] The EMME region is comprised of: Bahrain, Cyprus, Egypt, Greece, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Turkey and UAE.

[55] https://www.pio.gov.cy/assets/pdf/newsroom/2019/09/%CE%A0%CF%81%CF%8C%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%B1%20%CE%94%CF%81%CE%AC%CF%83%CE%B5%CF%89%CE%BD%20(1).pdf

The Initiative was presented by the President Nicos Anastasiades to several of his counterparts in the context of bilateral and trilateral meetings, as well as to all EMME Ambassadors in Nicosia by the Environment Minister Dr. Costas Kadis and the Foreign Minister Nikos Christodoulides earlier this year, and during bilateral meetings of Minister Kadis with several of his counterparts of the EMME region in the margins of the Abu Dhabi meeting. The Cyprus Government Initiative has also been communicated to stakeholders such as the EU and the Food and Agriculture Organization, and is receiving positive reaction from Capitals, both as regards content and value added of the specific focus.

To achieve the objective of developing a Regional Action Plan on Climate Action Coordination, a detailed work programme has been developed, consisting of two distinct components: a scientific and an intergovernmental component.

It is an on-going project of which results are expected in the summer of 2021, with the Adoption of a Regional Action Plan on Coordinating Climate Action.

7. Other reporting matters

No other matters to be reported.