



United Nations

FCCC/ARR/2013/MLT



Framework Convention on
Climate Change

Distr.: General
24 December 2013

English only

**Report of the individual review of the inventory submission
of Malta submitted in 2013***

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

GE.14-60021



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I. Introduction and summary

1. This report covers the review of the 2013 inventory submission of Malta, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The desk review took place from 16 to 20 September 2013 and was conducted by the following team of nominated experts from the UNFCCC roster of experts at their respective home offices: generalist – Mr. Sandro Federici (San Marino); energy – Mr. Ricardo Fernandez (European Union (EU)); industrial processes and solvent and other product use – Mr. Ole-Kenneth Nielsen (Denmark); agriculture – Mr. Nielsen; land use, land-use change and forestry (LULUCF) – Mr. Federici; and waste – Mr. Pavel Gavrilita (Republic of Moldova). Mr. Federici and Mr. Fernandez were the lead reviewers. The review was coordinated by Ms. Lisa Hanle (UNFCCC secretariat).

2. In accordance with the “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention” (hereinafter referred to as the UNFCCC review guidelines), a draft version of this report was communicated to the Government of Malta, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next inventory submission, unless otherwise specified.

3. In 2011, the main greenhouse gas (GHG) in Malta was carbon dioxide (CO₂), accounting for 88.1 per cent of total GHG emissions¹ expressed in CO₂ equivalent (CO₂ eq), followed by methane (CH₄) (5.5 per cent), hydrofluorocarbons (HFCs) (4.4 per cent) and nitrous oxide (N₂O) (1.7 per cent). Perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) collectively accounted for 0.3 per cent of the overall GHG emissions in the country. The energy sector accounted for 88.8 per cent of total GHG emissions, followed by the industrial processes sector (4.7 per cent), the waste sector (4.2 per cent), the agriculture sector (2.3 per cent) and the solvent and other product use sector (0.04 per cent). Total GHG emissions amounted to 3,021.19 Gg CO₂ eq and increased by 50.6 per cent between the base year and 2011. The expert review team (ERT) concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable; however, percentages of specific GHG contribution to total emissions reported in the NIR (page XIV) are not correct (for general issues related to quality assurance/quality control (QA/QC), see table 3).

4. Tables 1 and 2 show GHG emissions under the Convention, by gas and by sector, respectively. In table 1, CO₂, CH₄ and N₂O emissions do not include emissions and removals from the LULUCF sector.

¹ In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO₂ eq excluding LULUCF, unless otherwise specified.

Table 1
Greenhouse gas emissions by gas, 1990 to 2011

Greenhouse gas	Gg CO ₂ eq								Change 1990–2011 (%)
	1990	1995	2000	2005	2008	2009	2010	2011	
CO ₂	1 865.50	2 213.03	2 345.19	2 704.03	2 715.63	2 628.48	2 640.62	2 663.09	42.8
CH ₄	91.11	104.70	125.00	139.88	157.99	167.21	175.38	167.36	83.7
N ₂ O	49.94	59.15	61.00	58.51	55.72	54.35	51.90	50.42	1.0
HFCs	NA, NE, NO	NA, NE, NO	8.29	64.51	116.73	120.34	121.61	132.18	NA
PFCs	NA, NE, NO	NA, NE, NO	0.00	23.39	12.93	7.02	6.63	3.34	NA
SF ₆	0.01	1.51	1.54	1.64	1.83	1.57	1.78	4.81	43 055.2

Abbreviations: NA = not applicable, NE = not estimated, NO = not occurring.

Table 2
Greenhouse gas emissions by sector, 1990 to 2011

Sector	Gg CO ₂ eq								Change 1990–2011 (%)
	1990	1995	2000	2005	2008	2009	2010	2011	
Energy	1 878.10	2 226.04	2 360.56	2 722.43	2 734.83	2 647.29	2 659.62	2 681.65	42.8
Industrial processes	0.33	3.21	10.11	89.92	131.66	129.17	130.24	140.57	42 747.9
Solvent and other product use	2.48	2.48	3.01	2.26	2.10	1.60	1.29	1.31	–47.3
Agriculture	87.81	93.83	102.95	93.58	86.45	83.26	78.04	70.90	–19.3
LULUCF	–56.54	–56.54	–55.91	–57.08	–58.86	–58.87	–59.67	–59.67	5.5
Waste	37.84	52.81	64.40	83.76	105.77	117.64	128.73	126.76	235.0
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	1 950.02	2 321.85	2 485.12	2 934.88	3 001.96	2 920.09	2 938.24	2 961.52	51.9
Total (without LULUCF)	2 006.56	2 378.38	2 541.03	2 991.95	3 060.82	2 978.96	2 997.92	3 021.19	50.6

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

5. The 2013 annual inventory submission was submitted on 12 April 2013 (the common reporting format (CRF) tables) and 15 April 2013 (NIR); it contains a complete set of CRF tables for the period 1990–2011 and an NIR. The inventory submission was submitted in accordance with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines).

6. The full list of materials used during the review is provided in annex I to this report.

2. Overall assessment of the inventory

7. Table 3 contains the ERT’s overall assessment of the inventory submission of Malta. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3

The expert review team’s overall assessment of the inventory submission

<i>General findings and recommendations</i>		
The expert review team’s (ERT’s) findings on completeness of the 2013 inventory submission		
Non-land use, land-use change and forestry ^a	Not complete	<p>Mandatory: “NE” is reported for CO₂, CH₄ and N₂O emissions from gasoline consumption in navigation (1990–2004); CH₄ and N₂O emissions from biomass consumption in residential; CO₂, CH₄ and N₂O emissions from all fuels in agriculture/forestry/fisheries (1990–2001); CO₂ emissions from lime production (1990–1994); and direct soil N₂O emissions for N-fixing crops and crop residue. The ERT recommends that Malta estimate emissions for these categories in order to ensure completeness and/or time-series consistency</p> <hr/> <p>Non-mandatory: “NE” is reported for CO₂ emissions for several fuels in reporting using the reference approach (ethane, naphtha, bitumen, lubricants, petroleum coke and refinery feedstocks, coking coal, other bituminous coal, peat, brown coal and patent fuel, coke oven gas, solid biomass and gas biomass); feedstocks and non-energy use of fuels; CO₂ and CH₄ emissions from distribution of oil products; AD for road paving with asphalt (1990–1994); potential emissions of HFCs, PFCs and SF₆ from various categories; and N₂O emissions from aerosol cans</p>

<i>General findings and recommendations</i>		
Land use, land-use change and forestry ^a	Not complete	<p>Mandatory: “NE” is reported for carbon stock change in living biomass, dead organic matter and mineral soils for other land converted to forest land; net carbon stock change in living biomass (2003, 2004, 2006 and 2010) and soils (2003, 2004 and 2006) for other land converted to cropland; and biomass burning on cropland remaining cropland. Further, some categories and pools reported as “NO” but the ERT has reason to believe the correct notation key is “NE” (see paras. 71 and 75 below). The ERT recommends that Malta estimate emissions in order to ensure completeness</p> <hr/> <p>Non-mandatory: none</p>
The ERT’s findings on recalculations and time-series consistency in the 2013 inventory submission	Generally not consistent	<p>The ERT identified several issues related to time-series consistency, in multiple sectors:</p> <ul style="list-style-type: none"> • There is incomplete reporting of the time series of emissions in the energy and industrial processes sectors (see paras. 50 and 51 below) and inconsistent reporting in the energy and agriculture sectors (see paras. 19, 56 and 66 below); • Inconsistent land representation over time (see para. 74 below)
The ERT’s findings on verification and quality assurance/quality control procedures in the 2013 inventory submission	Not sufficient	<p>No information has been provided as to whether the inventory data are subject to any verification or independent review procedures. Malta affirmed that to date no formal QA/QC plan and no documentation have been completed. The ERT reiterates the recommendation made in the previous review report that Malta develop a QA/QC plan, in particular tier 1 QC procedures, and provide information on the QA/QC plan in the NIR (see paras. 17, 18, 27, 38, 42, 55, 76 and 83 below)</p>
The ERT’s findings on the transparency of the 2013 inventory submission	Sufficient	<p>Although the energy sector is generally transparent, the ERT identified several issues related to transparency in multiple sectors, including in the provision of background data used to support the calculation of emissions in the industrial processes, agriculture, land use, land-use change and forestry and waste sectors (see paras. 43, 54, 77, and 86–88 below)</p>

Abbreviations: AD = activity data, EF = emission factor, N = nitrogen, NE = not estimated, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control.

^a The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default EFs are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

8. The NIR described the institutional arrangements for the preparation of the inventory. According to the NIR, the first national inventory of emissions and removals of GHGs was carried out by the University of Malta and covered the period from 1990 to 2000. In 2001, the Malta Environment and Planning Authority (MEPA) was entrusted with the responsibility of compiling the national GHG inventory until 2010. As of 2011, the Malta Resources Authority (MRA) has overall responsibility for the national inventory. The National Emissions Inventory Team within the Climate Change and Policy Unit at MRA has been delegated the main responsibility for managing the inventory compilation system from data collection, through data management, to the preparation and submission of reports. During the review, the ERT was not provided with the requested additional information on institutional arrangements and inventory planning, preparation and management. Considering the large number of categories not estimated in the energy, industrial processes and LULUCF sectors and the inconsistencies between methods in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and methodologies applied for estimating GHG emissions and removals in the energy and LULUCF sectors, the ERT recommends that Malta strengthen and enhance its institutional arrangements for GHG inventory compilation in terms of both institutional framework and technical capacity. Further, the ERT encourages the Party to explore the possibility of receiving assistance from the EU, through EU-financed activities and/or technical services of the European Commission, or, for example, to set up a twinning programme with another EU member State for mutual support in inventory planning and other activities.

Inventory preparation

9. Table 4 contains the ERT's assessment of Malta's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Malta

<i>General findings and recommendations</i>		
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> (hereinafter referred to as the IPCC good practice guidance) and the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i> (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	No	
Does the Party use the key category analysis to prioritize inventory improvements?	No	The ERT noted that Malta does not use the key category analysis to improve the inventory. The Party indicated that it plans to improve categories based on resource availability. The ERT reiterates the recommendation made in the previous review report that Malta use the results of the key category analysis to prioritize the development and improvement of the inventory and report on this process in the NIR
Are there any changes to the key category analysis in the latest submission?	Yes	CO ₂ emissions from other transportation (transport) of liquid fuels and CH ₄ emissions from manure management for dairy cattle have become key categories in the latest inventory submission (see para. 60 below)
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out consistent with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes, generally	Malta has not reported the sources of the values used to calculate uncertainty of AD and EFs at the category level (see paras. 20, 42, 55 and 77 below) or explained how the uncertainty analysis is used to prioritize inventory improvements. The ERT reiterates the recommendation made in the previous review report that Malta improve the transparency of the uncertainty analysis by including information on the assumptions used to calculate the uncertainty

General findings and recommendations

of AD and EFs at the category level and provide information to explain how the uncertainty analysis is used to prioritize further inventory improvements

Quantitative uncertainty (including LULUCF)	Level = 4.8%
	Trend = 6.6%

Quantitative uncertainty (excluding LULUCF)	Not provided
	Not provided

Abbreviations: AD = activity data, EFs = emission factors, ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

10. The information provided in the NIR on the inventory preparation process is rather limited in terms of the description of the allocation of specific responsibilities in the inventory development process, including those related to the choice of methods, and the processing, archiving and approval of the inventory. The ERT recommends that Malta provide more detailed information on the inventory preparation process.

Inventory management

11. Malta does not yet have a centralized archiving system and the information on archiving in the NIR is limited. In response to a question raised by the ERT during the review, Malta explained that the activity data (AD) and emission factors (EFs) used are logged in an Excel spreadsheet and given a unique data identifier. The ERT reiterates the recommendation made in the previous review report that Malta provide further information on current practices relating to data collection, data assessment and archiving, including documentation on QA/QC procedures.

4. Areas for further improvement identified by the expert review team

12. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report.

B. Energy

1. Sector overview

13. The energy sector is the main sector in the GHG inventory of Malta. In 2011, emissions from the energy sector amounted to 2,681.65 CO₂ eq, or 88.8 per cent of total GHG emissions. Since 1990, emissions have increased by 42.8 per cent. The key drivers for the rise in emissions are higher electricity production and road transportation demand. Within the sector, 72.3 per cent of the emissions were from energy industries, followed by 21.1 per cent from road transportation, 3.9 per cent from other sectors (particularly residential and commercial) and 2.7 per cent from manufacturing industries and construction.

14. The NIR provides transparent information on the methods and EFs used to estimate GHG emissions. Tier 1 methods and default EFs from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) were generally used for all subcategories, with the exception of public electricity and heat production, where plant-specific AD were used to estimate emissions (see para. 29 below). The ERT recommends that Malta implement, or start developing a plan to implement, higher-tier methods for estimating emissions from its key categories, in line with the IPCC good practice guidance, and to report on any progress in the NIR.

15. During the review, the ERT asked Malta to clarify the criteria and/or rationale for using the 2006 IPCC Guidelines for some categories (without justification in the NIR) and the Revised 1996 IPCC Guidelines for other categories. In response to the questions raised by the ERT during the review, the Party stated that the choice depended on the availability of EFs. As recommended in previous review reports, the transparency of Malta's NIR could be improved by: including justifications for the decision to use default EFs from the 2006 IPCC Guidelines, where relevant; and implementing and reporting a comparison of country-specific EFs with the IPCC default EFs. The ERT notes that the UNFCCC reporting guidelines state that all Parties included in Annex I to the Convention (Annex I Parties) shall use the Revised 1996 IPCC Guidelines and the IPCC good practice guidance

to estimate and report GHG emissions and removals by sinks. The ERT recommends that Malta endeavour to follow the UNFCCC reporting guidelines in order to improve the comparability of its emission estimates with those of other Annex I Parties.

16. In addition, the format for reporting is not always comparable with other Parties. For example, the level of disaggregation of emissions from manufacturing industries and construction is not consistent with the UNFCCC reporting guidelines, because emissions are reported for all industry combined and not by major subcategory. In addition, Malta uses the notation key “NA” (not applicable) for categories not occurring in the country, where the notation key “NO” (not occurring) should be used. The ERT reiterates recommendations made in previous review reports that Malta allocate AD and emissions to the appropriate subcategories, in order to improve the comparability of its emission estimates with those of other Annex I Parties. The ERT also recommends that the Party change the notation key “NA” to “NO” in all instances where emissions do not occur in the country.

17. Malta did not provide a QA/QC plan for the energy sector. In response to questions raised by the ERT during the review, the Party explained that it is considering the implementation of a QA/QC system. The ERT notes that according to the UNFCCC reporting guidelines, each Annex I Party shall elaborate an inventory QA/QC plan and implement general inventory QC procedures (tier 1) in accordance with its QA/QC plan following the IPCC good practice guidance. In addition to these tier 1 procedures, Annex I Parties should also apply category-specific QC procedures (tier 2) for key categories and for those individual categories in which significant methodological changes and/or data revisions have occurred, in accordance with the IPCC good practice guidance. The ERT strongly recommends that Malta elaborate a QA/QC plan for the energy sector (which accounts for almost 90 per cent of total GHG emissions in the country) as required by the UNFCCC reporting guidelines.

18. In response to questions raised by the ERT during the review regarding data available to estimate GHG emissions, Malta explained that the verified reports from the EU emissions trading system (ETS) are available to the Malta Resource Authority. In addition, the Maltese energy balance compiler has access to the same EU ETS reports. The ERT considers that the quality of the inventory is strengthened when the energy balance compilers have access to all plant-specific AD from the EU ETS, and the GHG inventory compilers have access to the background data from the energy balance. The ERT commends Malta for this consistency and transparency. However, the category-specific QA/QC procedures performed on the data are not adequately described in the NIR. The ERT recommends that the Party improve the description in the NIR of the category-specific QA/QC activities performed on its AD data, with the objective of better understanding the links between the EU ETS, the energy balances and the data reported in the CRF tables. This additional information should be clear and concise, to the extent possible. Finally, the ERT further recommends that Malta include copies of its national energy balance for the latest reported year, outlining the final energy consumption by sector.

19. The ERT has identified a few instances where the time series was not consistent for a number of categories (e.g. there have been changes in data source providers for international bunker activities and access to new AD for public electricity and heat production). In addition, recommendations made in the previous review report included that Malta provide information on how the consistency of the time series would be ensured in the 2013 inventory submission. The current ERT did not find any information on this in the 2013 NIR. During the review, the ERT asked Malta to clarify whether it has any plans to improve the time-series consistency of its emission estimates in the near future. The Party responded that this would be considered. The ERT recommends that Malta improve its time-series consistency and/or report on how this consistency would be achieved. The ERT

further recommends that the Party explain whether time-series consistency is being affected by changes in Malta’s institutional arrangements, as described in paragraph 8 above.

20. Malta reported relatively low uncertainties in the AD in table A7-0-1 of annex 7 to the NIR. For example, the uncertainty for AD in energy industries is 1.0 per cent, and the uncertainty for industrial users and residential and commercial consumption is 5.0 per cent. The ERT notes that the statistical difference in the energy data reported to Eurostat is very large, and accounted for 20.0 per cent of gross inland consumption in 2011 (excluding international shipping). During the review, the ERT asked the Party to try to explain any potential reasons for such low uncertainty values in the AD reported in the NIR. Malta explained that it will investigate this issue with its National Statistics Office. The ERT is aware that statistical differences in the energy balance are not directly comparable with uncertainties in the AD reported at a more disaggregated level. However, the ERT recommends that Malta explain, and where appropriate review, the large discrepancies related to accuracy in the AD reported in its inventory compared with its energy balance.

21. The ERT notes that many of the recommendations made in the previous review report have not been implemented. The ERT also notes that the report was published on 14 March 2013. It recommends that Malta endeavour to implement the recommendations made in the annual inventory reviews. The ERT notes that prompt implementation of the recommendations would also help the Party to be as prepared as possible for the next commitment period.

2. Reference and sectoral approaches

22. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 23–28 below.

Table 5
Review of reference and sectoral approaches

		<i>General findings and recommendations</i>
Difference between the reference approach and the sectoral approach	Energy consumption: –1.38 PJ, –4.31% CO ₂ emissions: –104.39 Gg CO ₂ , 3.9%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	See paragraph 23 below
Are differences with international statistics adequately explained?	No	See paragraphs 24–26, 28, 35 and 37 below
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Not clear	See paragraph 28 below

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

23. Malta estimated CO₂ emissions from fossil fuel combustion using the reference approach for 2009, 2010 and 2011, but not for earlier years. The ERT notes that the energy balance is reported to Eurostat for all years of the time series. It also notes that differences above 2.0 per cent between the reference and sectoral approaches are not clearly explained in the NIR. The ERT reiterates the recommendations made in previous review reports that the Party estimate CO₂ emissions using the reference approach for all years of the time series. The ERT also recommends that the Party explain differences in CO₂ emissions which are above 2.0 per cent.

24. Fuel imports of secondary oil products reported to Eurostat (107,304.00 TJ) are significantly higher than fuel imports reported in the CRF tables (92,671.99 TJ) in 2011. Also, the total apparent consumption reported to Eurostat was 47,185.00 TJ (after excluding marine bunkers) in 2011, compared with 33,928.85 TJ reported in the CRF tables. In response to questions raised by the ERT during the review, the Party explained that Eurostat includes international aviation fuel consumption as part of the inland fuel consumption. The ERT is aware of this reporting difference but notes that it would only account for the smaller part of the discrepancy in total energy consumption. The ERT recommends that the Party investigate these differences and report on the reasons for the discrepancies in the reporting of fuel imports and total energy consumption, or reconcile these differences.

25. Malta reported to Eurostat some quantities of petroleum products for export. In response to questions raised by the ERT during the review, the Party explained that energy exports do not occur in Malta, with the exception of international bunker operations and non-combustion energy use on marine vessels. The ERT notes that exports in the energy balance are separate from international marine bunkers. The ERT also notes that non-energy consumption has been reported to Eurostat and that this is part of Malta's gross inland energy consumption (see para. 24 above). The ERT recommends that Malta investigate the apparent discrepancy in fuel exports, reconcile it where appropriate and report on any progress in its NIR.

26. During the review, Malta was asked to give an indication of the quality of the energy balance reported to Eurostat under the EU Energy Statistics Regulation. The ERT considers that this would provide valuable information about the appropriateness of the comparisons between energy data reported in the CRF tables and energy data reported internationally. Malta responded that there are numerous validation checks during the compilation of the energy balance and that a good metadata quality system is in place. The ERT therefore recommends that Malta make any reasonable effort to reconcile the differences between the energy data reported in the CRF tables and the energy data reported to Eurostat.

International bunker fuels

27. The consumption of international bunker fuels is very high in Malta and accounted for 59,934.25 TJ in 2011. Of this, 55,308.08 TJ corresponded to marine bunkers and 4,626.18 TJ corresponded to aviation bunkers. The total apparent consumption was 33,928.85 TJ in the reference approach and 35,339.75 TJ in the sectoral approach. The size of international bunker activities therefore outweighs own energy consumption in the country. In addition, and as explained above, data reported internationally are not fully consistent with the data reported in the CRF tables. The ERT recommends that Malta use verification techniques, as explained in the IPCC good practice guidance, to help to

establish the inventory's reliability regarding energy trade (e.g. fuel imports, exports and bunkers). In addition, the ERT recommends that the Party make use of additional sources of information, such as Eurocontrol, as a supplementary QA activity regarding the fuel allocation for domestic and international uses based on higher-tier methods.

Feedstocks and non-energy use of fuels

28. The NIR indicates that there are no feedstocks or non-energy use of fuels in Malta. During the review, the ERT requested information on how Malta accounts for the use of lubricants in transport and the use of bitumen for road paving, and noted that Malta reported 246.00 TJ of industrial non-energy consumption to Eurostat for 2011. In response to questions raised by the ERT during the review, the Party explained that lubricants and bitumen are not used in Malta and that differences in reporting to Eurostat and to the UNFCCC secretariat were due to different methodological approaches. The ERT recommends that Malta increase the transparency in the reporting of feedstocks and non-energy use of fuels, both in the CRF tables and in the NIR, by providing verifiable information that lubricants in transport (including disposal) and bitumen for road paving are not used in the country. The ERT also recommends that Malta clarify the reporting of non-energy use of fuels for industrial purposes to Eurostat.

3. Key categories

Stationary combustion: liquid fuels – CO₂, CH₄ and N₂O²

29. Malta has been using AD from the two local power plants to estimate emissions from public electricity and heat production since 2005. The two plants are included in the EU ETS and account for almost two thirds of total GHG emissions in the country. However, Malta uses default EFs from the Revised 1996 IPCC Guidelines for the entire time series. During the review, the ERT asked the Party to explain the reason for using IPCC default EFs instead of plant-specific EFs from the EU ETS verified reports for the relevant fuels, namely, gas oil and residual fuel oil. Malta explained that plant-specific EFs were not available for the entire time series. The ERT notes that the same power plants using similar fuels were also operational during the 1990s. In fact, during the review Malta explained that one of the plants was already operational in 1990 and used coal, heavy fuel oil (HFO) and gas oil. The other plant was commissioned in 1992 and used HFO and gas oil. Malta also indicated that coal use was discontinued in 1995. In addition, Malta used IPCC default net calorific values (NCVs) and oxidation factors (OXs) for the period 1990–2008, but used plant-specific NCVs and a 100 per cent OX from the EU ETS verified reports from 2009 onwards. The ERT notes that full oxidation is consistent with both the 2006 IPCC Guidelines and the EU Monitoring and Reporting Guidelines³ under the EU ETS, but not with the current Revised 1996 IPCC Guidelines. In order to improve the comparability, accuracy and time-series consistency of its emission estimates, the ERT recommends that Malta:

- (a) Use the plant-specific emission and OXs as well as the NCVs available from the annual EU ETS reports as far back as possible;

² Not all emissions related to all gases under this category are key categories, particularly CH₄ and N₂O emissions. However, since the calculation procedures for the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

³ EU Commission Regulation No. 601/2012 on the monitoring and reporting of GHG emissions pursuant to Directive 2003/87/EC of the European Parliament and the Council. 21 June 2012. Available at <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF>>.

(b) Consider using the averages of these factors for the period 1990–2004, while duly considering the fuel mix;

(c) Report these estimates, including any relevant information such as NCVs, OXs, EFs and AD used in the estimation of emissions, in the NIR.

30. Malta reported all emissions from manufacturing industries and construction under other (manufacturing industries and construction). According to the NIR, the AD reported by the Party were obtained directly from fuel suppliers and distributors. During the review, the ERT asked Malta to provide an explanation for not allocating fuel consumption by industry in the CRF tables. The Party explained that disaggregated data at the subcategory level were not provided by the suppliers and distributors. The ERT reiterates recommendations made in previous review reports that Malta allocate AD and emissions to the appropriate subcategories, in line with the UNFCCC reporting guidelines, in order to improve comparability with other Annex I Parties.

31. According to the NIR, emissions from biodiesel used in manufacturing industries and construction have been reported under biomass. In response to questions raised by the ERT during the review, Malta confirmed that both the fossil and biomass fractions of biodiesel are reported as biomass and that all CO₂ emissions from biodiesel are therefore excluded from the national GHG totals. In addition, Malta indicated that all biodiesel blends are permitted for use in Malta, ranging from B0 to B100, with the exception of road transportation, where the maximum blend allowed is 7.0 per cent. The ERT recommends that the Party report the AD and emissions from the biogenic fraction of biodiesel under biomass and the fossil fraction under liquid fuels.

32. Malta reported a consumption of liquid fuels used in manufacturing industries and construction of about 981.24 TJ in 2011. The energy consumption reported to Eurostat was close to zero after excluding electrical energy for the same year. In response to questions raised by the ERT during the review, Malta explained that all suppliers were requested to provide information on their sales and that this information was reported in the CRF tables. The ERT recommends that Malta investigate these differences and report in the NIR on the reasons for the apparent discrepancies in final industrial consumption.

Road transportation: liquid fuels – CO₂

33. Malta used a default EF (18.90 t C/TJ or 69.30 t CO₂/TJ) from the Revised 1996 IPCC Guidelines to estimate CO₂ emissions from gasoline used in road transportation. This IPCC CO₂ EF for gasoline is among the lowest of the EFs used by other Annex I Parties (ranging from 68.00 to 76.07 in 2011). The ERT noted that the default carbon EF from table 1–1 of the Revised 1996 IPCC Guidelines used by Malta in its calculations refers to a more general default value for calculations made using the reference approach. In response to questions raised by the ERT during the review, Malta explained that there is no precise, validated information from the fuel suppliers on the carbon content and NCVs in the country. The ERT noted that, according to the IPCC good practice guidance (chapter 2.1.1.2), when traded fuels are in common circulation it is good practice to obtain the carbon content of the fuels and the NCVs from the fuel suppliers and to use local values wherever possible. The ERT recommends that the Party obtain data on the NCVs and carbon content from the fuel suppliers in order to develop and use a more accurate EF when estimating CO₂ emissions from gasoline. If such data are not available, the ERT recommends that Malta use the default CO₂ EF of 73.00 t CO₂/TJ from table 1-36 of the reference manual of the Revised 1996 IPCC Guidelines, as this is the recommended default value applicable to European gasoline passenger cars.

34. Malta reported CO₂ emissions from biodiesel consumption in road transportation under biomass. In response to questions raised by the ERT during the review, Malta

confirmed that CH₄ and N₂O emissions are reported as part of diesel and that CO₂ is not included in national GHG totals. Malta also indicated that there is a restriction on biodiesel blends for road transportation to be compliant with EN 590 specifications to be sold in the EU. This allows for a blending of up to 7.0 per cent of biodiesel with conventional diesel. The ERT recommends that the Party report AD and emissions from the biogenic fraction of biodiesel under biomass and the fossil fraction under liquid fuels. The ERT notes that, given the blending of up to 7.0 per cent, at least 93.0 per cent of biodiesel consumption should be reported under liquid fuels and not under biomass.

35. The quantity of diesel oil in road transportation reported by Malta in CRF table 1.A was 3,682.74 TJ in 2011. The quantity of diesel oil reported to Eurostat was approximately 4,047.00 TJ in the same year. In response to questions raised by the ERT during the review, Malta explained that the significantly higher value reported to Eurostat was due to different methodological approaches. The Party also indicated that efforts are under way to align the two methodologies and to report a common sectoral fuel consumption for international reporting. The ERT recommends that Malta improve the consistency of the AD reported in the CRF tables with the energy statistics reported internationally, and report on any progress in the NIR.

36. Malta uses tier 1 methods to estimate emissions of CH₄ and N₂O from road transportation. During the review, the ERT asked the Party whether it has considered implementing higher-tier methods for estimating CH₄ and N₂O emissions from road transportation, such as the customized country-specific tier 3 model used to report under the Convention on Long-range Transboundary Air Pollution. Malta responded that it is considering the implementation of the COPERT IV model, subject to the availability of input AD. The ERT recommends that Malta investigate the possible implementation of the COPERT IV model, which would improve the accuracy of non-CO₂ emission estimates, and report on any progress in the NIR.

Other sectors: liquid fuels – CO₂ emissions

37. The consumption of liquid fuels in other sectors reported in the CRF tables was about 1,551.51 TJ in 2011. The final consumption reported to Eurostat (excluding electrical energy) was approximately 874.00 TJ in the same year. As with industrial consumption and road transportation, Malta indicated that efforts are under way to align the different methodologies used in order to report common sectoral consumption numbers. The ERT again recommends that Malta improve the consistency of the AD reported in the CRF tables with the energy statistics reported internationally, and report on any progress in the NIR.

4. Non-key categories

Civil aviation: liquid fuels – CO₂, CH₄ and N₂O

38. Malta uses a tier 1 method to estimate emissions from civil aviation based on fuel data provided by aviation fuel suppliers. In response to questions raised by the ERT during the review, the Party indicated that it has not compared the total fuel consumption with other sources, such as Eurocontrol. As mentioned in paragraph 27 above, the ERT recommends that the Party make use of additional sources of information, such as Eurocontrol, which is based on higher-tier methods, as a supplementary QA activity to verify the fuel allocation for domestic and international uses.

Other (energy): liquid fuels – CO₂, CH₄ and N₂O

39. Malta reported the notation key “NA” for both stationary and mobile under this category. During the review, the ERT asked the Party to explain whether any emissions

from mobile or stationary military fuel combustion occurred in the country. Malta explained that fuel combustion from military use is accounted for under transport. The ERT recommends that the Party report these emissions under the subcategory other (energy), in line with the Revised 1996 IPCC Guidelines. If this is not possible for confidentiality reasons, the ERT recommends that Malta change the notation key from “NA” to “IE” (included elsewhere), and to include the relevant explanation in the NIR.

Oil and natural gas: liquid fuels – CO₂ and CH₄

40. The NIR indicates that Malta has “limited possibilities for fugitive emissions”. With the exception of distribution of oil products, where “NE” (not estimated) is reported, all the values reported in CRF table 1.B.2 are “NO”, suggesting that no fugitive emissions occur in the country. In response to questions raised by the ERT during the review, the Party indicated that oil products are distributed to the final user via private distributors or petroleum filling stations. Malta also explained that part of the imported oil is stored in the country before distribution. The ERT notes that although Malta has an oil distribution network, there are no methods from the Revised 1996 IPCC Guidelines to estimate emissions from the distribution of the imported refined oil products (gasoline, diesel, kerosene, residual fuel oil and liquefied petroleum gas). The ERT encourages the Party to estimate emissions for oil distribution and improve the description in the NIR of fugitive emissions, for example, by explaining succinctly how the imported refined oil products arrive in the country and are distributed to the end consumers.

C. Industrial processes and solvent and other product use

1. Sector overview

41. In 2011, emissions from the industrial processes sector amounted to 140.57 Gg CO₂ eq, or 4.7 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 1.31 Gg CO₂ eq, or 0.04 per cent of total GHG emissions. Since 1990, emissions have increased by 42,747.9 per cent in the industrial processes sector and decreased by 47.3 per cent in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is increasing emissions of HFCs from refrigeration and air-conditioning equipment. Within the industrial processes sector, 99.8 per cent of the emissions were from consumption of halocarbons and SF₆, followed by 0.1 per cent each from mineral products and chemical industry. Metal production, other production and production of halocarbons and SF₆ are reported as “NA” or “NO”.

42. The ERT did not identify any information in the NIR on sector-specific QA/QC procedures or on the sectoral uncertainty analysis. In response to questions raised by the ERT during the review, Malta informed the ERT that the lack of QA/QC procedures was the case for most inventory sectors. The ERT strongly recommends that Malta develop and implement QA/QC procedures for the industrial processes and solvent and other product use sector and provide information on the uncertainty of this sector.

2. Key categories

Consumption of halocarbons and SE₆ – HFCs and PFCs⁴

43. The sectoral background tables in the CRF tables for the reporting of fluorinated gases (F-gases) (table 2(II).F) have not been completed. In response to a question raised by the ERT during the review, Malta informed it that the data required to be included in these tables are mostly unavailable. The ERT notes that this is not in line with the UNFCCC reporting guidelines and considers that this significantly reduces the transparency of the inventory and limits the possibility of conducting a thorough review. The ERT strongly recommends that Malta collect the necessary data to complete the background information tables in accordance with the UNFCCC reporting guidelines.

44. Malta uses the tier 1 method from the 2006 IPCC Guidelines for estimating emissions from refrigeration and air conditioning. However, since this category is identified as a key category, it is good practice to use a tier 2 methodology. In response to a question raised by the ERT during the review, Malta informed it that a service agreement has been signed with a consultant to develop a better methodology, including the move to a tier 2 methodology. The ERT strongly recommends that Malta proceed with this project and report on the status in the NIR.

45. Based on the NIR, it is not clear how F-gases imported in products have been considered in the inventory, for example, imported vehicles with air conditioning, aerosols and metered dose inhalers. In response to a question raised by the ERT during the review, Malta informed it that no AD have yet been identified where F-gases imported in products can be quantified and that the calculation is based only on bulk imports. The ERT recommends that Malta, as part of the planned project discussed in paragraph 44 above, consider the import of F-gases in products and report on this in the NIR.

46. Malta has reported perfluorooctane emissions from semiconductor manufacture and emissions of 1,1,1,3,3-pentafluorobutane from foam blowing. Neither of these substances has global warming potential (GWP) values adopted by the Conference of the Parties and hence they should be reported separately from the national total in accordance with the UNFCCC reporting guidelines. In response to a question raised by the ERT during the review, Malta indicated that the issue would be corrected in the 2014 inventory submission. The ERT recommends that Malta report F-gases for which there are no agreed GWP values separately from the national total (e.g. in CRF table 9(b)) in accordance with the UNFCCC reporting guidelines.

3. Non-key categories

Lime production – CO₂

47. In the previous review report, it was recommended that Malta estimate and report emissions from lime production for the years 1990–1994. In the 2013 inventory submission, the NIR stated that the average lime production between 1995 and 1997 has been used to extrapolate production back to 1990. However, neither the AD nor emissions are reported in the CRF tables. In response to a question raised by the ERT during the review, Malta informed it that the CRF tables would be corrected for the next inventory submission. The ERT reiterates the recommendation made in the previous review report that Malta report the AD and emissions for lime production for 1990–1994.

⁴ Not all emissions related to all gases under this category are key categories, particularly PFC emissions. However, since the calculation procedures for the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

Limestone and dolomite use – CO₂

48. Malta does not report any use of limestone and dolomite in the CRF tables. During the review, the ERT enquired whether there was production of ceramics in Malta. In response, Malta informed the ERT that no ceramics production is believed to occur in Malta. However, the ERT notes that at least one company (Bristow Potteries Ltd.) in Malta seems to produce ceramic products. Furthermore, the ERT notes that carbonates are used in a wide range of activities in addition to ceramics manufacture, such as glass manufacture, flue gas desulphurization and water treatment. The ERT recommends that Malta investigate the extent of the use of carbonates in the production of ceramics, calculate emissions, if appropriate, and report on the result in the NIR. Furthermore, the ERT also recommends that Malta investigate whether carbonates other than soda ash are used in glass production and whether carbonates are used for any other processes where CO₂ is released to the atmosphere.

Soda ash production and use – CO₂

49. The NIR states that it is assumed that only 95.0 per cent of the imported soda ash is used and the calculated emissions are therefore multiplied by 0.95. In response to a question raised by the ERT during the review, Malta clarified that the explanation in the NIR is wrong and that 100 per cent utilization is assumed in the inventory. The ERT recommends that Malta correct the description in the NIR.

Road paving with asphalt – CO₂ and non-methane volatile organic compounds

50. As noted in the previous review report, Malta has reported the AD for road paving with asphalt as “NE” for the period 1990–1994 in CRF tables 2(I).A–G and the associated CO₂ emissions as “NA”. In response to a question raised by the ERT during the review, Malta informed it that the time series would be completed for the next inventory submission. The ERT reiterates the recommendation made in the previous review report that Malta estimate and report the AD, if necessary by extrapolation, and the associated emissions.

51. As also noted in the previous review report, Malta has used two sources of AD for this category: statistics on asphalt imports (for the period 1995–2003) from research conducted for the first national communication under the Convention and AD on actual road paving supplied by Transport Malta (for the period 2004–2011). The ERT noted a significant increase in CO₂ emissions between 2003 (0.01 Gg CO₂) and 2004 (0.09 Gg CO₂) that may compromise the time-series consistency. In response to a question raised by the ERT during the review, Malta indicated that the investigation of this issue was still pending. The ERT reiterates the recommendation made in the previous review report that Malta investigate the time-series inconsistency in the estimates of CO₂ emissions from road paving with asphalt, recalculate emissions, if appropriate, and report on its findings in the NIR.

Carbide production – CO₂

52. In response to a recommendation made in the previous review report, Malta has changed the CO₂ EF for calcium carbide (CaC₂) use (previously 1.38 t CO₂ per t CaC₂) to the IPCC default (1.10 t CO₂ per t CaC₂ imported). However, the text in the NIR has not been updated. In response to a question raised by the ERT during the review, Malta informed it that the text in the NIR would be updated in the next inventory submission. The ERT recommends that Malta update the methodological description in the NIR to reflect the actual methodology used.

D. Agriculture

1. Sector overview

53. In 2011, emissions from the agriculture sector amounted to 70.90 Gg CO₂ eq, or 2.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 19.3 per cent. The key driver for the fall in emissions is the apparent decrease in the number of dairy cattle. Within the sector, 40.6 per cent of the emissions were from enteric fermentation, followed by 36.0 per cent from manure management and 23.4 per cent from agricultural soils.

54. In line with the findings of previous review reports, the ERT considers that the transparency of the information on the agriculture sector is lacking. For example, Malta has reported many parameters as “NE” in CRF tables 4.A (gross energy intake and average CH₄ conversion rate), 4.B(a) (allocation by climate region, animal weights, volatile solids daily excretion and CH₄ producing potential), 4.B(b) (nitrogen (N) excretion rates and N excretion per animal waste management system (AWMS)) and 4.D (AD and emissions from crop residues and N-fixing crops). The ERT strongly reiterates the recommendation made in the previous review reports that Malta report the required parameters in line with the UNFCCC reporting guidelines.

55. The ERT did not identify any information in the NIR on sector-specific QA/QC procedures or on the sectoral uncertainty analysis. In response to questions raised by the ERT during the review, Malta informed it that the lack of QA/QC procedures was the case for most inventory sectors. The ERT strongly reiterates the recommendation made in the previous review report that Malta develop and implement QA/QC procedures for the agriculture sector and provide information on the uncertainty of this sector.

56. For the period 1990–1999, Malta has reported, in table 6-1 of the NIR, constant populations for dairy cattle and poultry, and no population data for non-dairy cattle. Malta has also reported that the population of sheep and goats increased by 162.0 and 103.0 per cent, respectively, between 1994 and 1995. The ERT also identified that the number of horses increased by 106.0 per cent from 2009 to 2010, the number of swine increased by 35.0 per cent from 1999 to 2000 and decreased by 34.0 per cent from 2010 to 2011, the number of poultry decreased by 24.0 per cent from 2004 to 2005 and by 21.0 per cent from 2009 to 2010, and the number of rabbits was constant from 1990 to 1999, 2000 to 2009 and 2010 to 2011. From 1999 to 2000 the number of rabbits increased by 89.0 per cent and decreased by 81.0 per cent from 2009 to 2010. Despite the apparently inconsistent time series, no explanations are provided in the NIR. In response to a question raised by the ERT during the review, Malta explained that data for the period 1990–1999 were based on the 2002 inventory and that the original data source was not available. Malta also explained that data from FAOSTAT, the database of the Food and Agriculture Organization of the United Nations (FAO), are available but consist of constant numbers that do not seem to reflect the reality any better than the 2002 inventory estimates. The ERT considers that the time series for all animal types are inconsistent. The ERT strongly reiterates the recommendation made in the previous review report that Malta review the population data for all livestock categories, ensure time-series consistency and report on any recalculations.

2. Key categories

Enteric fermentation – CH₄

57. Malta has estimated CH₄ emissions for all reported livestock (cattle, sheep, goats, horses, swine and rabbits) using a tier 1 method with default EFs from the Revised 1996 IPCC Guidelines, except for rabbits, where a country-specific EF from the Italian inventory

is used. The ERT reiterates the recommendation made in the previous review report that Malta justify the applicability of the Italian CH₄ EF to national circumstances in Malta.

58. Malta has identified enteric fermentation as a key category. In response to a question raised by the ERT during the review as to whether Malta has any plans to use a tier 2 method, the Party indicated that data are not currently available. In line with the IPCC good practice guidance, the ERT reiterates the recommendation made in the previous review report that Malta use a higher-tier method to estimate emissions from this category.

59. Malta assumes that all cattle prior to 2000 are dairy cattle and non-dairy cattle do not occur. Currently, the tier 1 EF used (100 kg/head/year) could result in an overestimation of the CH₄ emissions for the years 1990–1999 for cattle if non-dairy cattle also exist, because the EF used in the inventory (which is the default EF for dairy cattle from the Revised 1996 IPCC Guidelines for Western Europe) is higher than the default EF for non-dairy cattle (48 kg/head/year). The ERT recommends that Malta split the cattle population into dairy and non-dairy cattle using an appropriate technique, such as extrapolation, from the IPCC good practice guidance and calculate emissions accordingly for the entire time series.

Manure management – CH₄

60. The ERT noted that Malta used tier 1 EFs for CH₄ from the 2006 *EMEP/CORINAIR Emission Inventory Guidebook* for Western Europe and temperate climates. The ERT notes that the data in this guidebook are old and that the newer versions of the guidebook no longer contain guidance on GHGs as users are referred to the IPCC guidelines. Therefore, the ERT recommends that Malta refer to the default EFs available from the Revised 1996 IPCC Guidelines. Also, in line with recommendations made in the previous review report, the ERT notes that the CH₄ EF for manure management depends on the AWMS used; however, Malta reported “NE” for the allocation between different types of AWMS. The ERT therefore recommends that Malta assess the applicability of the tier 1 default EFs and, if necessary, implement a higher-tier methodology.

3. Non-key categories

Manure management – N₂O

61. Malta has reported N₂O emissions from manure management for cattle, swine and poultry in figure 6-7 and section 6.3.2.2 of the NIR. However, the Party has reported the N excretion rate and the AWMS as “NE” in CRF table 4.B(b). In response to questions raised by the ERT during the review, Malta indicated that the appropriate corrections have been made. The ERT strongly recommends that Malta replace the notation keys with figures in CRF table 4.B(b) and ensure that the information in the NIR and in the CRF tables is consistent.

62. Malta uses the same N excretion rate for both dairy and non-dairy cattle (63 kg N/livestock unit (LU) for solid manure and 65 kg N/LU for liquid manure). The ERT concludes that it is improbable that dairy and non-dairy cattle would have the same N excretion rate since dairy cattle will usually have a far greater energy intake and hence also a larger N excretion. These values are also different from the default N excretion rates for Western Europe from the Revised 1996 IPCC Guidelines (100 kg/head/year for dairy cattle and 70 kg/head/year for non-dairy cattle). In response to questions raised by the ERT during the review, Malta confirmed that it used the same rates and did not indicate any further planned improvements. The ERT recommends that Malta compare the country-specific N excretion values for all animal types with the IPCC defaults and explain the differences.

63. During the review the ERT noted that there was no information on N excretion rates for sheep, goats, horses and rabbits in the NIR. In response to a question raised by the ERT during the review, Malta explained that N excretion rates and emissions had not been estimated for any of these animal categories. The ERT strongly recommends that Malta estimate the N excretion rates and the resulting N₂O emissions for these animal categories.

64. Table 6.4 in the NIR provides N excretion rates for cattle and poultry, but no information is available for swine. In response to a question raised by the ERT during the review, the Party provided a spreadsheet for calculating N₂O emissions from swine. The ERT noted that to calculate the N excretion for swine, the number of animals is multiplied with the daily manure excretion and then with fixed values for the ratio of slurry to manure and the N content of the manure. The ERT recommends that information be provided in the NIR regarding these assumptions. Furthermore, the ERT recommends that information be provided in the NIR to substantiate and explain the underlying data for the country-specific values presented in table 6.4.

Direct soil emissions – N₂O

65. As noted in the previous review report, Malta has reported emissions from crop residues and N-fixing crops as “NE”. In response to a question raised by the ERT during the review, regarding why these emissions are not estimated, considering that statistics on crop production are available from FAO, Malta indicated that this would be considered. The ERT strongly reiterates the recommendation made in the previous review report that Malta estimate and report emissions from these subcategories.

66. As also noted in the previous review report, the trend in the use of synthetic fertilizers is very unstable across the time series, especially between 1994 and 1995 (an increase of 113.0 per cent) and between 1997 and 1998 (an increase of 119.0 per cent). The ERT noted that Malta has used data from FAOSTAT for the years 1990–1994 and data from the National Statistics Office for the years 1995–2011. In response to questions raised by the ERT during the review, Malta provided it with the calculation spreadsheet. The ERT notes that there are significant differences between the N content reported by the National Statistics Office and the content calculated based on the chemical properties, and that Malta corrects the N amount reported in the statistical data. The ERT reiterates the recommendation made in the previous review report that Malta review the consistency of the time series and explain the trend in the NIR. Furthermore, the ERT recommends that Malta investigate the quality of the statistical data reported on the N content of the imported fertilizers and describe the corrections made to the statistical data in the NIR.

67. Malta does not estimate N excretion for several animal categories (see paras. 62–64 above). This leads to an underestimation of both direct and indirect N₂O emissions from agricultural soils. The ERT strongly recommends that Malta estimate and report these emissions.

68. Malta uses the methodology from the 2006 IPCC Guidelines to estimate the amount of manure N available to soils. However, Malta does not describe the methodology, including the equations used, in the NIR. The ERT recommends that Malta improve the methodological description in the NIR, including a listing of all parameters used in the calculation and the values used.

69. According to the NIR, Malta assumes that only 10.0 per cent of swine slurry is applied to soils. The ERT questioned the fate of the remaining 90.0 per cent of the slurry. In response, Malta informed the ERT that the figure of 10.0 per cent of swine slurry being applied to soils was a result of expert judgement from the Ministry for Resources and Rural Affairs and that it is assumed that the remaining 90.0 per cent of the slurry is collected in cesspits for later disposal. Based on the description provided, it seems that manure is stored

in an anaerobic lagoon, which could mean that emissions of CH₄ from manure management are significantly underestimated. The ERT recommends that Malta provide more information on the fate of the 90.0 per cent of the slurry, including details on the storage conditions. The ERT also strongly recommends that Malta calculate all emissions from storage of slurry and transparently describe in the NIR the methodology used to calculate and report emissions.

E. Land use, land-use change and forestry

1. Sector overview

70. In 2011, net emissions from the LULUCF sector amounted to –59.67 Gg CO₂ eq. Since 1990, net removals have increased by 5.5 per cent. The key driver for the rise in removals is the expansion of perennial cropland. Within the sector, net removals of 48.69 Gg CO₂ eq were from forest land, followed by net removals of 10.98 Gg CO₂ eq from cropland. The categories grassland, wetlands, other land and all categories with non-CO₂ emissions are reported as “NO”, while settlements are reported as “NE”, “NO”. In 2011, the sector offset 2.0 per cent of the total GHG emissions.

71. The inventory for the LULUCF sector is incomplete in the following categories:

(a) For forest land, only gains in above-ground biomass carbon (C) stocks have been estimated (see para. 78 below); above-ground biomass C stock losses and any C stock change in below-ground biomass have not been estimated;

(b) For cropland, only gains in above-ground biomass C stocks of perennial crops have been estimated (see para. 81 below); soil organic matter C stock changes in annual and perennial crops have not been estimated;

(c) Soil organic matter C stock changes in the grassland category have been reported as “NO”, although the ERT concludes that these emissions have not been estimated (see para. 73 below);

(d) C stock changes in all carbon pools in land-use conversion categories have been reported as “NE” or “NO” (see para. 75 below);

(e) Emissions from biomass burning have been reported as “NE” or “NO”.

72. In the previous review report the ERT found the same incompleteness; it reiterates the recommendation made in the previous review report of increasing the completeness of the LULUCF sector estimates.

73. Malta has reported its land representation by applying approach 1, which means that the land representation does not allow the Party to report estimates for the “land in conversion” categories. In its land representation, Malta has not reported any grassland and has reported only perennial crops under cropland. However, data sources⁵ indicate that in the country there are grazed pastures, as well as areas cultivated with annual crops, and areas with natural vegetation⁶ that do not reach the forest definition thresholds. In response to questions raised by the ERT during the review, Malta indicated that it does not have grasslands, and only emissions from perennial crops are calculated because there is no long-term storage of biomass in annual crops. The ERT recommends that Malta report

⁵ See for instance

<http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Agricultural_census_in_Malta>.

⁶ See for instance <<http://www.eea.europa.eu/soer/countries/mt/land-use-state-and-impacts-malta>>.

areas of pastures under grassland and report areas of annual crops under cropland, as well as associated C stock changes in the soil organic matter pool.

74. The land representation of Malta does not cover the total area of the country (32,000 ha)⁷ and does not cover a constant area across the time series (i.e. 24,539 ha in 1990 but 24,380 ha in 2011), thus being inconsistent with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT reiterates the recommendation made in the previous review report to prepare a land representation, consistent across time, which covers the entire national territory of Malta and includes all the land-use categories. The ERT also recommends that Malta limit the use of the category other land to those lands without vegetation that do not fall within any other land-use category, and therefore report pasture and areas with natural vegetation that do not reach the forest definition thresholds under grassland and annual crops under cropland. Further, the ERT encourages the Party to plan an additional collection and compilation of data with the aim of being able to prepare a complete and consistent land representation, applying approach 2.

75. As reported in previous review reports, the Party does not use notation keys consistently (e.g. all land-use conversion categories are reported as “NO” while they are actually “NE”). The ERT reiterates the recommendation made in the previous review report to use “NO” for any category, pool and/or gas for which the Party has information confirming that it does not occur, and to provide such information in the NIR, and use “NE” for categories, pools and/or gases for which there is no information on emissions/removals, or for which net emissions/removals are negligible. Further, the ERT recommends that Malta not leave any cells blank in the CRF tables (e.g. dead organic matter in CRF tables 5.A and 5.B), thereby ensuring that for any cell either an estimate or a notation key is reported.

76. As noted in the previous review report, Malta has reported, in table 7-3 of the NIR, the areas of other land remaining other land. The ERT noted that the area reported in the NIR (22,778.6 ha) differs from that reported in CRF table 5.F (22,860.65 ha) for the year 1999 (a difference of 0.08 kha). The ERT reiterates the recommendation made in the previous review report that Malta correct this discrepancy between the NIR and the CRF table, enhance QA/QC procedures and ensure the consistency of its reporting.

77. The reported uncertainty estimates for the AD and for the C stock change factors (CSCF) in forest land and cropland are: 18.0 per cent (AD), 50.0 per cent (CSCF) for forest land; 5.0 per cent (AD) and 50.0 per cent (CSCF) for cropland. However, no information on the source of uncertainties has been reported. In response to questions raised by the ERT during the review, Malta indicated that uncertainty data for forest land are based on Corine Land Cover 2006 and MEPA, while uncertainty data for cropland are based on National Statistics Office figures. To improve transparency, the ERT reiterates the recommendation made in the previous review report that Malta report the sources of the uncertainty values.

2. Key categories

Forest land – CO₂

78. To estimate C stock changes in living biomass, Malta applies tier 1 and does not estimate any losses (losses are reported as “NE” in CRF table 5.A). Not reporting losses from living biomass is not consistent with the IPCC good practice guidance for LULUCF and results in reporting forest land with an infinitely continuous C accumulation. Under tier 1, while for new forests (i.e. forests younger than 21 years) the reporting of a net C stock

⁷ <<http://www.fao.org/countryprofiles/index/en/?iso3=MLT>>.

increase for 20 years could be justified if no harvesting and no disturbances occur, for forests older than 20 years the assumption of a continuous net accumulation of C in the living biomass pool is not supported. The ERT reiterates the recommendation made in the previous review report that the Party report C stock losses in the above-ground biomass pool, including losses due to natural mortality and disturbances. Further, the ERT notes that because forest land is a key category, a higher methodological tier should be used for preparing estimates of C stock changes; therefore, the ERT recommends that Malta make efforts to collect the necessary data to prepare estimates, for all C pools, at a tier 2 methodological level.

79. In a note to table 7-1 of the NIR, Malta reported that the growing stock of shrubland (44.8 m³/ha) is its removal factor (i.e. the increment). Further, on page 98, the growing stock of shrubland is used in equation 3 to estimate the annual biomass accumulation of shrubland. The ERT considers that this is not in accordance with the IPCC good practice guidance for LULUCF because the growing stock is the accumulated biomass stocked in a forest since its plantation/regrowth, and it is not the annual increment of biomass. The ERT recommends that Malta use the correct factor, namely, the annual increment of biomass for estimating the annual above-ground biomass gains in shrubland and report the revised estimate.

80. In the NIR, Malta has stated that an afforestation project (the conversion of land to forest land) has been under implementation since 2005 (page 99); however, no information on GHG emissions and removals from those afforested lands has been provided in the inventory due to their early stages of implementation. The ERT notes that a Party should report all land converted, regardless of the age of the stands. In response to a question raised by the ERT during the review regarding when Malta intends to reflect the results of this project in the inventory, the Party indicated that it will consider this in the near future. The ERT reiterates the recommendation made in the previous review report that Malta include any afforested area, and associated GHG emissions and removals, under the category forest land.

3. Non-key categories

Cropland – CO₂

81. To estimate carbon stock changes in living biomass, Malta applies tier 1 and does not estimate any losses (losses are reported as “NE” in CRF table 5.B). The ERT notes that reporting a net carbon stock increase for woody cropland is consistent with a tier 1 method only for woody crops younger than 31 years, for the temperate climate zone. For woody crops older than 30 years, tier 1 assumes no net carbon stock changes in woody biomass. The ERT recommends that the Party revise its estimate, by excluding all woody crops older than 30 years.

F. Waste

1. Sector overview

82. In 2011, emissions from the waste sector amounted to 126.76 Gg CO₂ eq, or 4.2 per cent of total GHG emissions. Since 1990, emissions have increased by 235.0 per cent. The key drivers for the rise in the emissions are the increase in the amount of waste sent to landfills and absence of measures to reduce degradable organic carbon (DOC) content in the waste being landfilled. Within the sector, 86.1 per cent of the emissions were from solid waste disposal on land (SWDL), followed by 13.2 per cent from wastewater handling and 0.7 per cent from waste incineration.

83. Malta has not provided information on sector-specific QA/QC procedures in the waste sector chapter of the NIR. The ERT reiterates the recommendation made in the previous review report that the Party develop QA/QC procedures for the waste sector and report them in the NIR.

2. Key categories

Solid waste disposal on land – CH₄

84. Malta has used the first-order decay (FOD) method from the 2006 IPCC Guidelines to estimate CH₄ emissions from solid waste disposal sites (SWDS). In response to a question raised by the ERT during the review to justify the use of this method, the Party indicated that it decided to implement a higher-tier method and the FOD model from the 2006 IPCC Guidelines provides “sufficient certainty”. The ERT notes that according to the UNFCCC reporting guidelines, Parties shall use the IPCC good practice guidance, or national methods, if they are considered to better reflect the national situation. The ERT does not find Malta’s explanation for the use of the 2006 IPCC Guidelines sufficient as it does not clearly indicate why these guidelines are preferable for Malta over the IPCC good practice guidance, and reiterates the recommendation made in the previous review report that Malta justify its use of the FOD method from the 2006 IPCC Guidelines in the NIR.

85. The Party used a higher OX for unmanaged waste (0.6) than that stipulated in the 2006 IPCC Guidelines (0.0 for managed, unmanaged and uncategorized SWDS and 0.1 for managed covered with CH₄ oxidizing material). According to the IPCC good practice guidance, the use of an OX higher than 0.1 is not recommended as it is probably too high for national inventories. In response to a question raised by the ERT during the review, the Party indicated that the OX was implemented following a specific study on unmanaged landfills in Malta, carried out as part of the effort to increase accuracy of the inventory. The ERT welcomes the Party’s effort to assess site-specific conditions and the composition analysis of gases from the unmanaged landfill; however, it recognizes the large discrepancy between Malta’s country-specific OX and the IPCC default value. The ERT recommends that Malta either refer to a well-documented source (e.g. conduct a peer review of the study provided) and use the country-specific OX or use the IPCC default OX and recalculate CH₄ emissions from SWDL. The ERT also recommends that the Party provide transparent documentation in its NIR.

86. The ERT noted that information on CH₄ recovery is very limited and ambiguous in the NIR. According to the NIR, recovery has taken place at the Magtab Environmental Complex since 2008, but no additional information is given in the NIR regarding the metered values of CH₄ recovered. In response to a question raised by the ERT during the review, the Party provided data on energy recovery for the year 2011 only. According to the IPCC good practice guidance, the default value for CH₄ recovery is zero, and recovery should be included only if references documenting the amount of CH₄ recovery (e.g. based on metering of gas) are available. The ERT reiterates the recommendation made in the previous review report that Malta provide detailed information on CH₄ recovery in the NIR for all years in which recovery is reported (e.g. quantity of CH₄ recovered and method used to quantify CH₄).

87. The ERT noted that the Party used, for the first time, a multi-phase model based on waste composition data for the estimation of emissions from municipal solid waste (MSW). In this model the amounts of each type of degradable waste material are entered separately. However, in the NIR, the Party reported a DOC content in municipal waste (0.18). In response to a question raised by the ERT during the review, Malta provided it with the DOC content per each type of degradable waste material (i.e. food waste, garden waste, paper, wood and straw, textiles, disposable diapers, sewage sludge and industrial waste).

The ERT recommends that the Party include the information provided during the review in the NIR in order to increase transparency.

88. Malta reported a CH₄ generation rate constant only for municipal waste and did not provide any information on half-lives and CH₄ generation rates of waste fractions. In response to a question raised by the ERT during the review, the Party provided the k values and half-lives of the following waste fractions (paper/textile waste, wood/straw/rubber waste, garden and park waste, and food waste/sewage sludge). The ERT recommends that the Party include the information provided during the review in the NIR in order to enhance the transparency of its reporting.

89. In CRF table 6.A, the Party reported the notation key “IE” for DOC and the CH₄ correction factor (MCF) for managed SWDL and in the additional information table reported the notation key “NA” for all the parameters, except population. In response to general questions raised by the ERT during the review on the use of notation keys for this category, the Party indicated that it will review notation keys for the next inventory submission. The ERT recommends that Malta replace the notation keys in the CRF tables with appropriate values.

90. Furthermore, the ERT noted that Malta reported in CRF table 6.A different notation keys for aggregated AD (reported “NA”), MCF (reported “IE”), DOC degraded (reported “IE”) and implied emission factor (IEF) (reported “NA”) for unmanaged SWDS, as compared with those reported in the subcategories deep and shallow (“NO” for AD; “IE”, “NO” for MCF; “NA”, “NO” for DOC degraded; and “NO” for IEF). The ERT recommends that Malta revise its notation keys in order to ensure reporting consistency.

3. Non-key categories

Waste incineration – CH₄ and N₂O

91. The Party has used the default CH₄ EF applicable to open burning (6,500 g CH₄/t waste) from the 2006 IPCC Guidelines to estimate CH₄ emissions from the incineration of MSW for 1990 to 2003. In response to a question raised by the ERT during the review, Malta explained that the facility was uncontrolled and therefore it had decided to use a conservative estimate of emissions for this time period. The ERT considers that using a CH₄ EF for open burning might overestimate the emissions from incineration of MSW. The ERT also noted that Malta has used the default N₂O EF from the 2006 IPCC Guidelines applicable to batch type incineration to estimate N₂O emissions for 1990–2003 (221 g N₂O/tonne waste). The ERT recommends that Malta revise its CH₄ EF, ensure consistency in selections of default EFs for waste incineration and provide an explanation in its NIR.

III. Conclusions

92. Table 6 summarizes the ERT’s conclusions on the 2013 inventory submission of Malta, in accordance with the UNFCCC review guidelines.

Table 6
Expert review team's conclusions on the 2013 inventory submission of Malta

		<i>General findings and recommendations</i>
The ERT concludes that the inventory submission of Malta is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Non-land use, land-use change and forestry ^a	Not complete	See paragraphs 47 and 65 above
Land use, land-use change and forestry ^a	Not complete	See paragraphs 78 and 80 above
The ERT concludes that the inventory submission of Malta has been prepared and reported in accordance with UNFCCC reporting guidelines	Generally no	See paragraphs 15–17, 30, 43, 46, 54 and 84 above
The Party's inventory is in accordance with the <i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i> , the <i>IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> and the <i>IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>	Generally yes	See paragraphs 9 (table 4), 14, 15, 29, 39, 58, 74, 78, 84 and 85 above
The institutional arrangements continue to perform their required functions	No	See paragraphs 8, 10, 11, 17 and 42 above

Abbreviations: CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

^a The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the *IPCC Revised 1996 Guidelines for National Greenhouse Gas Inventories*, the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

“Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”. FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

Status report for Malta 2013. Available at <http://unfccc.int/resource/docs/2013/asr/mlt.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/MLT. Report of the individual review of the greenhouse gas inventory of Malta submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/mlt.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Anthony Rizzo (Malta Resources Authority), including additional material on the methodology and assumptions used. The following documents¹ were also provided by Malta:

National Statistical Office, Malta. (January 2013) *Solid Waste Management in Malta 2004-2011* Valletta, Malta.

Sustech consulting. (June 2008) *Agricultural Waste Management Plan for the Maltese Islands: Final Study*.

¹ Reproduced as received from the Party.

Vella, Alfred.J (March 2013) *Emissions of Methane from Maghtab Landfill: an opinion based on measurement data pertaining to the landfill and Scott Wilson's Report CT2586-2004*. Zejtun, Malta.

Annex II

Acronyms and abbreviations

AD	activity data
C	carbon
CH ₄	methane
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CRF	common reporting format
CSCF	carbon stock change factor
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU	European Union
F-gas	fluorinated gas
FAO	Food and Agriculture Organization of the United Nations
FOD	first-order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ without GHG emissions and removals from LULUCF
GWP	global warming potential
ha	hectare
HFCs	hydrofluorocarbons
IE	included elsewhere
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
m ³	cubic metre
MCF	methane conversion factor
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
N ₂ O	nitrous oxide
NIR	national inventory report
NO	not occurring
OX	oxidation factor
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10 ¹⁵ joule)
QA/QC	quality assurance/quality control
SF ₆	sulphur hexafluoride
SWDL	solid waste disposal on land
SWDS	solid waste disposal sites
TJ	terajoule (1 TJ = 10 ¹² joule)
UNFCCC	United Nations Framework Convention on Climate Change