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Technical analysis of the second biennial update report of Papua New Guinea submitted on 25 May 2022

Summary report by the team of technical experts

Summary

According to decision 2/CP.17, paragraph 41(a), Parties not included in Annex I to the Convention, consistently with their capabilities and the level of support provided for reporting, were to submit their first biennial update report by December 2014. Further, paragraph 41(f) of that decision states that Parties not included in Annex I to the Convention shall submit a biennial update report every two years, either as a summary of parts of their national communication in the year in which the national communication is submitted or as a stand-alone update report. As mandated, the least developed country Parties and small island developing States may submit biennial update reports at their discretion. This summary report presents the results of the technical analysis of the second biennial update report of Papua New Guinea, conducted by a team of technical experts in accordance with the modalities and procedures contained in the annex to decision 20/CP.19.

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
AFOLU	agriculture, forestry and other land use
APERC	Asia Pacific Energy Research Centre
AR	Assessment Report of the Intergovernmental Panel on Climate Change
BUR	biennial update report
CDM	clean development mechanism
CGE	Consultative Group of Experts
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ETF	enhanced transparency framework under the Paris Agreement
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
HWP	harvested wood products
ICA	international consultation and analysis
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance	*Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
MRV	measurement, reporting and verification
N_2O	nitrous oxide
NA	not applicable
NC	national communication
NDC	nationally determined contribution
NE	not estimated
NIR	national inventory report
NMVOC	non-methane volatile organic compound
NO	not occurring
non-Annex I Party	Party not included in Annex I to the Convention
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
REDD+	reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks (decision 1/CP.16, para. 70)
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
SF_6	sulfur hexafluoride
TTE	team of technical experts
UNFCCC guidelines for the preparation of NCs from non-Annex I Parties	"Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention"

UNFCCC reporting guidelines on BURs	"UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention"

I. Introduction and process overview

A. Introduction

1. The process of ICA consists of two steps: a technical analysis of the submitted BUR and a facilitative sharing of views under the Subsidiary Body for Implementation, resulting in a summary report and a record respectively.

2. According to decision 2/CP.17, paragraph 41(a), non-Annex I Parties, consistently with their capabilities and the level of support provided for reporting, were to submit their first BUR by December 2014. In addition, paragraph 41(f) of that decision states that non-Annex I Parties shall submit a BUR every two years, either as a summary of parts of their NC in the year in which the NC is submitted or as a stand-alone update report.

3. Further, according to paragraph 58(a) of the same decision, the first round of ICA is to commence for non-Annex I Parties within six months of the submission of the Parties' first BUR. The frequency of developing country Parties' participation in subsequent rounds of ICA, depending on their respective capabilities and national circumstances, and the special flexibility for small island developing States and the least developed country Parties, will be determined by the frequency of the submission of BURs.

4. Decision 14/CP.19, paragraph 7, outlines that developing country Parties seeking to obtain and receive payments for results-based actions can submit relevant information and data through the BUR in the form of a technical annex as per decision 2/CP.17, annex III, paragraph 19.[1] Decision 14/CP.19, paragraph 8, outlines that the submission of the technical annex is voluntary and in the context of results-based payments. As mandated by decision 14/CP.19, paragraphs 10–14, the technical annex submitted by Papua New Guinea has been subject to technical analysis by two LULUCF experts who are included as members of a TTE. The results of the technical analysis are captured in a separate technical report.[2]

5. Papua New Guinea submitted its first BUR on 17 April 2019, which was analysed by a TTE in the fourteenth round of technical analysis of BURs from non-Annex I Parties, conducted from 2 to 6 September 2019. After the publication of its summary report, Papua New Guinea participated in the ninth workshop for the facilitative sharing of views, convened virtually on 24 November 2020.

6. This summary report presents the results of the technical analysis of the second BUR of Papua New Guinea, undertaken by a TTE in accordance with the provisions on the composition, modalities and procedures of the TTE under ICA contained in the annex to decision 20/CP.19.

B. Process overview

7. In accordance with the mandate referred to in paragraph 2 above, Papua New Guinea submitted its second BUR on 25 May 2022 as a stand-alone update report. The submission was made within three years and one month from the submission of the first BUR.

8. During the technical analysis, the Party clarified that it faced difficulties related to the coronavirus disease 2019 pandemic, which resulted in the submission of the BUR more than two years after the submission of the last BUR.

9. A desk analysis of Papua New Guinea's BUR was conducted remotely from 29 August to 2 September 2022 and was undertaken by the following TTE, drawn from the UNFCCC roster of experts on the basis of the criteria defined in decision 20/CP.19, annex, paragraphs 2–6: Parvana Babayeva (Azerbaijan), Ménouer Boughedaoui (former member of the CGE from Algeria), Remi D'Annunzio (France), Manuel Estrada (Mexico), Ngozi Eze (Nigeria), Akram Hamza (Tunisia), Rocio Lichte (former member of the CGE from Germany), Gervais Ludovic Itsoua Madzous (former member of the CGE from the Congo),

[1] The technical annex on the results of implementing REDD+ activities.

[2] At the time of publication of this report, the technical report was being prepared.

Philippe Missi Missi (Cameroon), Takashi Morimoto (Japan), Ngoc Tran Thi Bich (Viet Nam) and Harry Vreuls (Kingdom of the Netherlands). Ngozi Eze and Harry Vreuls were the co-leads. The technical analysis was coordinated by Sohel Pasha (secretariat).

10. During the technical analysis, in addition to the written exchange, in the virtual team room, to provide technical clarifications on the information reported in the BUR, the TTE and Papua New Guinea engaged in consultation[3] on the identification of capacity-building needs for the preparation of BURs and participation in the ICA process. Following the technical analysis of Papua New Guinea's second BUR, the TTE prepared and shared a draft summary report with Papua New Guinea on 14 June 2023 for its review and comment. Papua New Guinea, in turn, provided its feedback on the draft summary report on 17 July 2023.

11. The TTE finalized the summary report in consultation with the Party on 17 July 2023.

II. Technical analysis of the biennial update report

A. Scope of the technical analysis

12. The scope of the technical analysis is outlined in decision 20/CP.19, annex, paragraph 15, according to which the technical analysis aims to, without engaging in a discussion on the appropriateness of the actions, increase the transparency of mitigation actions and their effects and shall entail the following:

(a) The identification of the extent to which the elements of information listed in paragraph 3(a) of the ICA modalities and guidelines (decision 2/CP.17, annex IV) have been included in the BUR of the Party concerned (see chap. II.B below);

(b) A technical analysis of the information reported in the BUR, specified in the UNFCCC reporting guidelines on BURs (decision 2/CP.17, annex III), and any additional technical information provided by the Party concerned (see chap. II.C below);

(c) The identification, in consultation with the Party concerned, of capacity-building needs related to the facilitation of reporting in accordance with the UNFCCC reporting guidelines on BURs and to participation in ICA in accordance with the ICA modalities and guidelines, taking into account Article 4, paragraph 3, of the Convention (see chap. II.D below).

13. The remainder of this chapter presents the results of each of the three parts of the technical analysis of Papua New Guinea's BUR outlined in paragraph 12 above.

B. Extent of the information reported

14. The elements of information referred to in paragraph 12(a) above include the national GHG inventory report; information on mitigation actions, including a description of such actions, an analysis of their impacts and the associated methodologies and assumptions, and information on progress in their implementation; information on domestic MRV; and information on support needed and received.

15. According to decision 20/CP.19, annex, paragraph 15(a), in undertaking the technical analysis of the submitted BUR, the TTE is to identify the extent to which the elements of information listed in paragraph 14 above have been included in the BUR of the Party concerned. The TTE considers that the reported information is mostly consistent with the UNFCCC reporting guidelines on BURs. Specific details on the extent of the information reported for each of the required elements are provided in the tables included in annex I.

16. The current TTE noted improvements in the reporting in Papua New Guinea's second BUR compared with that in its previous BUR. Information on the GHG inventory, mitigation actions and their effects, needs and support and institutional arrangements reported in the Party's second BUR demonstrates that it has taken into consideration the areas for enhancing

[3] The consultation was conducted via videoconferencing.

the transparency of the extent of the information reported noted by the previous TTE in the summary report on the technical analysis of the Party's previous BUR.

C. Technical analysis of the information reported

17. The technical analysis referred to in paragraph 12(b) above aims to increase the transparency of information reported by the Parties on mitigation actions and their effects, without engaging in a discussion on the appropriateness of those actions. Accordingly, the focus of the technical analysis was on the transparency of the information reported in the BUR.

18. For information reported on national GHG inventories, the technical analysis also focused on the consistency of the methods used for preparing those inventories with the appropriate methods developed by the IPCC and referred to in the UNFCCC reporting guidelines on BURs. Papua New Guinea submitted an NIR as a stand-alone document and, further to consultations with the TTE, requested a more detailed analysis and documentation of the findings contained in the NIR to be undertaken using the agreed GHG inventory tool.

19. The results of the technical analysis are presented in the remainder of this chapter.

1. Information on national circumstances and institutional arrangements relevant to the preparation of national communications on a continuous basis

20. As per the scope defined in paragraph 2 of the UNFCCC reporting guidelines on BURs, the BUR should provide an update to the information contained in the most recently submitted NC, including information on national circumstances and institutional arrangements relevant to the preparation of NCs on a continuous basis. In their NCs, non-Annex I Parties report on their national circumstances following the reporting guidance contained in decision 17/CP.8, annex, paragraphs 3–5, and they could report similar information in their BUR, which is an update of their most recently submitted NC.

21. In its second BUR, Papua New Guinea provided an update on its national circumstances, including features of geography, climate and weather, population, economy, agriculture, forestry, fish resources, energy, transport and domestic climate change policy that might affect the Party's ability to deal with mitigating and adapting to climate change.

22. In addition, Papua New Guinea provided a summary of relevant information regarding its national circumstances in tabular format.

23. Papua New Guinea transparently reported in its second BUR an update on its existing institutional arrangements relevant to the preparation of its NCs and BURs on a continuous basis. The description covers key aspects of the institutional arrangements, including the legal status and roles and responsibilities of the overall coordinating entity, the involvement and roles of other institutions and experts, and mechanisms for information and data exchange. As per the Climate Change (Management) Act 2015, the Climate Change and Development Authority of Papua New Guinea is the designated entity for preparing the country's BURs and NCs. The Party reported in its BUR information on the establishment of the Energy Sub-Technical Working Committee and the AFOLU Sub-Technical Working Committee. These committees consist of key government agencies, private sector agencies and non-governmental organizations from the energy and AFOLU sectors and are responsible for providing technical inputs to the Climate Change and Development Authority for the preparation of the Party's BURs.

24. Papua New Guinea reported in its second BUR an update on its domestic MRV arrangements. The description covers key aspects of the institutional arrangements, including the context for the establishment of the current MRV arrangements that were formulated during the preparation of the enhanced NDC submitted to the UNFCCC in 2020. These arrangements are designed at the national level and are part of the government structure that governs and monitors the progress of the activities and projects that will be implemented to achieve the mitigation and adaptation targets in the enhanced NDC, as outlined in the Enhanced NDC Implementation Plan (2021–2030).

25. During the technical analysis, Papua New Guinea clarified the current initiatives to enhance its institutional arrangements for compliance with requirements under the ETF. The initiatives relate to training of national experts to set up the MRV system.

2. National greenhouse gas emissions by sources and removals by sinks

26. As indicated in table I.1, Papua New Guinea reported information on its GHG inventory in its BUR mostly in accordance with paragraphs 3–10 of the UNFCCC reporting guidelines on BURs and paragraphs 8–24 of the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties, contained in the annex to decision 17/CP.8.

27. Papua New Guinea submitted its second BUR in 2022, and the GHG inventory reported is for 2000–2017. The latest reported inventory year is more than four years prior to the date of submission of the Party's BUR. In its BUR (section 2.2.3), Papua New Guinea clarified that the planned submission of the BUR for 2021 was delayed owing to the pandemic.

28. Papua New Guinea submitted an NIR in conjunction with its second BUR. The relevant sections of the NIR were referenced in the BUR and the document was made publicly available on the UNFCCC website.[4]

29. GHG emissions and removals for the BUR covering the 2000–2017 inventories were estimated using tier 1 methodology from the 2006 IPCC Guidelines, while in some cases (for the IPPU, LULUCF and waste sectors) tier 2 methodology were used.

30. Information on AD and EFs used and their sources was clearly reported in the BUR, and more detailed information on AD and EFs, including their sources, was reported in the separate sections in the NIR. Various sources were used for AD, such as data provided by government agencies, the private sector and intergovernmental organizations, such as the Food and Agriculture Organization of the United Nations. Most EFs used in the estimation of GHG emissions were sourced from the 2006 IPCC Guidelines, although certain country-specific EFs were used for the LULUCF and waste sectors.

31. Information on the reason for selecting the IPCC default EFs used in the energy and agriculture sectors was not clearly reported in Papua New Guinea's NIR. For example, according to NIR table 5-4, the CH_4 EF for manure management of swine is 14.1, which is the weighted average of the EFs by average annual temperature for the Oceania region (2006 IPCC Guidelines, vol. 4, chap. 10, table 10.14). However, the default EFs listed for swine for the Oceania region in the 2006 IPCC Guidelines are for market swine at 17 °C and 27 °C, which are both 13 kg CH_4/head/year, and for breeding swine at 17 °C and 27 °C, which are 23 kg CH_4/head/year and 24 kg CH_4/head/year respectively. During the technical analysis, the Party clarified that AD for swine were not disaggregated into market swine and breeding swine. As such, when calculating the CH_4 EF for manure management of swine, it was assumed that 90 per cent of the total swine population was market swine, while the remaining 10 per cent was breeding swine. It was also assumed that breeding swine are only present in coastal areas (27 °C temperature) and not in the highlands (17 °C temperature). Therefore, the CH_4 EF for 27 °C was used (i.e. 13 kg CH_4/head/year for market swine and 24 kg CH_4/head/year for breeding swine). Further, it was not clear to the TTE which years of livestock population data were used for each species in calculating the weighted averaged CH_4 EFs for manure management. During the technical analysis, the Party clarified that the CH_4 EFs were calculated using the annual population of each livestock species for the whole time series (2000–2017) and the weighted average CH_4 EF results were the same for each species for the whole time series. The Party also acknowledged that some errors had occurred in the selection of the correct IPCC default EFs: for example, instead of using 2.56 kg CH_4/head as the CH_4 EF for manure management of horses (NIR table 5-4), the value used should be 2.19 kg CH_4/head (2006 IPCC Guidelines, vol. 4, chap. 10, table 10.15); instead of using 1 kg CH_4/TJ as the CH_4 EF for all fuels for civil aviation (NIR table 3-11), the value for all fuels for civil aviation should be 0.5 kg CH_4/TJ (2006 IPCC Guidelines, vol. 2, chap. 3, table 3.6.5); and instead of using 56 kg CH_4/TJ and 68 kg CH_4/TJ as the CH_4 EFs for motor gasoline for agriculture off-road and forestry off-road (NIR table 3-11), the values used

[4] https://unfccc.int/BURs.

should be 140 kg CH_4/TJ and 170 kg CH_4/TJ respectively (2006 IPCC Guidelines, vol. 2, chap. 3, table 3.3.1).

32. Information on the Party's total GHG emissions by gas for 2017 is outlined in table 1 in Gg CO_2 eq. It shows an increase in emissions of 33.7 per cent without LULUCF since 2000 (8,052 Gg CO_2 eq), and a decrease in emissions of 83.3 per cent with LULUCF since 2000 (–12,436 Gg CO_2 eq).

Table 1
Greenhouse gas emissions by gas of Papua New Guinea for 2017

Gas	*GHG emissions (Gg CO_2 eq) including LULUCF*	*% change 2000–2017*	*GHG emissions (Gg CO_2 eq) excluding LULUCF*	*% change 2000–2017*
CO_2	–5 754	–66.3	7 084	87.0
CH_4	2 657	–30.8	2 578	–27.8
N_2O	988	21.7	954	37.3
HFCs	151	NE	151	NE
PFCs	NE	NE	NE	NE
SF_6	NE	NE	NE	NE
Total	**–1 958**	**–84.3**	**10 767**	**33.7**

33. Information on other emissions was clearly reported, including 29.57 Gg NMVOCs for 2017.

34. Information on nitrogen oxides, carbon monoxide and sulfur dioxide emissions was not clearly reported in Papua New Guinea's BUR. During the technical analysis, the Party clarified that it had encountered financial and human resources challenges in obtaining a complete set of AD for these gases and therefore used notation keys "NE" and "NO" to report these gases.

35. Papua New Guinea applied notation keys in tables where numerical data were not provided. The use of notation keys was consistent with the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties.

36. Notation keys were not used for one category, 1.C (CO_2 transport and storage), and the cell is blank (BUR table 2-4). During the technical analysis, Papua New Guinea clarified that the transport and storage of CO_2 does not occur in the country, therefore CO_2 emissions from this source will be reported as "NO" in its next submission.

37. Papua New Guinea reported comparable information addressing the tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF and the sectoral reporting tables annexed to the Revised 1996 IPCC Guidelines (BUR table 2-4).

38. The shares of emissions that different sectors contributed to the Party's total GHG emissions excluding LULUCF, as calculated by the TTE using information from the BUR, in 2017 are reflected in table 2.

Table 2
Shares of greenhouse gas emissions by sector of Papua New Guinea for 2017

Sector	*GHG emissions (Gg CO_2 eq)*	*% share*[a]	*% change 2000–2017*
Energy	8 673	80.6	28.3
IPPU	153	1.4	NA
Agriculture	935	8.7	27.7
LULUCF	–12 725	NA	–37.9
Waste	1 006	9.3	79.6

[a] *Note*: Share of total emissions without LULUCF.

39. Papua New Guinea reported information on its use of GWP values consistent with those provided by the IPCC in its AR2 based on the effects over a 100-year time-horizon of GHGs.

40. For the energy sector, information was clearly reported on methodological tier levels, AD and their sources, EFs, key categories and notation keys used. Twelve categories of the energy sector were identified as key categories without LULUCF. The AD, such as those for fuel consumption by fuel type by sector for category 1.A (fuel combustion activities) and crude oil and natural gas production for category 1.B (fugitive emissions from fuels), are included in the energy balance table developed by APERC based on data provided by Papua New Guinea.[5]

41. According to NIR table 1-3, for the key category assessment without LULUCF, the CO_2 emissions for subcategory 1.A.1.b (petroleum refining) were reported as 122.46 kt CO_2 eq. While NIR table 3-8 shows the correspondence between the IPCC CRF categories and the sectors of the APERC energy balance table used as AD, NIR table 3-8 shows that APERC energy balance table sectors 9.4 (refineries), 9.6 (petrochemical industry) and 10.1.14 (oil refineries) correspond to subcategory 1.A.1.b (petroleum refining) of the CRF. Looking at the APERC energy balance table for 2017, energy consumption for sectors 9.6 (petrochemical industry) and 10.1.14 (oil refineries) are zero, and the energy accounted under sector 9.4 (refineries) is energy transformed rather than combusted. It was not clear to the TTE how Papua New Guinea applied the values in the energy balance table to estimate CO_2 emissions for subcategory 1.A.1.b (petroleum refining). During the technical analysis, the Party acknowledged that the energy accounted for under sector 9.4 (refineries) of the APERC energy balance table is not energy consumed but energy transformed. This also applies to sector 9.6 (petroleum industry). The energy consumed by oil refineries should only be that calculated for sector 10.1.14 (oil refineries) of the APERC energy balance table. Therefore, the energy consumed by oil refineries and the GHG emissions for 2017 should both be zero, and the relevant modification will be made in future GHG inventories.

42. For the IPPU sector, information was clearly reported on methodological tier levels, AD and their sources, EFs, key categories and notation keys used. Papua New Guinea for the first time reported HFC emissions for category 2.F.1 (refrigeration and air conditioning) for 2015–2017 in its BUR. The HFC emission estimates are taken from the HFC Emissions Inventory Report 2021 provided by the Climate Change and Development Authority, which estimated the emissions based on Chinese export data and the customs import data of Papua New Guinea.

43. HFC emissions before 2014 were not estimated. The impact of HFC emissions for category 2.F.1 (refrigeration and air conditioning) in the IPPU sector for 2017 was very significant, accounting for 98.3 per cent of total emissions in the sector, and this source was identified as a key source. During the technical analysis, the Party clarified that there was no relevant information to estimate HFC emissions covering the years before 2014 and, owing to the high level of uncertainty for the available data set, no splicing techniques could be used to estimate and report HFC emissions covering the entire time series. Estimates of PFCs and SF_6 were not provided owing to the absence of potential PFC emissions sources in the country and difficulties in obtaining the necessary data on possible emissions sources (e.g. electrical equipment), as clarified by the Party in the NIR.

44. For 2006 IPCC Guidelines AFOLU categories 3.A and 3.C, agricultural soils (direct and indirect N_2O) and enteric fermentation (CH_4) were identified as key categories and the most relevant emissions sources in the sector.

45. Information was not reported on the number of livestock or the amount of fertilizer used. During the technical analysis, the Party provided the data for the livestock population by each livestock group for the four regions in Papua New Guinea, and also provided the total amount of annual synthetic fertilizers applied to soils.

46. For the LULUCF sector, Papua New Guinea reported annual GHG emissions and removals for 2000–2017. Categories 3.B.4 (wetlands), 3.B.6 (other land) and 3.D.1 (HWP) were reported as "NE" (NIR table 6-1). The Party clarified in its NIR that categories 3.B.4 (wetlands) and 3.B.6 (other land) were not estimated because no land-use change had occurred and emissions for category 3.D.1 (HWP) were considered zero, since instantaneous

[5] The APERC energy balance tables for the years since 1980 are available at https://www.egeda.ewg.apec.org/egeda/database_info/annual_data.html.

oxidation is assumed when primary forest is converted to degraded forest. The Party further clarified in the NIR that the majority of the country's logs are exported with very few being processed onshore. In the future, when the policy on onshore processing of logs comes into effect, HWP emissions/removals will be included. Overall, the net removals from the LULUCF sector fluctuated between a minimum of 1,164 kt CO_2 eq in 2007 and a maximum of 20,864 kt CO_2 eq in 2001. There were also years where the LULUCF sector had net emissions, fluctuating between a minimum of 422 kt CO_2 eq in 2010 and a maximum of 5,617 kt CO_2 eq in 2015 due to an increasing rate of deforestation and degradation, and increased areas of forest fire.

47. Information on managed land for the categories wetlands and other land was not clearly reported in Papua New Guinea's BUR. During the technical analysis, the Party clarified that the distinction between managed and unmanaged lands had not been made and it was assumed in the BUR that all land areas in Papua New Guinea were managed. In addition, wetlands and other land were assumed to have undergone minimal human disturbance. Therefore, it was assumed that both categories were in equilibrium, and that their net removals were close to zero. Because human disturbance was minimal, these categories can be considered unmanaged land. The Party clarified that a proper classification will be in place on wetlands and other land in the future if Papua New Guinea finds these two categories to be significant sources of GHG emissions.

48. For the waste sector, information was clearly reported on GHG emissions, methodological tier levels, AD and their sources, EFs, key categories, notation keys used and other information specific to the sector, such as an overview of the wastewater treatment and discharge pathways of Port Moresby in Papua New Guinea. Category 5.D.1 (domestic wastewater) was identified as a key category and the most relevant emissions source in the sector because industrial wastewater is collected through the domestic wastewater collection system. GHG emissions from incineration and open burning of municipal solid waste and CH_4 emissions from lagoon systems were newly estimated and reported in the second BUR.

49. The assumptions for estimating parameters used in the calculation of emissions from the waste sector were not reported. During the technical analysis, Papua New Guinea provided clarification on the assumptions used to estimate the population and waste generation per person per day for the inventory years 2000–2017.

50. The BUR provides an update to some of the GHG inventories reported in the Party's previous NCs and BURs. The information reported provides an update of the Party's first BUR, which addresses anthropogenic emissions and removals for 2000–2015. The update was carried out for 2000–2017 using the methodologies contained in the 2006 IPCC Guidelines, thus generating a consistent 18-year time series for all GHGs other than HFCs.

51. The Party did not report the summary list of categories or sectors where recalculations were performed and the resulting change in emission estimates compared with the first BUR, but the Party provided the related information on category-specific recalculations, such as the reasons for the recalculation for each category in the dedicated section of its NIR.

52. Papua New Guinea described in its BUR the institutional framework for the preparation of its 2017 GHG inventory. The Party reported that the Climate Change and Development Authority is the governmental body responsible for its climate change policy and GHG inventory and BUR, which were prepared with the support of the Food and Agriculture Organization of the United Nations through the Global Environment Facility Capacity-building Initiative for Transparency and the Green Climate Fund Readiness and Preparatory Support Programme, and the Japan International Cooperation Agency. Among its key functions, the Climate Change and Development Authority identifies data sources for each sector, collects and compiles AD and EFs for each sector and is responsible for the estimation and reporting of GHG emissions by sources and removals by sinks for the national inventory.

53. Information on the arrangements for archiving data and efforts to make data collection a continuous process was not reported in the BUR. During the technical analysis, the Party clarified that the Climate Change and Development Authority is responsible for developing and maintaining an archiving system to ensure institutional memory and to fully and systematically document all the AD and the methodologies used in the preparation of the

BURs and NCs. The Party further clarified that previous reports were prepared on a project-by-project basis. Papua New Guinea has institutionalized the process of preparing BURs and NCs. As per the Climate Change (Management) Act 2015, the designated entity for preparing and communicating the BURs and NCs is the Climate Change and Development Authority, which ensures that collecting and archiving data for the preparation of the GHG inventory is a continuous process.

54. Papua New Guinea clearly reported that a key category analysis was performed with and without LULUCF for the level of emissions for 2017, which is the latest year of the GHG inventory. Fourteen and 19 categories were identified as key categories with and without LULUCF respectively. The main key sources without LULUCF were CO_2 emissions for category 1.A.2 (manufacturing industries and construction), at 34.96 per cent of total national emissions, and for subcategory 1.A.3.b (road transportation), at 14.11 per cent of total national emissions, and CH_4 emissions for subcategory 1.B.2.a.ii (oil production – flaring), at 7.95 per cent of total national emissions. The main key sources with LULUCF were CO_2 emissions for categories 3.B.1 (forest land remaining forest land), at 52.16 per cent of total national emissions, 3.B.2 (land converted to cropland), at 18.76 per cent of total national emissions, and 1.A.2 (manufacturing industries and construction), at 8.31 per cent of total national emissions.

55. In BUR tables 2-5 and 2-6, and NIR tables 1-3 and 1-4 for key category analysis, the information on subcategory 1.B.2.a.ii (oil production – flaring) is duplicated. During the technical analysis, the Party clarified that this was a mistake that will be amended.

56. The BUR provides information on general QA/QC measures as included in the QA/QC plan prepared in 2020. The plan is based on the tier 1 QA/QC procedures in accordance with the IPCC good practice guidance. Papua New Guinea is planning to strengthen this plan over the next few years. The TTE commends Papua New Guinea for providing information in accordance with the IPCC good practice guidance.

57. Papua New Guinea clearly reported information on CO_2 fuel combustion emissions using both the sectoral and the reference approach and the differences between the two approaches. The information reported indicates that the combustion emissions under the sectoral and reference approach for 2017 are 7,002 kt CO_2 and 6,869 kt CO_2 respectively. The difference between the estimates calculated using the two approaches was reported as 16.0 per cent for 2004 and 2.0 per cent for 2017. The differences between the two approaches before 2004 are relatively large, ranging from –8 to –14 per cent, while the differences after 2005 range from –2 to +6 per cent. The Party also reported that the differences are due to a statistical discrepancy in crude oil data.

58. Papua New Guinea did not report GHG emissions from international aviation and marine bunker fuels. The Party explained in the NIR that emissions from international bunker fuels were not estimated owing to a lack of reliable data. The Party also explained in the NIR that domestic and international bunkers for civil aviation and navigation were reported as an aggregated figure owing to limited data.

59. Papua New Guinea for the first time reported information on the uncertainty assessment (level) of its national GHG inventory. The uncertainty analysis was based on the tier 1 approach and covers most source categories and all direct GHGs, except CH_4 and N_2O for subcategory 3.C.1.a (prescribed burning of savannahs), N_2O for category 2.G.3 (indirect N_2O emissions) and HFCs for category 2.F.1 (refrigeration and air conditioning). The results obtained, as reported in NIR table 1-5, reveal that the level uncertainty for emissions in 2017 is 259.0 per cent including LULUCF and the largest uncertainty comes from fugitive emissions and domestic wastewater. The TTE commends Papua New Guinea for providing in its NIR information on the selected uncertainty values for AD and EFs.

60. For subcategory 3.C.1.a (prescribed burning of savannahs), and categories 2.G.3 (indirect N_2O emissions) and 2.F.1 (refrigeration and air conditioning), there were no uncertainty estimations. During the technical analysis, the Party clarified that it had faced human resources challenges in conducting the uncertainty assessment for these subcategories, and capacity-building for conducting uncertainty assessment was identified as one of the Party's needs in its BUR.

61. The TTE noted that the transparency of the information reported on GHG inventories could be further enhanced by addressing the areas noted in paragraphs 31, 34, 36, 41, 43, 45, 47, 49, 53, 55 and 60 above, which could facilitate a better understanding of the information reported on GHG inventories.

62. In paragraph 43 of the summary report on the technical analysis of the Party's first BUR, the previous TTE noted areas where the transparency of the reporting on GHG inventories could be further enhanced. The current TTE noted the improvements referred to in paragraphs 35, 37, 42, 54 and 59 above, namely providing information on the application of notation keys, the comparable information addressing the tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF, HFC emissions for 2015–2017 and the methodology used for conducting the key category analysis and conducting the uncertainty assessment of its national GHG inventory, and commends the Party for enhancing the transparency of its reporting.

3. Mitigation actions and their effects, including associated methodologies and assumptions

63. As indicated in table I.2, Papua New Guinea reported in its BUR, fully in accordance with paragraphs 11–13 of the UNFCCC reporting guidelines on BURs, information on mitigation actions and their effects, to the extent possible.

64. The information reported provides a comprehensive overview of the Party's mitigation actions and their effects. In its BUR, Papua New Guinea reported information on its national context and framed its national mitigation planning and actions in the context of its enhanced NDC (2020), which builds upon the national development and climate change ambitions and strategies set out in the national policy documents listed in BUR table 3-1, such as the Papua New Guinea Vision 2050 (2009), the Papua New Guinea Development Strategic Plan 2010–2030 (2010), the National Climate Compatible Development Management Policy (2014) and the National Strategy for Responsible Sustainable Development for Papua New Guinea (2014). The quantitative national sectoral emission reduction targets for 2030 are to achieve net zero carbon emissions in the energy industry subsector and to shift the LULUCF sector from a net GHG source to a net GHG sink by achieving an emission reduction of 10,000 Gg CO_2 eq compared with the 2015 levels by 2030. Papua New Guinea reported that climate change has been mainstreamed in and integrated into its development plans, including mitigation. Most of the mitigation actions are in the energy and AFOLU sectors. Papua New Guinea also reported that, if all activities are sustained, the country is expected to achieve economy-wide carbon neutrality by 2050, with the energy and AFOLU sectors being the main sources of emission reductions.

65. Papua New Guinea reported a list of existing mitigation actions and those planned to be implemented between 2021 and 2030 (BUR table 3-2) within the scope of its enhanced NDC (2020). Among these mitigation actions, 41 are in the energy sector and 14 are in the AFOLU sector. The mitigation actions in the energy sector focus mainly on improving energy efficiency and promoting renewable energy sources. Papua New Guinea is targeting an energy mix of 78 per cent renewables by 2030 in the electricity generation subsector, and improving energy efficiency in electricity consumption and for the transport sector. The mitigation actions in the AFOLU sector focus mainly on reducing emissions from deforestation and forest degradation, mostly due to unsustainable agricultural practices. The overall mitigation goal for the AFOLU sector is for it to convert from a net GHG source to a net GHG sink by 2030 by implementing mitigation measures such as forest management to reduce deforestation and increase reforestation and afforestation, as well as promoting climate-smart agricultural practices. The TTE acknowledged the information, which is presented in this summary report as contextual without assessing the completeness and transparency of the information.

66. The Party reported a summary of its mitigation actions in tabular format (BUR table 3-3) in accordance with decision 2/CP.17, annex III, paragraph 11. The Party also reported information on its mitigation actions in narrative format. The TTE noted that Papua New Guinea improved the transparency of its reporting by providing comprehensive information on mitigation actions that are outside the scope of its enhanced NDC (2020) in both tabular (BUR table 3-2) and narrative format.

67. Consistently with decision 2/CP.17, annex III, paragraph 12(a), Papua New Guinea clearly reported the names of the mitigation actions that are outside the scope of its enhanced NDC (2020), including information on the nature of the actions, coverage (sectors and gases) and progress indicators in the BUR (table 3-3). A clear description of mitigation actions, as well as information on quantitative goals, was provided in the BUR. The TTE noted the improvement in the transparency of the Party's reporting by its provision of clear information on the sectors covered by the mitigation actions, the nature of the mitigation actions, the implementation status and progress indicators for mitigation actions in the BUR.

68. Papua New Guinea clearly reported information on methodologies and assumptions, the objectives of the actions and steps taken or envisaged to achieve those actions for all mitigation actions in the energy, waste and AFOLU sectors. Information on the progress of implementation of the mitigation actions and steps undertaken and results achieved, such as estimated outcomes and estimated emission reductions, was also clearly reported. The TTE noted that Papua New Guinea improved the transparency of its reporting by including clear information for all the mitigation actions in the energy, waste and AFOLU sectors.

69. The mitigation action in the energy sector is the construction of a 55 MW geothermal power project with an annual estimated emission reduction of 278,904 t CO_2 eq. The implementation of the project under the CDM has been completed and resulted in emission reductions of 163,036 t CO_2 eq during 2006–2007. Papua New Guinea also reported a 36 MW biomass power project registered under the Gold Standard, which is a certification standard for carbon offset projects. The biomass power plant is currently being constructed and CDM methodology was applied to estimate emission reductions (153,375 t CO_2 eq per annum).

70. All seven mitigation actions in the waste sector (BUR table 3-3) are implemented under the CDM and are related to CH_4 capture and utilization in the Party's palm oil mills. Two projects were completed, four are being planned and construction has not started for one. The annual estimated emission reduction ranges from 44,998 to 63,801 t CO_2 eq.

71. The mitigation action in the AFOLU sector is registered under the Gold Standard. A total area of 12,400 ha of a planned 15,000 ha was planted with eucalyptus to produce fuelwood to be used in a biomass power plant. Gold Standard methodology was applied to estimate the annual removals from this project (21,224 t CO_2 eq per annum over a 30-year crediting period).

72. Papua New Guinea provided information on its involvement in international market mechanisms as a Party to the Kyoto Protocol. Papua New Guinea documented eight registered CDM projects under the UNFCCC CDM process and two projects registered under the Gold Standard (see paras. 69–71 above). The statistics include information on the total projects, sectors covered and quantity of certified emission reductions issued for Papua New Guinea, as well as the methodologies applied. The total emission reductions from these registered CDM projects amount to 673,095 t CO_2 eq per annum and were mostly waste-to-energy projects that cut across the energy and waste sectors. The total emission reductions from the two Gold Standard projects in the energy and AFOLU sectors amount to 174,599 t CO_2 eq per annum. The TTE noted that Papua New Guinea improved the transparency of its reporting by clearly reporting information on the country's participation in international market mechanisms, namely the CDM and the Gold Standard, in BUR table 3-3.

73. Papua New Guinea reported information on its domestic MRV arrangements in accordance with decision 2/CP.17, annex III, paragraph 13. The information reported indicates that in addition to the MRV systems for implementing and monitoring REDD+ activities in the country, which were described in detail in Papua New Guinea's first BUR, the Party has designed and developed a domestic MRV system covering the energy and AFOLU sectors, for which mitigation actions have been formulated in the country's enhanced NDC. Papua New Guinea reported that it has developed an institutional framework, based on the Climate Change (Management) (Nationally Determined Contribution) Regulation (2022), to implement the climate change mitigation MRV. The Climate Change and Development Authority, with the support of the Technical Advisory Committee, is mandated to coordinate the overall domestic MRV framework and reporting under the Convention. Information on monitoring the progress of implementation of mitigation actions

is sent to the Climate Change and Development Authority from the implementing institutions, which have been named for each mitigation action in BUR tables 3-2 and 3-3, by the Energy and AFOLU Sub-Technical Working Committees.

74. Information on the operational status of the MRV system and roles played by the institutions in preparing the second BUR was not reported. During the technical analysis, Papua New Guinea clarified that since the MRV system is still in its infancy, having been developed at the time of the NDC update in 2020, the Party needs to establish a mitigation MRV portal and enhance the capacity of relevant institutions to provide the data and information necessary to track mitigation actions across sectors and meet reporting obligations as set out in decision 2/CP.17 and its annex III.

75. The TTE noted that the transparency of the information reported on mitigation actions could be further enhanced by addressing the areas noted in paragraph 74 above, which could facilitate a better understanding of the information reported on mitigation actions.

76. In paragraph 59 of the summary report on the technical analysis of Papua New Guinea's first BUR, the previous TTE noted areas where the transparency of the reporting on mitigation actions could be enhanced. The current TTE noted the improvements referred to in paragraphs 65–68 above, namely providing information in tabular format, on methodologies and assumptions, quantitative goals and progress indicators for all mitigation actions outside the scope of the enhanced NDC (submitted in 2020) and clearly reporting information on CDM and Gold Standard projects, and commends the Party for enhancing the transparency of its reporting.

4. Constraints and gaps, and related technology, financial, technical and capacity-building needs, including a description of support needed and received

77. As indicated in table I.3, Papua New Guinea reported in its BUR, mostly in accordance with paragraphs 14–16 of the UNFCCC reporting guidelines on BURs, information on finance, technology and capacity-building needs and support received.

78. Papua New Guinea reported information on constraints and gaps, and related financial, technical and capacity-building needs in accordance with decision 2/CP.17, annex III, paragraph 14. In its BUR, Papua New Guinea identified constraints and gaps related to the preparation of its GHG inventory (BUR table 2-7) for the agriculture sector (i.e. data availability and consistency). Papua New Guinea reported that as per the preliminary estimates, it requires USD 1 billion to implement the actions to achieve the targets of the enhanced NDC (2020) over 2021–2030. Its technical and capacity-building needs (BUR table 4-1) are primarily related to conducting assessments in mitigation (i.e. mitigation impact, sustainable development and transformative change assessments), adaptation (i.e. vulnerability needs assessments) and cross-cutting areas (i.e. financial needs and technology needs assessments) and using tools and guidelines for the preparation of the GHG inventory.

79. Information on constraints and gaps related to areas other than the GHG inventory, such as institutional arrangements, was not reported in Papua New Guinea's BUR and the reason for this was not clear to the TTE. During the technical analysis, the Party provided additional information on its financial, technical and capacity-building needs and clarified that challenges remain in addressing constraints and gaps that were identified and reported in table 5-1 of the first BUR. Constraints on mitigation activities include a limited budget and ineffective institutional arrangements, while constraints on adaptation activities include a limited budget and the geographical situation of the country hindering data collection. Gaps related to mitigation activities include the lack of an established MRV system for mitigation actions other than REDD+ and of a legal regulation for sectoral emission mitigation plans, while those related to adaptation activities include the lack of an established MRV system for adaptation activities and of country-specific historical data for climate-induced hazard modelling.

80. Papua New Guinea reported information on financial resources, technology transfer, capacity-building and technical support received in accordance with decision 2/CP.17, annex III, paragraph 15. A list of support received from 2017 to 2022 to implement adaptation, mitigation and MRV activities was provided in tabular format (BUR table 4-2). The Party reported that it has received financial resources, technology transfer, capacity-building and

technical support for 25 projects since 2017 through bilateral or multilateral agreements with various governments and organizations (i.e. the Adaptation Fund, Asian Development Bank, Government of Australia, Department of Foreign Affairs and Trade of Australia, European Union, German Agency for International Cooperation, Global Environment Facility, Green Climate Fund, Government of Italy, Japan International Cooperation Agency, Korean International Cooperation Agency, Ministry of Foreign Affairs and Trade of New Zealand, NDC Partnership, United States Agency for International Development and World Bank). The largest amount received during 2016–2023 was a USD 32.23 million grant from the Asian Development Bank to improve Papua New Guinea's capacity to assess and incorporate climate change risks in its development investment programme. Most of the support received was in the form of grants.

81. Papua New Guinea did not report the financial support it received from the Global Environment Facility for preparing its second BUR. During the technical analysis, the Party confirmed that the information on funds received for the preparation of the second BUR was unavailable owing to an inefficient mechanism for recording support received, adding that Papua New Guinea needs to strengthen its capacity for building a robust system to record support received.

82. Papua New Guinea reported information on nationally determined technology needs with regard to the development and transfer of technology in accordance with decision 2/CP.17, annex III, paragraph 16. The technology needs for the energy sector as identified in the Enhanced NDC Implementation Plan (2021–2030) and the NDC Implementation Roadmap for the electricity sector include the development of solar power systems and a mini-hydropower system that will displace the fossil fuel-based generators that supply electricity to the grid. The Party also has technology needs with respect to monitoring the progress of the actions identified in the Enhanced NDC Implementation Plan and the NDC Implementation Roadmap for the AFOLU sector. The Party also indicated its technology needs related to the development and implementation of climate-resilient transport infrastructure and an early warning system.

83. Information on the process to demonstrate that the technology needs are nationally determined was not clearly reported in Papua New Guinea's BUR. During the technical analysis, the Party clarified that information on technology needs was taken from the plans and policies of relevant key stakeholders in the energy and AFOLU sectors to develop the enhanced NDC (2020). Therefore, the technology needs are based on the needs of these key stakeholders. The Party further clarified that it would need technical support or capacity-building to conduct a thorough technology needs assessment, as reported in BUR table 4-1.

84. The TTE noted that the transparency of the information reported on needs and support received could be enhanced by addressing the areas noted in paragraphs 79, 81 and 83 above, which could facilitate a better understanding of the information reported on needs and support received.

85. In paragraph 65 of the summary report on the technical analysis of Papua New Guinea's first BUR, the previous TTE noted areas where the transparency of the reporting on needs and support received could be enhanced. The current TTE noted the improvements in reporting information on financial and technology needs referred to in paragraphs 78 and 82 above and commends the Party for enhancing the transparency of its reporting.

86. Papua New Guinea clarified during the technical analysis its areas for improvement for future BURs for compliance with requirements under the ETF. The initiatives relate to building a robust system to record support received and establishing an MRV system for needs and support.

5. Any other information

87. Papua New Guinea reported some information on its REDD+ Finance and Investment Plan to support the implementation of the National REDD+ Strategy (2017–2027), which may lead to 26 Mt CO_2 eq GHG emission reductions or avoidance for deforestation and forest degradation, responsible for 90 per cent of the Party's GHG emissions. Actions include changing the way commercial agriculture, in particular oil palm cultivation, is developed, improvements in the sustainability of timber supply and coordinated land-use planning.

D. Identification of capacity-building needs

88. In consultation with Papua New Guinea, the TTE identified the following needs for capacity-building that could facilitate the preparation of subsequent BURs and participation in ICA:

(a) For GHG inventory preparation, build or enhance national capacity to:

(i) Estimate historical emissions to improve completeness of time series and archive data collected for the preparation of the GHG inventory;

(ii) Improve the estimates for key sources;

(iii) Design and develop surveys or questionnaires for data collection on the livestock population in Papua New Guinea to improve the accuracy of GHG emission estimates and move to higher methodological tier levels;

(iv) Disaggregate the AD for domestic and international aviation and navigation, and report emissions from international bunkers;

(v) Estimate HFC emissions for category 2.F.1 (refrigeration and air conditioning) before 2014;

(b) For mitigation actions and their effects, build or enhance national capacity to:

(i) Develop methods and tools for quantifying the potential for emission reduction, and assessing co-benefits before implementing mitigation policies and measures (ex ante), which will facilitate the monitoring of progress, assessing of results (ex post) and reporting of information in subsequent reports;

(ii) Develop and analyse emissions scenarios;

(iii) Improve the data-collection process and enable the implementing institutions involved in the Party's mitigation MRV framework to apply methods and tools for monitoring progress and collecting data and to report emissions reduced or avoided owing to implemented mitigation policies and actions;

(iv) Identify and report relevant information on steps planned or taken to facilitate the measurement of impacts of planned or implemented mitigation actions and underlying steps taken or planned for the implementation of mitigation actions;

(v) Formulate mitigation measures and assess the GHG effects of nature-based solutions, in particular reduced emissions and enhanced removals from the forest sector for fossil fuel offsetting from the energy industries subsector;

(vi) Build on the domestic MRV system and develop economy-wide mitigation measures to include sectors other than the energy and AFOLU sectors, such as IPPU and waste, with quantitative goals towards achieving the country's carbon neutrality goal by 2050;

(vii) Identify and report gases addressed by individual mitigation actions, with a focus on the energy sector and other sectors for which mitigation actions have been formulated;

(viii) Understand and apply the provisions in the UNFCCC reporting guidelines on BURs, particularly those in paragraph 12(a), including reporting on quantitative goals and progress indicators for individual or grouped mitigation actions in the energy sector (and other sectors for which mitigation actions have been formulated);

(c) For reporting constraints and gaps, and related technology, financial, technical and capacity-building needs, including describing support needed and received, build or enhance national capacity to:

(i) Set up a robust MRV system to record support received;

(ii) Address gaps in mitigation and adaptation activities, including the lack of an established MRV system for mitigation actions other than REDD+ and of legal regulations for sectoral emission mitigation plans, and the lack of an established MRV

system for adaptation activities and of country-specific historical data for climate-induced hazard modelling.

89. The TTE noted that, in addition to those identified during the technical analysis, Papua New Guinea reported the following capacity-building needs in its BUR, which include capacity-building needs for future BURs and transitioning to the ETF:

(a) Strengthening national capacity to conduct a thorough technology needs assessment to identify more country-specific technology needs since those identified in the section are based on preliminary assessments;

(b) Strengthening national capacity to report on adaptation, the GHG inventory, mitigation and cross-cutting areas;

(c) Strengthening national capacity in the AFOLU sector MRV system and the national GHG inventory management system to ensure fulfilment of AFOLU reporting requirements under the Paris Agreement.

90. In paragraph 67 of the summary report on the technical analysis of Papua New Guinea's first BUR, the previous TTE, in consultation with Papua New Guinea, identified capacity-building needs. In its second BUR, Papua New Guinea reflected that some of those capacity-building needs have been addressed:

(a) Using the 2006 IPCC Guidelines, with a focus on data collection and archiving and using notation keys; using the IPCC inventory software; understanding and using the UNFCCC reporting guidelines on BURs; and using IPCC methodologies to conduct QA/QC procedures and uncertainty assessment;

(b) Improving the transparency of reporting by providing comprehensive information on mitigation actions in tabular format;

(c) Providing clear information on the sectors covered by the mitigation actions, nature of the mitigation actions, implementing information and progress indicators;

(d) Reporting clear information on the country's participation in international market mechanisms, namely the CDM and the Gold Standard, in table 3-3 of the second BUR;

(e) Improving the information reported on the institutional arrangements, including establishing the Energy and AFOLU Sub-Technical Working Committees;

(f) Providing an update on domestic MRV arrangements;

(g) Identifying the nationally determined technology needs.

III. Conclusions

91. The TTE conducted a technical analysis of the information reported in the second BUR of Papua New Guinea in accordance with the UNFCCC reporting guidelines on BURs and concludes that the information reported is mostly consistent. It provides an overview of national circumstances and institutional arrangements relevant to the preparation of NCs on a continuous basis; the national inventory of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol, including an NIR; mitigation actions and their effects, including associated methodologies and assumptions; constraints and gaps, and related financial, technical and capacity-building needs, including a description of support needed and received; and an update on the domestic MRV arrangements. During the technical analysis, additional information was provided by Papua New Guinea on capacity-building needs for enhancing the current MRV systems, improving the accuracy of the GHG inventory, conducting better mitigation assessments and building a good data system to track support received. The TTE concluded that the information analysed is mostly transparent.

92. Papua New Guinea reported an update on the institutional arrangements relevant to the preparation of its BURs, including its national circumstances, economic sectors and domestic climate change policy that might affect the Party's ability to mitigate and adapt to climate change impacts. The update covers key aspects of the institutional arrangements,

including the legal status and roles and responsibilities of the overall coordinating entity, the involvement and roles of other institutions and experts, and mechanisms for information and data exchange. The TTE noted improvements to the information reported in the BUR, including the information on the establishment of the Energy and AFOLU Sub-Technical Working Committees.

93. In its second BUR, submitted in 2022, Papua New Guinea reported information on its national GHG inventory for 2000–2017. This included GHG emissions and removals of CO_2, CH_4 and N_2O for most relevant sources and sinks. It also included for the first time HFC emissions from one source but covered only 2015–2017. Estimates of PFCs and SF_6 were not provided owing to difficulties in obtaining the necessary data, as clarified by the Party in the NIR. Notation keys "NE" and "NO" were used for reporting PFCs and SF_6. Numeric values were reported for NMVOCs but notation keys "NE" and "NO" were used for reporting nitrogen oxides and carbon monoxide owing to difficulties in obtaining a complete set of AD for these gases, as clarified by the Party during the technical analysis. The inventory was developed on the basis of the 2006 IPCC Guidelines. The total GHG emissions for 2017 were reported as 10,767 Gg CO_2 eq (excluding LULUCF) and –1,958 Gg CO_2 eq (including LULUCF). Fourteen key categories with LULUCF and 19 key categories without LULUCF were identified.

94. Papua New Guinea reported information on mitigation actions and their effects in both tabular and narrative format, including sectoral emission reduction targets to be achieved by 2030 compared with the 2015 baseline emission level, and framed its national mitigation plan and actions in the context of its enhanced NDC (2020), the Papua New Guinea Vision 2050 (2009), the Papua New Guinea Development Strategic Plan 2010–2030 (2010) and the National Climate Compatible Development Management Policy (2014). If all the mitigation actions within the scope of the enhanced NDC (2020) are implemented, Papua New Guinea will achieve net zero carbon emissions in the energy sector and a cumulative 10,000 Gg CO_2 eq reduction in GHG emissions in the LULUCF sector by 2030 compared with the 2015 levels. The TTE acknowledged the mitigation actions reported within the scope of the enhanced NDC (2020), which are presented in this summary report as contextual without assessing the completeness and transparency of the information. Papua New Guinea reported planned, implemented and ongoing actions in the energy, waste and AFOLU sectors that are outside the scope of its enhanced NDC (2020). The total emission reductions from these mitigation actions amount to 847,694 t CO_2 eq per annum. The Party also reported information on its involvement in international market mechanisms and on MRV arrangements.

95. Papua New Guinea reported information on key constraints, gaps and related needs, including support needed to address the constraints and gaps related to the preparation of its GHG inventory for the agriculture sector, a preliminary estimate of USD 1 billion to implement the actions to achieve the enhanced NDC (2020) targets over 2021–2030, technical and capacity-building needs related to conducting assessments in mitigation, adaptation and cross-cutting areas, and using tools and guidelines for the preparation of the GHG inventory. The Party further reported information on the transfer of technology received, including in the areas of renewable energy, energy efficiency and resilience-building. Information on constraints and gaps related to areas other than the GHG inventory, the process to determine technology needs and the financial support received to prepare the second BUR was not reported owing to a lack of capacity and of an established tracking system, as clarified by the Party during the technical analysis.

96. The current TTE noted improvements in the reporting in the Party's second BUR compared with that in its previous BUR. The information reported on the GHG inventory, mitigation actions and their effects, needs and support, and institutional arrangements demonstrates that the Party has taken into consideration the areas for enhancing the transparency of the information reported noted by the TTE in the summary report on the technical analysis of the first BUR. However, improvements are ongoing, and the Party has taken note of outstanding areas for future improvements.

97. The TTE, in consultation with Papua New Guinea, identified the 15 capacity-building needs listed in chapter II.D above and needs for capacity-building that aim to facilitate reporting in accordance with the UNFCCC reporting guidelines on BURs and participation

in ICA in accordance with the ICA modalities and guidelines, taking into account Article 4, paragraph 3, of the Convention. Papua New Guinea prioritized all the capacity-building needs.

Annex I

Extent of the information reported by Papua New Guinea in its second biennial update report

Table I.1
Identification of the extent to which the elements of information on greenhouse gases are included in the second biennial update report of Papua New Guinea

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, paragraph 41(g)	The first BUR shall cover, at a minimum, the inventory for the calendar year no more than four years prior to the date of the submission, or more recent years if information is available, and subsequent BURs shall cover a calendar year that does not precede the submission date by more than four years.	No	Papua New Guinea submitted its second BUR in May 2022; the GHG inventories reported are for 2000–2017.
Decision 2/CP.17, annex III, paragraph 4	Non-Annex I Parties should use the methodologies established in the latest UNFCCC guidelines for the preparation of NCs from non-Annex I Parties approved by the Conference of the Parties or those determined by any future decision of the Conference of the Parties on this matter.	Yes	Papua New Guinea used the 2006 IPCC Guidelines.
Decision 2/CP.17, annex III, paragraph 5	The updates of the section on national inventories of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol should contain updated data on activity levels based on the best information available using the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF; any change to the EF may be made in the subsequent full NC.	Yes	
Decision 2/CP.17, annex III, paragraph 6	Non-Annex I Parties are encouraged to include, as appropriate and to the extent that capacities permit, in the inventory section of the BUR:		
	(a) The tables included in annex 3A.2 to the IPCC good practice guidance for LULUCF;	Yes	Comparable information was reported in the NIR, tables 6-5, 6-10, 6-14 and 6-15.
	(b) The sectoral report tables annexed to the Revised 1996 IPCC Guidelines.	Yes	Comparable information was reported in the NIR, appendix II.
Decision 2/CP.17, annex III, paragraph 7	Each non-Annex I Party is encouraged to provide a consistent time series back to the years reported in its previous NCs.	Partly	The time series reported in the second BUR covers 2000–2017 but does not include 1994, which was reported in the Party's NC1.
Decision 2/CP.17, annex III, paragraph 8	Non-Annex I Parties that have previously reported on their national GHG inventories contained in their NCs are encouraged to submit summary information tables of inventories for previous submission years (e.g. for 1994 and 2000).	No	This information was not reported for 1994 and 2000.
Decision 2/CP.17, annex III, paragraph 9	The inventory section of the BUR should consist of an NIR as a summary or as an update of the information contained in decision 17/CP.8, annex, chapter III (National greenhouse gas inventories), including:	Yes	

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	(a) Table 1 (National greenhouse gas inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol and greenhouse gas precursors);	Yes	Comparable information was reported in table 2-4 of the second BUR.
	(b) Table 2 (National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF_6).	Yes	Comparable information was reported in table 2-4 of the second BUR.
Decision 2/CP.17, annex III, paragraph 10	Additional or supporting information, including sector-specific information, may be supplied in a technical annex.	Yes	The Party submitted a REDD+ technical annex to its BUR.
Decision 17/CP.8, annex, paragraph 12	Non-Annex I Parties are also encouraged, to the extent possible, to undertake any key source analysis as indicated in the IPCC good practice guidance to assist in developing inventories that better reflect their national circumstances.	Yes	
Decision 17/CP.8, annex, paragraph 13	Non-Annex I Parties are encouraged to describe procedures and arrangements undertaken to collect and archive data for the preparation of national GHG inventories, as well as efforts to make this a continuous process, including information on the role of the institutions involved.	Partly	Information on data-collection procedures was reported but information was not reported on the arrangements for archiving data and efforts to make data collection a continuous process.
Decision 17/CP.8, annex, paragraph 14	Each non-Annex I Party shall, as appropriate and to the extent possible, provide in its national inventory, on a gas-by-gas basis and in units of mass, estimates of anthropogenic emissions of:		
	(a) CO_2;	Yes	
	(b) CH_4;	Yes	
	(c) N_2O.	Yes	
Decision 17/CP.8, annex, paragraph 15	Non-Annex I Parties are encouraged, as appropriate, to provide information on anthropogenic emissions by sources of:		
	(a) HFCs;	Partly	Only HFC emissions for category 2.F.1 (refrigeration and air conditioning) between 2015 and 2017 were reported.
	(b) PFCs;	Yes	Notation keys “NE” and “NO” were used.
	(c) SF_6.	Yes	Notation keys “NE” and “NO” were used.
Decision 17/CP.8, annex, paragraph 16	Non-Annex I Parties are encouraged, as appropriate, to report on anthropogenic emissions by sources of other GHGs, such as:		
	(a) Carbon monoxide;	Yes	Notation keys “NE” and “NO” were used.
	(b) Nitrogen oxides;	Yes	Notation keys “NE” and “NO” were used.
	(c) NMVOCs.	Partly	Only NMVOC emissions for category 1.B.2 (oil and natural gas, and other) emissions from energy production were reported.

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 17/CP.8, annex, paragraph 17	Other gases not controlled by the Montreal Protocol, such as sulfur oxides, and included in the Revised 1996 IPCC Guidelines may be included at the discretion of Parties.	No	The Party did not report on other gases, such as sulfur oxides.
Decision 17/CP.8, annex, paragraph 18	Non-Annex I Parties are encouraged, to the extent possible, and if disaggregated data are available, to estimate and report CO_2 fuel combustion emissions using both the sectoral and the reference approach and to explain any large differences between the two approaches.	Yes	The information was reported for both the sectoral and the reference approach, and the differences were also reported.
Decision 17/CP.8, annex, paragraph 19	Non-Annex I Parties should, to the extent possible, and if disaggregated data are available, report emissions from international aviation and marine bunker fuels separately in their inventories:		
	(a) International aviation;	No	
	(b) Marine bunker fuels.	No	
Decision 17/CP.8, annex, paragraph 20	Non-Annex I Parties wishing to report on aggregated GHG emissions and removals expressed in CO_2 eq should use the GWP provided by the IPCC in its AR2 based on the effects of GHGs over a 100-year time-horizon.	Yes	The Party used the GWP provided in the AR2.
Decision 17/CP.8, annex, paragraph 21	Non-Annex I Parties are encouraged to provide information on methodologies used in the estimation of anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol, including a brief explanation of the sources of EFs and AD. If non-Annex I Parties estimate anthropogenic emissions and removals from country-specific sources and/or sinks that are not part of the Revised 1996 IPCC Guidelines, they should explicitly describe the source and/or sink categories, methodologies, EFs and AD used in their estimation of emissions, as appropriate. Parties are encouraged to identify areas where data may be further improved in future communications through capacity-building:		
	(a) Information on methodologies used in the estimation of anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol;	Yes	Papua New Guinea used the 2006 IPCC Guidelines. Tier 1 methodology was used, while in some cases (for the IPPU, LULUCF and waste sectors) tier 2 methodology was used.
	(b) Explanation of the sources of EFs;	Yes	Papua New Guinea used the 2006 IPCC Guidelines.
	(c) Explanation of the sources of AD;	Yes	Papua New Guinea used the 2006 IPCC Guidelines
	(d) If non-Annex I Parties estimate anthropogenic emissions and removals from country-specific sources and/or sinks that are not part of the Revised 1996 IPCC Guidelines, they should explicitly describe:	NA	
	(i) Source and/or sink categories;		
	(ii) Methodologies;		

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	(iii) EFs;		
	(iv) AD;		
	(e) Parties are encouraged to identify areas where data may be further improved in future communications through capacity-building.	Yes	
Decision 17/CP.8, annex, paragraph 22	Each non-Annex I Party is encouraged to use tables 1–2 of the guidelines annexed to decision 17/CP.8 in reporting its national GHG inventory, taking into account the provisions established in paragraphs 14–17. In preparing those tables, Parties should strive to present information that is as complete as possible. Where numerical data are not provided, Parties should use the notation keys as indicated.	Yes	Notation keys were used, except for category 1.C (CO_2 transport and storage).
Decision 17/CP.8, annex, paragraph 24	Non-Annex I Parties are encouraged to provide information on the level of uncertainty associated with inventory data and their underlying assumptions, and to describe the methodologies used, if any, for estimating these uncertainties:		
	(a) Level of uncertainty associated with inventory data;	Yes	
	(b) Underlying assumptions;	Yes	
	(c) Methodologies used, if any, for estimating these uncertainties.	Yes	

Note: The parts of the UNFCCC reporting guidelines on BURs on reporting information on GHG emissions by sources and removals by sinks in BURs are contained in decision 2/CP.17, paras. 3–10 and 41(g). Further, as per para. 3 of those guidelines, non-Annex I Parties are to submit updates of their national GHG inventories in accordance with paras. 8–24 of the UNFCCC guidelines for the preparation of NCs from non-Annex I Parties, contained in the annex to decision 17/CP.8. The scope of such updates should be consistent with the non-Annex I Party's capacity and time constraints and the availability of its data, as well as the level of support provided by developed country Parties for biennial update reporting.

Table I.2

Identification of the extent to which the elements of information on mitigation actions are included in the second biennial update report of Papua New Guinea

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 11	Non-Annex I Parties should provide information, in tabular format, on actions to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol.	Yes	Papua New Guinea included information in tabular format.
Decision 2/CP.17, annex III, paragraph 12	For each mitigation action or group of mitigation actions, including, as appropriate, those listed in document FCCC/AWGLCA/2011/INF.1, developing country Parties shall provide the following information, to the extent possible:		
	(a) Name and description of the mitigation action, including information on the nature of the action, coverage (i.e. sectors and	Yes	

Decision	*Provision of the reporting guidelines*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	gases), quantitative goals and progress indicators;		
	(b) Information on:		
	(i) Methodologies;	Yes	
	(ii) Assumptions;	Yes	
	(c) Information on:		
	(i) Objectives of the action;	Yes	
	(ii) Steps taken or envisaged to achieve that action;	Yes	
	(d) Information on:		
	(i) Progress of implementation of the mitigation actions;	Yes	
	(ii) Progress of implementation of the underlying steps taken or envisaged;	Yes	
	(iii) Results achieved, such as estimated outcomes (metrics depending on type of action) and estimated emission reductions, to the extent possible;	Yes	
	(e) Information on international market mechanisms.	Yes	
Decision 2/CP.17, annex III, paragraph 13	Parties should provide information on domestic MRV arrangements.	Yes	

Note: The parts of the UNFCCC reporting guidelines on BURs on the reporting of information on mitigation actions in BURs are contained in decision 2/CP.17, annex III, paras. 11–13.

Table I.3

Identification of the extent to which the elements of information on finance, technology and capacity-building needs and support received are included in the second biennial update report of Papua New Guinea

Decision	*Provision of the reporting requirements*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
Decision 2/CP.17, annex III, paragraph 14	Non-Annex I Parties should provide updated information on:		
	(a) Constraints and gaps;	Yes	
	(b) Related financial, technical and capacity-building needs.	Yes	Information on financial, technical and capacity-building needs was reported.
Decision 2/CP.17, annex III, paragraph 15	Non-Annex I Parties should provide:		
	(a) Information on financial resources received, technology transfer and capacity-building received;	Yes	
	(b) Information on technical support received from the Global Environment Facility, Parties included in Annex II to the Convention and other developed country Parties, the Green Climate Fund and multilateral institutions for activities relating	Partly	Information on support received for the preparation of the second BUR was not reported.

Decision	*Provision of the reporting requirements*	*Assessment of whether the information was reported*	*Comments on the extent of the information provided*
	to climate change, including for the preparation of the current BUR.		
Decision 2/CP.17, annex III, paragraph 16	With regard to the development and transfer of technology, non-Annex I Parties should provide information on:		
	(a) Nationally determined technology needs;	Yes	
	(b) Technology support received.	Yes	

Note: The parts of the UNFCCC reporting guidelines on BURs on the reporting of information on finance, technology and capacity-building needs and support received in BURs are contained in decision 2/CP.17, annex III, paras. 14–16.

Annex II

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gp/english/.

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

B. UNFCCC documents

First BUR of Papua New Guinea. Available at https://unfccc.int/BURs.

NC1 and NC2 of Papua New Guinea. Available at https://unfccc.int/non-annex-I-NCs.

Summary report on the technical analysis of the first BUR of Papua New Guinea, contained in document FCCC/SBI/ICA/2019/TASR.1/PNG. Available at https://unfccc.int/ICA-reports.

C. Other documents

The following references may not conform to UNFCCC editorial style as some have been reproduced as received:

Government of Papua New Guinea (2015). *Climate Change (Management) Act 2015*. Available at https://www.parliament.gov.pg/uploads/acts/15A-19.pdf.

Government of Papua New Guinea (2021). *Climate Change (Management)(Amendment) Act 2021*. Available at https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/113916/142991/F-2093592969/PNG113916.pdf.

Papua New Guinea Climate Change and Development Authority and Food and Agriculture Organization of the United Nations (2022). *PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ National Forest Monitoring System (2022–2025)*. Available at https://pngreddplus.org/wp-content/uploads/2022/05/PNG-Action-Plan-for-Enhanced-Transparency_Final_for_printing.pdf.