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NATIONAL GHG INVENTORIES OF NON-ANNEX I PARTIES FROM ASIA: PRELIMINARY SYNTHESIS. METHODOLOGICAL ISSUES.

Working Paper

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1. Articles 4.1 and 12.1 of the United Nations Framework Convention on Climate Change require all Parties to the Convention to communicate information to the Conference of the Parties (COP). This provision includes Parties that are not listed in Annex I to the Convention, referred to below as Parties. Article 12.5 specifies that each non-Annex I Party shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4.3. Parties that are least developed countries may make their initial communication at their discretion.

2. This paper covers the information provided by 14 Asian Parties that submitted their initial communication by 1 September 2000 (Cook Islands, Indonesia, Jordan, Kiribati, Lebanon, Malaysia, the Federated States of Micronesia, Nauru, the Philippines, the Republic of Korea, Samoa, Singapore, Tuvalu, and Vanuatu). It also covers the national GHG inventory of Israel,[1] which was officially submitted to the Convention.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS OF GREENHOUSE GASES

3. Pursuant to Articles 4.1 (a) and 12.1 (a) of the UNFCCC, all reporting Parties communicated a national inventory of anthropogenic emissions by sources and removal by sinks of greenhouse gases not controlled by the Montreal Protocol. Since this report covers inventory information from 14 out of 47 Asian non-Annex I Parties conclusions on common patterns of the reporting of inventory data may not necessarily be applicable for all Asian non-Annex I Parties. This document focuses on methodological issues in order to provide a general picture of how the reporting requirements have been met by the reporting Parties. The conclusions provided here may be useful for Parties that are in the process of preparing their initial national communication.

A. Methodological issues

4. The reporting of GHG inventory data by Parties should follow the UNFCCC guidelines taking into account relevant SBSTA conclusions as presented in table 1. Most Parties followed this guidance.

Methods and gases

5. All Parties followed the IPCC Guidelines to compile their national GHG inventory, and 13 of them used the Revised 1996 IPCC Guidelines. Generally, Parties used IPCC default methods, but some of them developed their own methodologies and emission factors for specific sectors. All Parties presented emission estimates for the three main gases, CO_2, CH_4 and N_2O, on a gas by gas basis. Eleven Parties provided emissions data for all or some ozone precursors (CO, NO_x, and NMVOC). All Parties reported on CO_2 emissions and removals from the *land-use change and forestry* sector, except the Federated States of Micronesia, Kiribati, Singapore and Tuvalu. Although not required by the UNFCCC guidelines, nine Parties provided estimates

[1] In addition, Israel updated a partial inventory (covering only CO_2 and CH_4), and Indonesia updated its 1990 national GHG inventory.

of aggregate GHG emissions in term of CO_2 equivalent using the IPCC Global Warming Potential (GWP) values. Table 2 summarizes the status of reporting of inventory data by Parties.

6. The degree of completeness in reporting on IPCC sectors and subsectors is high. Most Parties reported the most significant GHG emission source and sink categories, such as CO_2 emissions from *fuel combustion*, *industrial processes*, CO_2 removals from *land-use change and forestry*, CH_4 emissions from *agriculture* and *waste*, and N_2O *fuel combustion*.

7. The level of reporting from seven Small Island Developing States (SIDS), which four of them[2] belong to the category of least developed countries (LDCs), was less complete compared to other non-Annex I Parties.[3] This may reflect the structure of the economy of these countries. It also has to be noted that the overall GHG emissions of these countries is relatively low even when they are compared with other non-Annex I Parties. The seven small island States represent 47 per cent of the 15 non-Annex I Parties included in this compilation, however their emissions only amount for 0.05 per cent of the total.

8. The reporting of the other eight Parties that are neither SIDS nor LDCs is approximately the same as that of Annex I Parties as can be seen in table 3 which presents the degree of completeness of non-Annex I Parties excluding SIDS. The reporting in most IPCC source categories is more comprehensive than as identified in table 4, which includes all Asian non-Annex I Parties together.

9. No Party reported on fully fluorinated compounds,[4] such as PFCs and SF_6, as encouraged by the UNFCCC guidelines. Lebanon reported emissions of HFCs which are not requested by the UNFCCC guidelines, but encouraged to be reported by SBSTA conclusions adopted later than the guidelines. The lack of reporting on these gases may be explained by the possible non-existence of such emissions or by the fact that these emissions are not estimated. [5]

10. Estimates of emissions from *international aviation and marine bunker fuels* were reported by eight Parties. In conformity with the IPCC Guidelines, these emissions were not included in the national total but were reported separately. Some Parties provided a breakdown into marine and aviation bunkers.

11. The UNFCCC guidelines request Parties to make efforts to report the estimated range of uncertainty of their emission estimates, where appropriate. The reporting of uncertainties was limited since only four Parties complied with this request, all of them providing the information qualitatively. For estimates from the *energy* sector, high confidence levels were generally reported, while for the *land-use change and forestry* sector confidence levels ranged from medium to low[6] (see table 5).

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[2] Kiribati, Samoa, Tuvalu and Vanuatu.

[3] It should be noted that some small Annex I Parties, such as Monaco or Liechtenstein, provided less complete reporting of GHG emissions and removals than other Annex I Parties due to the specific structure of their economies.

[4] A fully fluorinated compound is one which contains atoms of fluorine (F) and only one other element (e.g. C, S, N). Thus, perfluorocarbons (PFCs), such as CF_4 and C_2F_6, and sulphur hexafluoride (SF_6) are fully fluorinated compounds, while hydrofluorocarbons (HFCs) are not.

[5] It has to be noted that the IPCC Guidelines did not provide methods for estimating emissions of these GHG until its 1996 version was available only as from mid 1997.

[6] For confidence levels reported by Annex I Parties, see document FCCC/SBSTA/1998/7, table 14.

Reporting tables

12. All Parties reported their inventories in accordance with the UNFCCC guidelines. Most of them provided more information than the minimum requested and used more comprehensive tabular formats than that of table II of the UNFCCC guidelines (see table 6). As all Parties followed the IPCC Guidelines for estimating their GHG emissions, they also generally used the reporting formats of these guidelines: nine reporting Parties used the IPCC summary[7] or provided similar breakdown of information, and six Parties presented their inventories using table II of the UNFCCC guidelines, however 10 of them included other sectors or source categories which are not explicitly required by that table.

13. The use of the IPCC summary tables provides for a more disaggregated reporting of GHG inventory data than identified in table II of the annex to the UNFCCC guidelines. Reporting of GHG emissions from a number of different IPCC source categories are not explicitly requested in this later table, but may be included under "other" in this table. This is particularly the case for some significant source categories, such as *waste* and *agricultural soils*. They were explicitly reported by 10 and 5 Parties, respectively, as indicated in table 6.

14. The relative share of GHG emissions for which no reporting is requested or are to be reported as "other" in a Party's total GHG emissions is sometimes substantial (see table 7). For the 15 Parties this share ranged from one per cent (Singapore) to 73 per cent (Samoa) of the aggregated GHG emissions, expressed in terms of CO_2 equivalent, with an average of 21 per cent.

15. Six Parties also provided IPCC worksheets (see table 8) which outline detailed calculations for the estimation of GHG emissions as well as numerical information on aggregate emission factors and activity data for inventories using the IPCC default methods. The provision of these worksheets contributes substantially to the transparency of the inventories.

16. In addition, three Parties estimated their fuel combustion emissions using both the reference and the sectoral approach as requested by the IPCC Guidelines (see table 8), while Lebanon mentioned that it performed the comparison but did not report the values of the difference. This is a useful self-verification procedure which greatly improves the transparency of the inventories. The usefulness of applying both approaches would be enhanced if the identified differences were explained by Parties, although this is not explicitly required by the IPCC Guidelines. For most Parties, the difference range between the results obtained with the two approaches was of similar magnitude to the differences reported by Annex I Parties that made such comparisons.[8]

17. Table II of the UNFCCC guidelines requests Parties to describe assumptions and methods, and the values of emission coefficients where these differ from IPCC default methods and coefficients. This allows for a more transparent reporting of inventory information. Most Parties used the default emission factors provided in the IPCC Guidelines. However, some Parties made an effort to develop national emission factors in order to better reflect their national circumstances, for example in *rice cultivation* as reported by the Republic of Korea. The Parties

[7] It has be noted that the IPCC software provide for automated reporting of IPCC summary tables. See Greenhouse Gas Inventory Software for the Workbook of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories - Instruction Manual.

[8] See document FCCC/SBSTA/1998/7, table 3.

that provided IPCC worksheets or standard data tables included the values of the aggregated emission factors used.

18. The source of the activity data used for the emission estimates of the different sectors and source categories was referenced by many Parties even though this information is not explicitly requested by the UNFCCC guidelines. Generally, Parties indicated that activity data were obtained from national sources such as national statistics provided by the respective ministries, municipalities and agencies, or from industrial facilities. In some cases, reference to international statistics was made, for example to statistics of the Food and Agriculture Organization of the United Nations (FAO).

Methodological problems identified

19. All Parties identified problems in preparing their national inventories (see table 9). Most of the problems relate to the lack of activity data for estimation of emissions in some sectors or unavailability of activity data that suit the needs for compiling the national GHG inventory in accordance with the IPCC Guidelines. Six Parties[9] reported problems related to limitations of the current IPCC methodologies for estimation of emissions in some sectors, particularly *land-use change and forestry*. Eight Parties[10] stated that for some source categories, the use of the IPCC default emission factors was not appropriate for their national circumstances and that the lack of national emission factors in these cases could affect the accuracy of the estimates.

20. In addition to the difficulties mentioned by Parties, other issues were also identified by the secretariat during the process of compiling the inventory information of the initial national communications:

(a) Different emission estimates for the same sector or source categories were indicated at different places of the communication;

(b) In some cases it was not clear whether certain source categories were not reported because they were not relevant for the country or had not been estimated for other reasons. Most Parties did not use appropriate notation keys as indicated in the IPCC Guidelines;

(c) Some Parties changed the format of the IPCC summary tables or did not include the precursors;

(d) In the *land-use change and forestry* sector, some inconsistencies were found in the reporting of estimates of biomass during a deforestation process, namely the fractions of biomass burned on site, burned off site and left to decay. In addition, there was no clear indication as to the time-frame of the activity data used in some source categories, such as *forest and grassland conversion* and *abandonment of managed lands*; and

(e) CH_4 and N_2O emissions of biomass energy burning were not reported by most Parties. These emissions may be substantial for some countries.

[9] Cook Islands, Indonesia, Lebanon, Malaysia, Philippines, and Singapore.
[10] Indonesia, Israel, Kiribati, Republic of Korea, Lebanon, Malaysia, Philippines, and Singapore.

Methodological problems encountered in the use of UNFCCC guidelines

21. The existence of the UNFCCC and the IPCC guidelines facilitated Parties to provide the best available data in their national GHG inventories. However, some common issues with the use of these latter guidelines[11] were identified:

(a) Table II of the annex to the UNFCCC guidelines does not facilitate disaggregated reporting of GHG emissions by sources and removals by sinks. This table does not not follow the disaggregation of the IPCC source-categories in most sectors, although it provides for reporting of any kind of emissions and removals under "others". If Parties that use the IPCC Guidelines would like to report all GHG emissions and removals they estimated, they have to add several rows under "others" to the table II of the UNFCCC guidelines.

(b) The UNFCCC guidelines state that Parties should use the IPCC Guidelines for National Greenhouse Inventories as appropriate and to the extent possible, but do not make specific reference to the Revised 1996 IPCC Guidelines that constitutes the most updated version of the guidelines. Decision 10/CP.2 was adopted by the COP before such guidelines for national greenhouse gas inventories were available to Parties. However, 14 reporting Parties used the Revised 1996 Guidelines, as encouraged by conclusions of the SBSTA at its fourth session, especially those that prepared their national communication over the last two years. All 12 Parties that submitted their inventories in the years 1999 and 2000 used the Revised 1996 IPCC Guidelines, except Kiribati and Malaysia that used a previous version of these guidelines.

(c) The UNFCCC guidelines encourage Parties to include in their national inventories information on fully fluorinated compounds, which cover PFC and SF_6 emissions. [12] The reporting of HFC emissions is not included in the UNFCCC guidelines[13] because they are not fully fluorinated compounds. However, a growth of HFC emissions is expected because these gases may be used as substitutes of the Ozone Depleting Substances to be phased out by the Montreal Protocol.

B. Issues related to the preparation of inventories

Institutional arrangements

22. A description of the existing institutional arrangements relevant to the preparation of national inventories on a continuing basis[14] was provided by 7 Parties.[15] In most cases, these arrangements consist of the establishment and operation of inter-institutional committees or agencies, or teams of national experts from different sectors, both from the public and the private sectors, and are usually coordinated by a leading national institution or ministry.

[11] See decision 12/CP.4, paragraph 7(b).
[12] See footnote 4.
[13] It has to be noted that when the UNFCCC guidelines (decision 10/CP.2) were adopted, almost all non- Annex I Parties did not have emissions of HFCs. Later, the fourth session of the SBSTA adopted conclusions encouraging non-Annex I Parties to report emissions of HFCs, PFCs and SF_6. (FCCC/SBSTA/1996/20/paragraph 31).
[14] See decision 10/CP.2, annex, paragraph 4 (FCCC/1996/15/Add.1).
[15] Indonesia, Micronesia, Nauru, the Philippines, Republic of Korea, Samoa, and Vanuatu.

Improvements, needs and support received

23. Ten Parties identified areas for further improvement of inventory data (see table 9) which mainly address the problems mentioned in paragraph 21 above. Most Parties mentioned the need for financial and technical assistance to improve their inventories. In addition, Parties drew attention to the importance of continuous collection of data and/or the establishment of appropriate databases.

24. Parties have made efforts to improve the quality of their emission estimates. Some of them described the application of national emission factors or methods that better suit their national circumstances. Others compared estimates obtained using the IPCC methodology or default emission factors with estimates obtained using their own methods, models and/or national or regional emission factors. Some of these improvements related also to the enhancement of the collection of activity data.

25. Significant improvements in the completeness, transparency and quality of the inventories were recognized in the GHG inventories of Parties which updated their previously submitted inventory data (see table 10). In some cases, problems identified by a given Party in its initial GHG inventory were overcome in a later submission. This suggests that by preparing the GHG inventories on a continuing basis, the reporting and quality of inventory data can be improved and some of the difficulties overcome.

26. The technical and financial support received by Asian reporting non-Annex I Parties constituted a key element in the preparation of the national inventories. Almost all Parties received support from the GEF and its implementing agencies in the development and execution of enabling activities which included the preparation of their national inventories in the context of their national communications.[16] Some reporting Parties acknowledged receiving technical and financial assistance for preparing inventories through bilateral or multilateral channels[17] before the preparation of their initial national communication. This fact also underlines the close relationship that exists between the quality of the inventories, their preparation on a continuous basis, and the provision for adequate resources and financial and technical support.

C. Presentation of results

27. Tables 11 to 17 summarize inventory data for CO_2, CH_4, N_2O, ozone precursors and international bunkers. The analysis provided in this section is based on 1994 inventory data where possible. For some Parties, estimates have been converted into CO_2 equivalent estimates using 1995 IPCC global warming potentials in order to facilitate comparison of inventory results. Such a presentation shows, for example, the relative contribution of the different greenhouse gases and the different sectors to a Party's total greenhouse gas emissions. It should be noted

[16] Parties may wish to refer to document FCCC/SBI/2000/INF.7 which provides information on the status of preparation of initial national communications from non-Annex I Parties and the secretariat activities to facilitate the provision of technical and financial support, and to document FCCC/SBI/1999/INF.8 on information on GEF funding for the preparation of national communications.

[17] Parties received assistance from the United States Country Studies Programme, the Netherlands Climate Change Studies Assistance Programme, the Canadian Government, the CC:TRAIN Programme of the United Nations Institute for Training and Research (UNITAR) and from the National Communications Support Programme (GEF/UNDP/UNEP).

that 9 out of 15 Parties considered here used CO_2 equivalent estimates to assess the relative contribution of each individual greenhouse gas or sector to their aggregate GHG emissions.

Emissions by sources and removal by sinks

28. All reporting Parties represent a net source of GHG emissions, with the exception of Cook Islands, which is a net GHG sink due to the relatively large CO_2 removals reported in the *land-use change and forestry* sector compared to emissions from all the other sectors. Considering CO_2 only, Cook Islands also showed a net removal of CO_2, by sinks from *land-use change and forestry* exceed total CO_2 emissions. [18]

Aggregate GHG emissions expressed in terms of CO_2 equivalent[19]

29. In terms of total GHG emissions expressed as CO_2 equivalent, carbon dioxide was the primary GHG for all Parties, except Vanuatu for which CH_4 came first, and Cook Islands and Samoa for which N_2O was the most important. Methane was generally the second largest contributor to aggregate GHG emissions.

30. *Energy*, *agriculture* and *land-use change and forestry* sectors constituted generally the most important sources of GHG emissions for the reporting Parties. Removals by sinks from *land-use change and forestry* in most Parties offset GHG emissions from this sector except in Indonesia and Lebanon. The *energy* sector was the largest source of GHG emissions for all Parties, except Samoa where the *agricultural* sector was the largest emitter. *Agriculture* was the second largest emitter sector for most Parties. Although in Indonesia, the second largest emitter was the *land-use change and forestry* sector.

Emissions of main greenhouse gases (CO_2, CH_4 and N_2O)

31. *Carbon dioxide (CO_2).* The share of CO_2 from *fuel combustion* in the *energy* sector was the largest for all Parties, ranging from 82 per cent (the Philippines) to 100 per cent (Cook Islands, Kiribati, the Federated States of Micronesia, Nauru, Samoa, Tuvalu and Vanuatu) of total CO_2 emissions. Within the *fuel combustion* sector, *energy industry* was generally the largest source. *Transport* was the most important source for four Parties[20] (33 to 69 per cent) and accounted for more than 30 per cent of CO_2 emissions from *fuel combustion* for Cook Islands. CO_2 emissions from international bunker fuels were reported by 8[21] Parties and were equivalent to between 0.3 per cent (Indonesia) and 48 per cent (Nauru) of total CO_2 emissions.[22]

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[18] In view of the different role of *the land-use change and forestry* sector in the different Parties - in some, this sector offsets total emissions, while in others it is a large source of emissions – and the request by the IPCC Guidelines to provide net emissions or removals in the different source categories of this sector, the term "total CO_2 emissions" in this document denotes the sum of CO_2 emissions from all sectors except CO_2 emissions and removals *from land-use change and forestry*. This facilitates the presentation of the data in a consistent and comparable manner.

[19] Aggregate GHG emission estimates given in this document represent the sum of total CO_2, CH_4 and N_2O emissions expressed in CO_2 equivalent, using IPCC 1995 GWP values. Total CO_2 emissions are calculated in line with the definition given in the previous footnote.

[20] Lebanon, the Philippines, Samoa and Vanuatu.

[21] Cook Islands, Indonesia, Israel, Jordan, Nauru, the Republic of Korea, Singapore and Vanuatu.

[22] According to the UNFCCC and IPCC Guidelines, these emissions are not accounted for in national GHG emissions.

The *land-use change and forestry* sector as a whole constituted a net sink of CO_2 for all Parties[23] except for Indonesia and Lebanon. For Indonesia, emissions from the *forest and grassland conversion* subsector exceeded the total removal by sinks. However, for 7[24] Parties, this subsector constituted the main removal by sinks.

32. *Methane (CH_4).* *Agriculture* was the most significant source of CH_4 emissions for 6[25] of the reporting Parties (from 44 to 100 per cent). *Waste* emissions were the most important CH_4 source for Jordan, Kiribati, Lebanon, Malaysia and Samoa (from 35 to 95 per cent). In the agricultural sector, *livestock* was the most important subsector for all reporting Parties, except for Indonesia, Malaysia, the Republic of Korea and the Philippines where *rice cultivation* was the most significant.

33. *Nitrous oxide (N_2O).* *Agriculture* was found the most important source of N_2O emissions for all reporting Parties, except Jordan, Malaysia, the Republic of Korea and Singapore[26], ranging from 86 per cent (Indonesia and the Philippines) to 100 per cent (Tuvalu), while *fuel combustion* was the largest source for Jordan, Malaysia and the Republic of Korea (77 to 79 per cent). For Cook Islands, Micronesia and Nauru, the *land-use change and forestry* sector constituted the most important N_2O source.

D. Current trends

34. In addition to the inventory data for the year 1994 and 1990 requested by the UNFCCC guidelines, Indonesia provided a complete GHG inventory for both 1990 and 1994, allowing for preliminary analysis of the trends of GHG emissions in this country. Additionally, the Republic of Korea also presented 1990 and 1994 emission estimates from the energy sector.

35. Total CO_2 emissions (excluding *land-use change and forestry*) increased over the 1990 to 1994 period by 33 per cent for Indonesia. Trends in CO_2 emissions differ when the *land-use change and forestry* sector is included in total CO_2 emissions. In this case, the increase in total CO_2 emissions in Indonesia was thus limited to four per cent.

36. CO_2 emissions from *fuel combustion* increased in 1994 compared to 1990 for Indonesia and the Republic of Korea. The largest increase was reported by the Republic of Korea (43 per cent).

37. The CH_4 emissions rose from 1990 to 1994 for Indonesia by 17 per cent.

38. Total N_2O emissions increased in Indonesia compared to 1990 levels (0.2 per cent).

[23] Due to its particular context, Singapore did not report on land-use change and forestry issues.
[24] Cook Islands, Indonesia, Israel, the Republic of Korea, Malaysia, the Philippines and Samoa.
[25] Cook Islands, Indonesia, Nauru, the Philippines, the Republic of Korea and Tuvalu.
[26] Due to its particular context, Singapore did not report on agriculture.

Tables

Table 1. Paragraphs of UNFCCC guidelines and SBSTA conclusions relevant to the reporting of inventory data

UNFCCC guidelines (decision 10/CP.2, annex)	
Paragraph 8	The Guidelines for the National Greenhouse Gas Inventories and Technical Guidelines for Assessing Climate Change Impacts and Adaptation or the simplified default methodologies adopted by the Intergovernmental Panel on Climate change (IPCC) should be used by non-Annex I Parties, as appropriate and to the extent possible, in the fulfilment of their commitments under the Convention.
Paragraph 9	Information should be provided on the following greenhouse gases: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), to the extent the Party's capacities permit. In addition, Parties are encouraged to include in their national inventories the fully-fluorinated compounds, as appropriate. Other greenhouse gases included in the IPCC methodology may be included at the discretion of the Parties. Emissions from bunker fuels should be reported separately from national emission.
Paragraph 10	Parties should strive to present the best available data in a table (see table II below), to the extent their capacities permit, and try to identify the areas where the data may be further improved in future communications through national capacity building.
Paragraph 14	Non-Annex I Parties should provide the best available data in their inventory. To this end such data should be provided for the year 1994. Alternatively, non-Annex I Parties may provide such data for the year 1990.
SBSTA conclusions: The SBSTA, at its fourth session, recalled decision 10/CP.2, and encouraged: (a) non-Annex I Parties to apply the Revised 1996 Guidelines, as appropriate and to the extent possible, in communicating their national greenhouse gas inventories (FCC/SBSTA/1996/20, paragraph 30(b)); (b) Parties to report actual emissions of HFCs, PFCs and SF_6, given that these better reflect the real releases to the atmosphere and encouraged Parties which are not in a position to report actual figures to report potential emissions (FCCC/SBSTA/1996/20, paragraph 31).	

Table 2: Status of reporting of inventory data

Party	Method used	Years	Reporting table[a]	Precursors: CO, NOx, NMVOC	HFCs, PFCs, SF_6	SO_2	Bunkers	CO_2 Equivalent estimates
Cook Islands	IPCC, 1996	1994	Table II	-	-	-	X	X (only some)
Indonesia	IPCC, 1996	From 1990 to 1994	IPCC Summary	X	-		X	X
Israel	IPCC, 1996	1996	IPCC Summary	X	-	X	X	X
Jordan	IPCC	1994	Table II (+ *waste)*	X	-	-	X	-
Kiribati	IPCC	1990, 1994 (only tables for 1994)	IPCC Summary	CO, NOx only	-	-	-	-
Lebanon	IPCC,1996	1994	IPCC Summary	X	X (HFCs only)	X	X	X
Malaysia	IPCC	1994	Table II (+ waste)	-	-	-	X	X
Federated States of Micronesia	IPCC, 1996	1994	Table II (+ waste) + IPCC Summary	X	-	X	-	-
Nauru	IPCC, 1996	1994	Table II	-	-	-	X[b]	X
Philippines	IPCC, 1996	1994	IPCC Summary	X	-	X	-	X
Republic of Korea	IPCC	1990 , 1994 and various years	IPCC Summary	X	-	-	X	X
Samoa	IPCC, 1996	1994	Table II (+ waste)	X	-	-	-	-
Singapore	IPCC, 1996	1994	Table II (+ waste)	-	-	-	X	X
Tuvalu	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	-	-
Vanuatu	IPCC, 1996	1994	IPCC Summary	CO, NOx only	-	-	X (aviation only)	-

[a] IPCC Summary refers to the IPCC Summary table 7A or a similar breakdown of information. "Table II" refers to table II of the UNFCCC guidelines for the reporting of inventory data.

[b] Nauru reported all aviation fuel under international bunkers.

Table 3. Completeness of reporting according to the IPCC Guidelines, excluding Small Island Developing States

GHG source category	CO_2		CH_4		N_2O	
	Reporting Parties	% of total	Reporting Parties	% of total	Reporting Parties	% of total
I.A. Fuel combustion	**8**	**100** *(100)*	**6**	**75** *(100)*	**6**	**75** *(100)*
1. Energy industries	7	88 *(91)*	6	75 *(79)*	6	75 *(82)*
2. Manufacturing industries and construction	5	63 *(91)*	6	75 *(82)*	6	75 *(74)*
3. Transport	7	88 *(94)*	6	75 *(91)*	6	75 *(85)*
4. Small combustion	6	75 *(94)*	5	63 *(85)*	5	63 *(76)*
5. Other	3	38 *(68)*	3	38 *(41)*	3	38 *(32)*
6. Biomass burning	2	25 *(32)*	2	25 *(29)*	2	25 *(18)*
I.B. Fugitive fuel emissions	**1**	**13** *(53)*	**3**	**38** *(88)*	**1**	**13** *(9)*
1. Solid fuels	1	13 *(15)*	5	63 *(71)*	1	13 *(-)*
2. Oil and natural gas	1	13 *(47)*	5	63 *(82)*	1	13 *(9)*
II. Industrial processes	**7**	**88** *(100)*	**4**	**50** *(53)*	**3**	**38** *(79)*
A. Mineral products	7	88 *(68)*	-	*. (-)*	-	*. (-)*
B. Chemical industry	3	38 *(32)*	3	38 *(24)*	2	25 *(50)*
C. Metal production	3	38 *(50)*	-	*. (18)*	-	*- (3)*
D. Other production	1	13 *(32)*	1	13 *(3)*	-	*. (3)*
III. Solvent use	-	*- (21)*	-	*- (-)*	-	*- (26)*
IV. Agriculture	-	*. (12)*	**7**	**88** *(100)*	**7**	**88** *(100)*
A. Enteric fermentation	-	-	7	88 *(97)*	-	*- (-)*
B. Manure management	-	-	5	63 *(91)*	4	50 *(15)*
C. Rice cultivation	-	-	4	50 *(35)*	1	13 *(9)*
D. Agricultural soils	1	13 *(12)*	-	*. (21)*	5	63 *(85)*
E. Prescribed burning of savannas	-	-	2	25 *(3)*	1	13 *(3)*
F. Field burning of agricultural residues	-	-	5	63 *(38)*	5	63 *(24)*
G. Other	-	-	2	25 *(-)*	1	13 *(-)*
V. Land-use change and forestry	**6**	**75** *(91)*	**5**	**63** *(44)*	**4**	**50** *(41)*
A. Changes in forest and other woody biomass stock	6	75 *(88)*	-	*- (3)*	-	*- (6)*
B. Forest and grassland conversion	4	50 *(32)*	5	63 *(26)*	3	*. (15)*
C. Abandonment of managed lands	2	25 *(7)*	-	*- (-)*	-	*- (-)*
D. CO2 emissions and removals from soils	-	*. (9)*	-	*- (-)*	-	*- (-)*
E. Other	-	*. (15)*	-	*- (15)*	-	*- (15)*
VI. Waste	**3**	**38** *(41)*	**7**	**88** *(97)*	**2**	**25** *(53)*
A. Solid waste disposal on land	-	*- (15)*	7	88 *(97)*	-	*. (-)*
B. Waste-water handling	1	13 *(3)*	5	63 *(74)*	1	13 *(24)*
C. Waste incineration	2	25 *(32)*	-	*. (35)*	-	*. (41)*
D. Other	-	-	-	*. (6)*	1	13 *(-)*
VII. Other	-	*- (3)*	-	-	-	*. (-)*
International bunker	**5**	**63** *(71)*	**2**	**25** *(35)*	**2**	**25** *(35)*

Notes:

- IPCC sectors or source categories reported by 75 per cent or more of the reporting non-Annex I Parties are given in shaded cells. The values given in italics and in parentheses indicate the percentage of reporting by Annex I Parties, for purposes of comparison. These values are taken from document FCCC/SBSTA/1998/7, table 18.
- Sources reported as not occurring (NO) were considered as reported in this table. Sources reported as NE (not estimated) or NA (not applicable) were not considered as reported.

Table 4. Completeness of reporting according to the IPCC Guidelines

GHG source category	CO_2		CH_4		N_2O	
	Reporting Parties	% of total	Reporting Parties	% of total	Reporting Parties	% of total
I.A. FUEL COMBUSTION	**15**	**100** *(100)*	**10**	**67** *(100)*	**10**	**67** *(100)*
1. Energy industries	10	67 *(91)*	9	60 *(79)*	9	60 *(82)*
2. Manufacturing industries and construction	8	53 *(91)*	8	53 *(82)*	7	47 *(74)*
3. Transport	10	67 *(94)*	9	60 *(91)*	9	60 *(85)*
4. Small combustion	9	60 *(94)*	8	53 *(85)*	8	53 *(76)*
5. Other	3	20 *(68)*	4	27 *(41)*	4	27 *(32)*
6. Biomass burning	2	13 *(32)*	4	27 *(29)*	4	27 *(18)*
I.B. Fugitive fuel emissions	**1**	**7** *(53)*	**3**	**20** *(88)*	**1**	**7** *(9)*
1. Solid fuels	1	7 *(15)*	5	33 *(71)*	1	7 *(-)*
2. Oil and natural gas	1	7 *(47)*	5	33 *(82)*	1	7 *(9)*
II. Industrial processes	**8**	**53** *(100)*	**4**	**27** *(53)*	**3**	**20** *(79)*
A. Mineral products	8	53 *(68)*	-	*. (-)*	-	*. (-)*
B. Chemical industry	3	20 *(32)*	3	20 *(24)*	2	13 *(50)*
C. Metal production	3	20 *(50)*	-	*. (18)*	-	*- (3)*
D. Other production	1	7 *(32)*	1	7 *(3)*	-	*. (3)*
III. Solvent use	-	*- (21)*	-	*- (-)*	-	*- (26)*
IV. Agriculture	**1**	**7** *(12)*	**13**	**87** *(100)*	9	**60** *(100)*
A. Enteric fermentation	-	-	13	87 *(97)*	-	*- (-)*
B. Manure management	-	-	8	53 *(91)*	5	33 *(15)*
C. Rice cultivation	-	-	4	27 *(35)*	1	7 *(9)*
D. Agricultural soils	1	7 *(12)*	-	*. (21)*	6	40 *(85)*
E. Prescribed burning of savannas	-	-	3	20 *(3)*	1	7 *(3)*
F. Field burning of agricultural residues	-	*. (-)*	5	33 *(38)*	5	33 *(24)*
G. Other	-	-	2	13 *(-)*	1	7 *(-)*
V. Land-use change and forestry	**10**	**67** *(91)*	**5**	**33** *(44)*	**4**	**27** *(41)*
A. Changes in forest and other woody biomass stock	8	53 *(88)*	-	*- (3)*	-	*- (6)*
B. Forest and grassland conversion	5	33 *(32)*	5	33 *(26)*	3	20 *(15)*
C. Abandonment of managed lands	3	20 *(7)*	-	*- (-)*	-	*- (-)*
D. CO_2 emissions and removals from soils	1	7 *(9)*	-	*- (-)*	-	*- (-)*
E. Other	.	*. (15)*	-	*- (15)*	-	*- (15)*
VI. Waste	**3**	**20** *(41)*	**11**	**73** *(97)*	**6**	**40** *(53)*
A. Solid waste disposal on land	-	*- (15)*	10	67 *(97)*	-	*. (-)*
B. Waste-water handling	1	7 *(3)*	7	47 *(74)*	2	13 *(24)*
C. Waste incineration	2	13 *(32)*	-	*. (35)*	-	*. (41)*
D. Other	-	-	-	*. (6)*	2	13 *(-)*
VII. Other	-	*- (3)*	-	-	-	*. (-)*
International bunker	**8** [a b]	**53** *(71)*	**3** [b]	**20** *(35)*	**3** [b]	**20** *(35)*

Notes:

- IPCC sectors or source categories reported by 75 per cent or more of the reporting non-Annex I Parties are given in bold. The values given in italics and in parentheses indicate the percentage of reporting by Annex I Parties, for purposes of comparison. These values are taken from document FCCC/SBSTA/1998/7, table 18.
- Sources reported as not occurring (NO) were considered as reported in this table. Sources reported as NE (not estimated) or NA (not applicable) were not considered as reported.

[a] *Nauru treated all aviation fuel as international bunkers.*

[b] *Vanuatu only reported fuels for aircraft.*

Table 5. Confidence level[a] of emission estimates

Gas and source	Indonesia	Lebanon	Samoa	Singapore[b]
CO_2				
Fuel combustion	H	H / M	H	H / M
Industrial processes		M	L	
Land-use change and forestry	L	M	L	
CH_4				
Fuel combustion	H	H / M	L	
Fugitive fuel emissions	H		L	
Livestock	M	M	L	
Other agriculture	M	M	L	
Waste			L	
N_2O[c]				
Fuel combustion	H	H /M	L	
Chemical industry			L	
Agricultural soils	M	M	L	

[a] The secretariat uses the term "confidence levels" in compiling data provided by Parties using different terms: uncertainties, error range, accuracy, etc. Confidence levels are given in per cent. For Parties that reported on uncertainties qualitatively, the following codes were used: High (H); medium (M); low (L).

[b] Singapore is also mentioning a medium level of confidence for the indirect nitrous oxide emissions from human sewage.

Table 6. Completeness of reporting according to table II of the UNFCCC guidelines

Greenhouse Gas Source and Sink Categories	CO_2		CH_4		N_2O	
	Total	%	Total	%	Total	%
Total (Net) National Emission (Gigagram per year)	13	87	11	73	13	87
1. All Energy	15	100	10	67	10	67
Fuel Combustion	15	100	10	67	10	67
Energy and transformation industries	10	67	8	53	9	60
Industry	8	53	8	53	6	40
Transport	10	67	9	60	9	60
Commercial-institutional	9	60	8	53	8	53
Residential	9	60	8	53	8	53
Other (please specify)	3	20	4	27	4	27
Biomass burned for energy	2	13	4	27	4	27
Fugitive Fuel Emission	1	7	4	27	1	7
Oil and natural gas systems	1	7	5	33	1	7
Coal mining	1	7	4	27	1	7
2. Industrial Processes	8	53	4	27	3	20
3. Agriculture	1	7	13	87	9	60
Enteric Fermentation			13	87		
Rice Cultivation			4	27	.	.
Savanna Burning			3	20	1	7
Others (please specify)	.	.	.	.	.	.
Manure management			8	53	5	33
Agricultural soils	.	.	.	.	5	33
Field burning of agricultural residues	.	.	5	33	5	33
Other			1	7	.	.
4. Land-Use Change and Forestry	10	67	5	33	4	27
Changes in Forest and other woody biomass stock	8	53				
Forest and Grassland Conversion	6	40	4	27	3	20
Abandonment of Managed Lands	3	20				
5. Other Sources as appropriate and to the extent possible (please specify)	8	53	10	67	6	40
CO_2 emissions and removals from soils	1	7				
Other (land-use change and forestry)	1	7	1	7	1	7
Waste	4	27	10	67	6	40
Solid waste disposal on land	1	7	9	60	.	.
Waste water handling	2	13	6	40	2	13
Waste incineration	2	13	.	.	.	.
Other (waste)			.	.	2	13
International bunkers	8	53	3	20	2	13

Notes:

Sectors and source categories that are not requested to be reported as "other" in table II of the UNFCCC guidelines are given in shaded cells.

Table 7. Share of IPCC source categories not explicitly requested by the UNFCCC guidelines in total emissions

		CO_2*	CH_4	N_2O	Aggregate
Party	**Year**	**%**	**%**	**%**	**%**
Cook Islands	1994		86	100	58
Indonesia	1990		20	13	9
Indonesia	1994		18	100	13
Israel	1996		92	66	15
Jordan	1994		94	65	37
Kiribati	1994		95	100	32
Lebanon	1994		89	99	12
Malaysia	1994		57	100	20
Micronesia (Federated States of)	1994		88	97	4
Nauru	1994		98	100	21
Philippines	1994		34	100	24
Republic of Korea	1990		41	86	5
Samoa	1994		35	100	73
Singapore	1994	1		100	1
Tuvalu	1994		100	100	16
Vanuatu	1994			100	3

* Does not include emissions/removals from the Land-use Change and Forestry sector for presentation purposes. However, the following Parties reported emissions/removals from the categories "CO_2 emissions and removals from soil" (Jordan, Samoa) and "Other land-use change and forestry" (Indonesia).

Table 8. Status of reporting using the IPCC reporting framework

Party	IPCC sectoral information							Comparison with reference approach (CO_2 fuel combustion) [a] Difference (%)	
	Sectoral reports	Worksheets [b]					Standard data tables		
		E	IP	A	LUCF	W			
Indonesia	-	1-1, 1-2, 1-6, 1-7	2-1, 2-2, 2-3, 2-4, 2-6, 2-7, 2-9, 2-10, 2-11	4-1, 4-2, 4-4, 4-5	5-1, 5-2, 5-3, 5-4	6-1	-	-	-
Israel	X	1-1, 1-2, 1-3, 1-4	2-1, 2-2, 2-4, 2-5, 2-6, 2-7, 2-10	4-1, 4-5	5-1	6-1, 6-2, 6-3	-	-	-
Jordan	-	1-1	-	4-1 (CH_4), 4-3, 4-4	5-1, 5-2, 5-3, 5-4, 5-5	6-1, 6-2, 6-3	E	X	2.4
Kiribati	-	1-1	-	4-1	-	6-2	-	-	-
Lebanon	X	1-1, 1-2, 1-3, 1-4	2-1, 2-2, 2-3, 2-4, 2-5, 2-7, 2-8, 2-10, 2-11, 2-12, 2-13, 2-15	4-1, 4-4, 4-5	5-1, 5-2, 5-3	6-1	-	-	-
Philippines	-	-	-	-	-	-	-	X	-5.35
Singapore	-	1-1, 1-2	-	-	-	6-4	-	-	-
Vanuatu	-	-	-	-	-	-	-	X	2.74

Notes:

The following abbreviations have been used:

E: Energy **LUCF:** Land-use change and forestry **A:** Agriculture
IP: Industrial processes **W:** Waste

[a] Comparison of CO_2 emission estimates from *fuel combustion* with those obtained using the IPCC reference approach. Differences as a percentage relative to the estimates obtained with the sectoral approach, which are set at 100 per cent in this table. For The Philippines, the difference given in this column was calculated by the secretariat based on the numerical data provided in the communications. For Vanuatu, the value given is as reported by the Party.

[b] In some cases, the numeration of worksheets refers to the Revised 1996 IPCC Guidelines, while in others, numeration refers to the 1995 version of those guidelines. A few Parties also added worksheets which are not part of the IPCC Guidelines.

Table 9. Problems encountered and areas for further improvement by Parties in the preparation of GHG emission inventories

Party	PROBLEMS/AREAS			Comments
	Activity data	Emission factors	Methods	
Cook Islands			X	The IPCC Guidelines have been modified to account for the fact that it does not fully capture the issues of size of small island developing states and the unique characteristics of the Cook Islands.
Indonesia	X	X	X	In order to increase the accuracy of the GHG inventory in the forestry sector, activity data, emission factors and methodology need to be improved. The magnitude of the net emission from the forestry sector depends on assumptions used in defining area of logged-over forest under growing stage / *The reliability of activity data and emission factors of the land-use change and forestry sector need to be verified and improved with more measurements.*
Israel	X			Impossibility to obtain reliable data concerning the use of HFCs PFCs and SF_6. / *Additional effort should be made in the future to obtain such data and complete the inventory.*
Jordan	X	X		*Determination of local emission factors for energy production and consumption, industrial processes, agriculture and land-use change and forestry.* *Measurement of emission factors for all identified sectors.* *Establishment of an environmental monitoring system for air, waste water, and dust.*
Kiribati	X	X		Reference approach was used due to lack of activity data. Default emission factors were also used; but these values need to be replaced by more appropriate sub-regional and national data. The lack of data related to LUCF and industrial processes did not allow to fill the methodological tables for these two sectors.
Lebanon	X	X	X	Industrial processes: default emission factors may differ from some local industrial processes because of the differences in the raw material used. Agriculture: default emission factors for domestic livestock were not appropriate. Forestry: - Use of expert judgements when no data was available. - Data availability is not sufficient for the calculation of net carbon fluxes on the basis of changes in soil carbon stocks / *Forestry - Photogrametry technique is an accurate method for future collection of data related to forest trees and non-forest trees using aerial photos scale: 1/10000.*

Party	PROBLEMS/AREAS			Comments
	Activity data	Emission factors	Methods	
Malaysia	X	X	X	Forestry: problem to collect data for forest plantation (different formats of databases used by relevant agencies); problem associate with the categorisation of forest types (different States use different categories) which has possibly affected the accuracy of the results; differences in terminology definitions (ambiguity in defining afforestation, reforestation, and sink enhancement) also affected the compilation of the inventory; uncertainty related to forest fires (natural or human induced). */ Need for appropriate local emission factors and more precise definition of the terms used in the forestry sector.*
Micronesia	X			The main problems encountered were either the lack of data or data quality issues. With the exception of the aggregate fuel data from the energy sector, all other data used to complete the inventory were derived from estimates / *Need to address a number of critical GHG data needs: fuel consumption from "end-use activities" in key sectors such as agriculture; HFCs, PFCs and SF_6 consumption; and carbon dioxide removals, with the aim of improving the collection and maintenance of data sets.*
Nauru	X	X		The availability of information for the inventory was relatively limited and this was a significant constraint / *Need for appropriate conversion figures for industrial processes such as phosphate extraction and processing.*
Philippines	X	X	X	Energy: problem with the classification of fuels used in the country. Industrial processes: there are cases where the IPCC Guidelines could not be directly applied. Agriculture: some existing data are not available in the format required by the IPCC methodology, like for methane emissions from rice fields. LUCF: calculations of carbon emissions from soil and abandoned lands were not done due to the absence of data.
Republic of Korea	X	X		Fuel combustion (non-CO_2): IPCC emission factors are not suitable for the available data: to apply IPCC non-CO_2 emission factors requires final energy consumption data by sector and by end-user. Such data are not available. Industrial processes (non-CO_2), agriculture, land-use change and forestry (non-CO_2), waste / *Inclusion of source categories not coveed so far.* *Modification of collecting and processing inventory data (non-CO_2 for industrial processes, agriculture, land-use change and forestry and waste).*

Party	PROBLEMS/AREAS			Comments
	Activity data	Emission factors	Methods	
Samoa	X			Lack of quality data and poor data management. Problem to calculate CO_2 emissions from biomass due to the lack of information on relevant dry matter mass of the various fuel wood types, and the net calorific value of each wood type. Due to the unavailability of appropriate information, SO_2 emissions from the energy sector were not reported.
Singapore	X	X	X	Uncertainties are attributed to the inadequate understanding of some of the processes used to estimate GHG emissions, conversion factors and incomplete data.
Tuvalu	X			Lack of availability of some data in most sectors / *Sources of emissions from the energy sector not taken into account will be on board in the second GHG inventory. Emissions from domestic wastewater is one area that is worth noting for future research work.*
Vanuatu	X			Despite limiting the inventory to three sectors, uncertainties and discrepancies in the data are significant. Energy: fuel wood, the principal source of energy for rural households and an important fuel for production of dried/smoked agricultural produces is not included. Also excluded is charcoal, a minor fuel in rural areas. There are presently inadequate statistics available about these fuels. LUCF: without additional investment in data collection, a lot of forestry related activities cannot be quantified / *Refinements of the emission estimates will require data collection to characterise the use of fire wood; burning of forest, scrub and grassland within subsistence and commercial agriculture, to improve hunting and accessibility; non-commercial forest activities; conversion of land use; waste inventories; and emissions from industry and manufacturing.*

Note: Problems encountered by Parties are written in regular font, while the areas for further improvement reported by Parties appear in italic.

Table 10. Improvements introduced in updates[a] of inventories

Party	Improvements
Indonesia	Improvement of activity data and emission factors: In 1990, it was reported that Indonesian forest was a net sink, however, with improvement of activity data as well as emission factors, Indonesian forest is becoming a net emitter. But uncertainty remains high.
Israel	Use of the Revised 1996 IPCC methodology. The first complete inventory (for the year 1996), covers all the sectors and main gases taken into account by the IPCC methodology.
Jordan	Improvements in reporting: - Worksheet 5-5 and 5-5A (change in soil carbon for mineral soil) provided. - Inclusion of the source 'agriculturally impacted soils'. - *Fuel combustion* (CH_4 and N_2O): disaggregation of estimates by subsectors (*energy and transformation industries, industry, transport, small combustion*).

Notes :

Jordan updated the inventory provided in its initial national communication. For Israel, improvements are in relation to a partial inventory submitted in 1997, which was compiled using the IPCC 1995 methodology and which only took into account CO_2 and CH_4; the country is yet to submit its National Communication.

Kiribati mentioned (in addition to the 1994 inventory) a GHG inventory for the year 1990; but no more information or related tables were given in the national communication.

Micronesia mentioned (in addition to the 1994 inventory) a 1990 inventory, but do not give any more information on the subject.

[a] Updates means a Party that have prepared and reported a national GHG inventory for a subsequent year after the submission of a first GHG inventory.

Table 11. Anthropogenic CO_2 emissions and removals by source/sink category, 1990 and 1994 (Gigagrams and percentage of total by Party)

	Fuel combustion [a]		Industrial processes		Other [b]		Total (excluding LUCF) [c]	Land-use change and forestry [d]	Total (including LUCF) [e]	Percentage of LUCF in total CO_2 [f]
1990	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**	**(Gg)**	**(Gg)**	**%**
Indonesia	128 398	90.0	14 290	10.0			142 688	188 139	330 827	131.9
Republic of Korea	238 990	93.2	17 512	6.8	11	0.0	256 513	-26 235	230 278	-10.2
Total	367 388		31 802		11		399 201	161 904	561 105	
1994										
Cook Islands	33	100.0					33	- 154	- 122	-474.3
Indonesia	170 016	89.9	19 120				189 136	155 624	344 761	82.3
Jordan	11 689	87.3	1 701	12.7			13 390	-3 548	9 842	-26.5
Kiribati	19	100.0					19		19	
Lebanon	11 679	85.9	1 924	14.1			13 603	200	13 803	1.5
Malaysia	84 415	94.1	4 973	5.5	318	0.4	89 706	-61 081	28 625	-68.1
Micronesia (Federa	236	100.0					236		236	
Nauru	28	100.0					28	- 9	19	-32.0
Philippines	47 336	81.7	10 596	0.2			57 932	-2 774	55 158	-4.8
Republic of Korea	342 746									
Samoa	102	100.0					102	- 82	20	-80.2
Singapore	26 648	48.7					54 676	0	54 676	0.0
Tuvalu	5	100.0					5		5	
Vanuatu	55	100.0					55	- 1	54	-2.1
Total	695 006		38 314		318		418 921	88 175	507 096	
1996										
Israel	50 344	37.1	1 889	1.4			135 635	- 370	135 265	-0.3

a Aggregate emissions of CO_2, CH_4 and N_2O in terms of CO_2 equivalent using 1995 IPCC global warming potentials.

b Includes *waste* and non-CO_2 (CH_4 and N_2O) *land-use change and forestry* emissions.

c Sum of aggregate GHG emissions (CO_2, CH_4 and N_2O in CO_2 equivalent) from all sectors, excluding CO_2 *land-use change and forestry* emission/removals. This total is set at 100 per cent in this table.

d Total net CO_2 emissions or removals from *land-use change and forestry*.

e Sum of aggregate GHG emission (CO_2, CH_4 and N_2O in CO_2 equivalent) from all sectors, including CO_2 *land-use change and forestry* emissions/removals.

f Percentage increase or decrease in aggregate GHG emissions with the inclusion of *land-use change and forestry*.

Table 12. Anthropogenic CO_2 emissions from fuel combustion, 1990 and 1994 (Gigagrams and percentage of total by Party)

	Energy industries		Industry		Transport		Small combustion [a]		Other [b]		Total
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)
1990											
Indonesia	37 301	29.1	36 953	28.8	34 588	26.9	19 555	15.2			128 398
Republic of Korea	37 934	15.9	87 282	36.5	42 198	17.7	64 592	27.0	6 985	2.9	238 990
Total	75 235		124 235		76 786		84 147		6 985		367 388
1994											
Cook Islands	16	50.0			16	49.3	0	0.7			33
Indonesia	50 702	29.8	50 014	29.4	47 047	27.7	22 253	13.1			170 016
Jordan	5 306	45.4	1 616	13.8	2 798	23.9	1 969	16.8			11 689
Kiribati	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	19
Lebanon	3 615	31.0	2 774	23.8	3 957	33.9	1 332	11.4			11 679
Malaysia							84 415	100.0			84 415
Micronesia (Federated States of)											236
Nauru											28
Philippines	15 458	32.7	8 980	19.0	15 801	33.4	7 097	15.0			47 336
Republic of Korea	76 378	22.3	127 703	37.3	71 040	20.7	62 648	18.3	4 977	1.5	342 746
Samoa	9	8.6			71	69.2	23	22.2			102
Singapore	12 990	48.7	8 922	33.5	4 100	15.4	636	2.4			26 648
Tuvalu											5
Vanuatu	13	23.0	1	1.7	37	66.7	5	8.7			55
Total	164 487		200 011		144 867		180 378		4 977		695 006
1996											
Israel	28 466	56.5	6 720	13.3	11 031	21.9	4 127	8.2			50 344

a Includes emissions from the source/sink categories: *commercial/institutional*, *residential* and *agricultural/forestry/fishing*.

b Includes emission from all other non-specified *fuel combustion* except from the combustion of *biomass*.

Table 13. Anthropogenic CO_2 emissions and removals[a] from land-use change and forestry by subcategories, 1990 and 1994 (Gigagrams and percentage of total flux from land-use change and forestry[b])

	Changes in forest and other woody biomass stock		Forest and Grassland conversion		Abandon-ment of managed lands		Other		Total net emissions or removals
1990	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)
Indonesia	-138 331	29.8	320 051	62.2			6 419	3.3	188 139
Republic of Korea	-26 235	100.0							-26 235
Total	-164 566		320 051				6 419		161 904
1994									
Cook Islands	- 154	100.0							- 154
Indonesia	-135 245	23.9	303 237	51.8	-69 607	24.6	57 240	26.9	155 624
Jordan	- 249	5.8	374	4.9	- 832	11.5	-2 841	44.5	-3 548
Kiribati									
Lebanon	142	71.1	58	22.4					200
Malaysia	-68 717	90.0	7 636	11.1					-61 081
Micronesia (Federated States of)									
Nauru									- 9
Philippines	-68 323	51.0	65 549	95.9					-2 774
Republic of Korea									
Samoa	- 240	53.2	125	42.7	- 27	15.8	60	42.1	- 82
Singapore									
Tuvalu									
Vanuatu									- 1
Total	-272 787		376 980		-70 466		54 459		88 175
1996									
Israel	- 370	100.0							- 370

a Negative values in Gg denote removal of CO_2. Positive values denote a net source of emissions.

b The given percentages represent the proportion of emissions and removal of this category in relation to the sum of the absolute values of the net emission in each category. For example, the percentage figure for changes in forest and other woody biomass stocks for Indonesia is 135 245/(135 245 + 300 237 + 69 607+57 240) * 100=23.9.

Table 14. Anthropogenic CH_4 emissions by source category, 1990 and 1994 (Gigagrams and percentage of total by Party)

	Energy				Agriculture						Waste		Other[c]		Total
	Fugitive Fuel		Fuel Combustion		Livestock[a]		Rice Cultivation		Other[b]						
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)
1990															
Indonesia	1,563.00	58.45	325.00	12.15							371.00	13.87	415.00	15.52	2,674.00
Republic of Korea	246.00	18.06	17.00	1.25	185.00	13.58	414.00	30.40			495.00	36.34	5.00	0.37	1,362.00
Total	1,809.00		342.00		185.00		414.00				866.00		420.00		4,036.00
1994															
Cook Islands					0.49	98.00					0.01	2.00			0.50
Indonesia	2,038.00	31.79	358.00	5.59	947.00	14.77	2,281.00	35.59	16.00	0.25	402.00	6.27	368.00	5.74	6,410.00
Jordan			2.00	0.49	25.00	6.17			2.00	0.49	376.00	92.84			405.00
Kiribati					0.02	4.44					0.43	95.56			0.45
Lebanon			3.00	5.56	8.00	14.81					43.00	79.63			54.00
Malaysia	593.13	26.61	42.00	1.88	75.00	3.37	252.00	11.31			1,266.50	56.83			2,228.63
Micronesia (Federated States of)			0.18	52.94	0.04	11.76					0.12	35.29			0.34
Nauru					0.23	67.65					0.11	32.35			0.34
Philippines	11.00	0.74	84.00	5.63	333.00	22.32	636.00	42.63	21.00	1.41	292.00	19.57	115.00	7.71	1,492.00
Republic of Korea															
Singapore															
Samoa			0.02	0.66	1.00	33.11			1.00	33.11	1.00	33.11			3.02
Tuvalu					0.04	100.00									0.04
Vanuatu															
Total	5,166.00		631.00		6,865.00		3,075.00		105.00		2,621.00		680.00		19,143.00
1996															
Israel			3.55	0.85	32.42	7.79					380.00	91.35			415.97

a Includes source/sink categories: *enteric fermentation* and *manure management*.
b Includes source/sink categories: *prescribed burning of savannas, field burning of agricultural residues and other*.
c Includes source/sink categories*: industrial processes* and *land-use change and forestry*.

Table 15. Anthropogenic N_2O emissions by source category, 1990 and 1994 (Gigagrams and percentage of total by Party)

	Energy				Industrial processes		Agriculture		Other		Total
	Transport		Other								
1990	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**	**%**	**(Gg)**
Indonesia			4.75	7.8			53.03	87.0	2.85	4.7	60.97
Republic of Korea	2.00	14.3	11.02	78.6			1.00	7.1			14.02
Total	2.00		15.77				54.03		2.85		74.99
1994											
Cook Islands									0.12	100.0	0.12
Indonesia	0.44	0.7	5.28	8.6	0.01	0.0	52.86	86.5	2.52	4.1	61.11
Jordan	0.08	20.0	0.31	77.5			0.01	2.5			0.40
Kiribati			0.00	0.1			0.00	99.9			0.000008
Lebanon	0.03	1.1	0.08	2.6			3.01	96.3	0.00	0.1	3.13
Malaysia			0.35	87.5			0.05	0.1			0.40
Micronesia (Federated States of)	0.00	12.2	0.00	31.5					0.01	56.4	0.009
Nauru									0.001	100.0	0.001
Philippines	0.14	0.3	2.18	4.7			39.77	86.5	3.87	8.4	45.96
Republic of Korea											0.00
Samoa	0.0006	0.0	0.0003	0.0			1.24	98.7	0.01	0.8	1.26
Singapore									0.19	100.0	0.19
Tuvalu			0.00	0.012			0.00002	100.0			0.00002
Vanuatu	0.03	94.1	0.00	5.9							0.029
Total	0.72		8.21		0.01		96.95		6.72		112.61
1996											
Israel	0.12	1.9	0.46	7.4	1.73	27.7	3.81	61.1			6.24

a Includes *land-use change and forestry* and *waste*.

b Includes *fugitive fuel emissions* and *fuel combustion* emissions other than *transport*.

Table 16. Anthropogenic emissions of precursor gases, 1990 and 1994 (Gigagrams)

	CO	NOx	NMVOC
1990	**(Gg)**	**(Gg)**	**(Gg)**
Indonesia	3 937	121	
Republic of Korea	1 056	851	152
Total	4 993	971	152
1994			
Cook Islands			
Indonesia	11 966	928	
Jordan	282	75	30
Kiribati	0	0	
Lebanon	476	54	361
Malaysia	28 625	2 231	0
Micronesia (Federa	7	2	1
Nauru			
Philippines	4 519	345	310
Samoa			0
Tuvalu	0	0	
Vanuatu	0.02	0.08	
Total	45 875	3 636	703
1996			
Israel	137 472	426	6

Table 17. Anthropogenic CO_2 emissions from international bunkers, 1990 and 1994 (Gigagrams)

1990	**(Gg)**
Indonesia	2,038
Republic of Korea	7,140
Total	9,178
1994	**(Gg)**
Cook Islands	32
Indonesia	1,684
Jordan	610
Nauru	13
Republic of Korea	16,100
Singapore	6,477
Vanuatu	5
Total	24,921
1996	**(Gg)**
Israel	2207

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