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## **JAPAN**

Report on the in-depth review of the national communication of Japan

Review team:

Jin-Gyu Oh, Republic of Korea  
Md. Reazuddin, Bangladesh  
Paul Schwengels, United States of America  
Debra Justus, International Energy Agency  
Lucas Assunção, UNFCCC secretariat, Coordinator

Also available on the World Wide Web (<http://www.unep.ch/iucc.html>)

Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed on by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 15 national communications from Annex I Parties was prepared (A/AC.237/81).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of Japan and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

## Summary<sup>1</sup>

1. The in-depth review was carried out between June and December 1995 and included a visit to Tokyo by the team from 3 to 7 July 1995. The team included experts from the Republic of Korea, Bangladesh, the United States of America and the International Energy Agency.

2. Japan is a leading world economy with the second highest gross domestic product (GDP), and has one of the highest population densities among countries of the Organization for Economic Co-operation and Development (OECD). It relies heavily on imported energy resources, particularly oil, to fuel the economy. Energy security is a policy imperative and a more diverse energy mix is an explicit policy goal in Japan. Energy efficiency gains over the last 20 years in Japanese industries have been impressive. The Government expects to transfer these levels of achievement to other sectors for energy security and climate change policy objectives, along with shifts in the energy mix such as doubling the nuclear electricity generating capacity between 1992 and 2010. Further emission reductions will, however, require even more ambitious shifts to less carbon-intensive fuels or efficiency gains in all sectors, though industry considers that most of the cost-effective improvements in that sector have already been achieved. With an expected population growth of 3 per cent over the decade of the 1990s and GDP growth projections of 3.5 per cent a year, a significant expansion in domestic consumption is expected. Japan's national target, as stated in its communication, is "to stabilize CO<sub>2</sub> emissions on a per capita basis in 2000 and beyond at about the same level as in 1990. Yet, further efforts are to be made to stabilize total CO<sub>2</sub> emissions in 2000 and beyond at the same level as in 1990." Japan generates the third highest carbon dioxide (CO<sub>2</sub>) level among Annex I Parties. By far the majority of Japan's CO<sub>2</sub> emissions are energy-related, yet its per capita energy-related CO<sub>2</sub> emissions (9.4 tonnes) are relatively low compared to the OECD average (12 tonnes).

3. The cornerstone of Japan's climate change strategy is the Action Programme to Arrest Global Warming set out in 1990. The programme launched a number of policies and measures which are implemented and funded by various government bodies from their core budgets rather than from special or additional funding. A Council of Ministers has responsibility for overseeing progress and annual reports are compiled for their consideration. Only limited information was available to the review team on the specific mitigation effects of individual measures and the status of their implementation. Overall, the aim of the policies and measures is to achieve a number of objectives, with particular emphasis on increased energy efficiency and fuel diversity to further Japan's goal of enhanced energy security. Policies and measures described in the national communication also build on the 1993 Basic Environment Law. Japan employs a variety of policy instruments in pursuit of these goals including: standards and guidelines, targets, voluntary approaches, subsidies, financial assistance, research and development and education. This mix of measures whereby the Government establishes

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<sup>1</sup> In accordance with decision 2/CP.1 (see FCCC/CP/1995/7/Add.1), the full draft of this report was communicated to the Japanese Government, which had no further comments.

targets and administrative guidance and the private sector implements the measures with government financial incentives has been successful in Japan's programmes to improve energy efficiency. It is representative of the consensus approach used in many public policy areas in Japan. The outlook for continued reliance on this mix of measures to work towards climate change objectives appears positive, given the involvement of the private and public sectors. Consistent with the Basic Environment Law, studies on possible economic instruments including a carbon tax have been carried out, although, during the review, no reference was made to the possible use of such instruments to manage increasing energy demand in sectors experiencing fast economic growth, such as the residential and private transport sectors.

4. In general, Japan has provided information to support its national inventory estimates which is consistent with the minimum requirements of the Intergovernmental Panel on Climate Change (IPCC) and the Convention reporting guidelines. The team, however, identified a few significant deviations from the IPCC and Convention guidelines, namely on the reporting of CO<sub>2</sub> emissions from biomass burning, the sectoral breakdown of fuel combustion sources and CO<sub>2</sub> removals by managed forests. Japan also uses its fiscal year (FY) as the basis for its statistics, which makes the comparison of inventory data with other Parties more difficult. The in-depth review process was very useful and facilitative in clarifying areas of discrepancy with the existing inventory and reporting guidelines. In agreement with government experts, the review team identified several priority areas for future work and national experts expressed their intention to eliminate discrepancies between Japan's greenhouse inventory data and IPCC recommendations.

5. Taking into account the assumptions and projections contained in the *1994 Long-Term Energy Supply and Demand Outlook*, which incorporates the effects expected from current measures, total CO<sub>2</sub> emissions are expected to reach 1.2 million Gg by FY-2000. This represents a 2.3 per cent increase on the 1990 levels. Based on these assumptions and the expectation of a 3 per cent increase in population this decade, the per capita CO<sub>2</sub> stabilization target established by the Government seems to be within reach. Yet, greater efforts will be necessary to achieve the second target of the Action Programme which aims at stabilizing total CO<sub>2</sub> emissions at 1990 levels by 2000 and beyond. To this effect, efforts will have to be made towards the development of innovative technologies, including those related to solar, hydrogen and other new energy sources, as well as CO<sub>2</sub> capture and disposal at a pace and scale greater than currently foreseen. However, during the review, new information was shared with the team suggesting that additional measures will be required even to attain the national per capita CO<sub>2</sub> target. These measures were envisaged in the 1994 energy outlook, but not reported in the national communication. Based on the latest information, the 1994 energy outlook assumes the full implementation of ongoing measures, "plus additional and as yet unidentified energy efficiency gains", as well as plans for a sharp increase in nuclear generating capacity. Total nuclear generating capacity is to increase from 41 gigawatts in 1995 to 70 gigawatts in 2010. Inventory data collected since 1990 indicate that CO<sub>2</sub> emissions have increased significantly in the residential, commercial and transport sectors. Total methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions are projected to remain at 1990 levels until 2000 and beyond. Preliminary data for FY-1991 and FY-1992 roughly confirm this trend.

6. The team believes that projections would be significantly improved with further analysis of the "without measures" scenario. Whilst not strictly required by the reporting guidelines, submission of such analysis is highly encouraged. Moreover, the one scenario provided deviated from the approved reporting guidelines as it did not include a sectoral breakdown, nor did it define the methodologies used.

7. Japan has fulfilled its commitment to report on adaptation (research) activities, systematic observation, and education, training and public awareness actions to support Japan's climate change policies. A full report on the expected impacts of climate change was submitted to the review team, although the relevant information was not included in the communication. Japan has also reported on its financial assistance in the context of the Convention and on the transfer of technology to some of its main trade partners with a view to assisting developing countries in pursuing the objective of the Convention. The team noted with appreciation the 17.4 per cent increase in Japan's official development assistance (ODA) in 1994 from 1993, although the ODA/GNP ratio remains at the relatively low level of 0.29 per cent.

8. Japan has to be commended for its research and scientific activities on the possible impacts and assessment of climate change and is invited to disseminate their results more widely as an important contribution to the overall implementation of the Convention.

## I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

9. Japan ratified the Convention on 28 May 1993. The secretariat received its first national communication on 20 September 1994. The in-depth review of the national communication was carried out during the period from June to December 1995, including a visit to Tokyo on 3-7 July 1995. The review team consisted of Mr. Jin-Gyu Oh (Republic of Korea), Mr. Md. Reazuddin (Bangladesh), Mr. Paul Schwengels (United States of America), Ms. Debra Justus (International Energy Agency) and Mr. Lucas Assunção (UNFCCC secretariat, Coordinator). In the course of the visit, the team met representatives of several ministries and agencies concerned, members of the scientific and academic community and a number of representatives of environmental and business non-governmental organizations. The activities of the Tokyo City government were also presented to the team.

10. Global environmental problems, including climate change, feature high among the priorities of the Government of Japan. Climate change mitigation options have been considered by several ministries and coordination has increased among the administrative organs most closely concerned. Overall coordination is ensured by the Council of Ministers for Global Environmental Conservation, which was established in May 1989. The Council oversees the implementation of Japan's Action Programme to Arrest Global Warming launched in 1990, and annual progress reports are submitted to the Council for consideration. There is no special funding for the implementation of the Action Programme. Rather, its activities are implemented by individual government bodies drawing from their specific core budgets.

11. As the member of the Organisation for Economic Co-operation and Development (OECD) that has the second highest gross domestic product (GDP) and one of the highest population densities (almost 70 per cent of the territory is covered by forests and the whole population lives in less than 15 per cent of its territory), Japan's energy supply structure is one of the most vulnerable among OECD countries. More than 81 per cent of energy supply is imported, with a high level of dependence on imported oil (58 per cent of the total). It has been stressed that Japan's efforts to mitigate climate change should be considered in conjunction with its situation as a major energy-importing country and its determination to ensure energy security. In this regard, the team took special note of current plans to increase total nuclear generating capacity from the 41 gigawatts in 1995 to 70 gigawatts by 2010, when it will account for 40 per cent of electricity generation <sup>2</sup>.

12. The national communication is based on the assumption that between 1990 and 2000 the Japanese population will grow by over 3 per cent and GDP will grow at a rate of roughly 3 to 3.5 per cent a year, with a significant expansion in domestic consumption expected. The country has a relatively low level of energy-related carbon dioxide (CO<sub>2</sub>) emissions per capita, the figure being approximately 9.4 tonnes of CO<sub>2</sub> compared to 12 tonnes for all member countries of OECD and 8 tonnes for European member countries.

13. Japan's approach to climate change places emphasis on restraining energy demand growth and increasing energy efficiency. Japan has achieved in the past decades some "decoupling" between economic growth and carbon dioxide (CO<sub>2</sub>) emissions, largely thanks to energy efficiency improvements and restructuring in its industrial sectors. Given the robust economic growth and increasing domestic consumption, continued progress in energy efficiency will require diligence. Improved integration of climate change matters will also be needed. Agencies and ministries seem to act independently in a spirit of competition rather than cooperating fully in mitigation efforts. Furthermore, during the visit it was made clear to the team that further emission reductions are forecast to be achieved in sectors currently experiencing rapid energy demand growth such as transportation and the residential and commercial sector, rather than industry. Successful policies and programmes in these areas will require further inter-agency coordination.

14. Japan has actively pursued energy efficiency improvements for two decades and has clearly succeeded in becoming one of the most energy efficient economies in the world. As an example, the (energy intensity) ratio of total primary energy supply to GDP decreased from 0.21 in 1973 to 0.15 in 1993 and is projected to reach 0.12 by 2010. In the 1990s, however, rapid economic growth, currency appreciation and low oil prices have shifted attention away from energy conservation, and energy efficiency gains have slowed.

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<sup>2</sup> Assuming an average plant capacity of 1350 megawatts, this expansion could mean the construction of some 17 new nuclear power plants by 2010.

15. Japan's national target is to stabilize CO<sub>2</sub> emissions on a per capita basis in the year 2000 and beyond at the same level as in 1990. The national target also states that "further efforts should also be made to stabilize total CO<sub>2</sub> emissions at the 1990 level in 2000 and beyond. The same is true for methane (CH<sub>4</sub>) emissions and other greenhouse gas (GHG) emissions including nitrous oxide (N<sub>2</sub>O)." Activities being undertaken by local authorities have increasingly provided new impetus in complementing federal policies to meet these goals.

16. The team considered that the quality and scope of the information provided in the communication was greatly improved by the discussions and documentation received during the country visit, in particular the *Long-Term Energy Supply and Demand Outlook* which was revised in 1994 to reflect changes in domestic demand and economic growth trends, as well as to incorporate climate change stabilization targets.

## II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

17. In general, Japan has provided information to support its national inventory estimates which is consistent with the minimum requirements of the Intergovernmental Panel on Climate Change (IPCC) and Intergovernmental Negotiating Committee (INC) reporting guidelines. With some notable exceptions, the major source categories are calculated consistently with IPCC methods and reported clearly. The Japanese national inventory treats international bunker fuels separately, as requested by the INC.

18. Japan provided data on CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC). Taking only the first three gases into account, and using 1994 global warming potential (GWP) values, CO<sub>2</sub> accounted for 96 per cent of emissions in 1990, most of them originating in the industry, transportation, residential and commercial sectors. More recent inventory data on CO<sub>2</sub> for 1991 through 1993 and on CH<sub>4</sub> and N<sub>2</sub>O for 1991 and 1992 were provided to the review team during the country visit. Although emission estimates were not provided for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>), Japanese experts agreed on the need for better monitoring of these emissions in Japan and reported that inventories were under development and would be provided in future communications. The availability of inventories for these other gases and their emission trends will assist in the early identification of new mitigation measures.

19. Japan is to be commended for its efforts to present and document its GHG inventory according to the guidelines provided. Japanese experts noted, however, that the IPCC Guidelines were received only in March 1994 and that they entailed substantial revisions to the procedures and formats previously used in Japan to produce GHG inventory estimates. As a result, several deviations from the IPCC and INC guidelines were present in the national inventory. The most significant deviations are the following:

(a) The 1990 inventory includes CO<sub>2</sub> emissions from biomass burning and the burning or decay of organic wastes. The IPCC Guidelines require that these emissions be excluded as they are generally offset by regrowth of biomass or other organic material on an annual basis. It is only when organic material is harvested in a non-sustainable or depleting manner that net CO<sub>2</sub> emissions occur. The Guidelines require that any net emissions be reported in the land-use and forestry categories;

(b) In presenting the sectoral breakdown of CO<sub>2</sub> emissions from fuel combustion, the 1990 inventory allocates emissions from electricity generation to the end-use subsectors (industry, residential/commercial, etc.) in which the electricity is consumed. This is clearly a valuable way of presenting the data for many policy analysis purposes. However, it is not consistent with the IPCC Guidelines and presents problems for comparison with data from other Parties. It is also internally inconsistent as Japan's inventory does not allocate emissions of CH<sub>4</sub> from electricity generation to end-use subsectors. It would be possible in the future to present the data both ways;

(c) Calculated removals of CO<sub>2</sub> by managed forests in 1990 are not presented in a form consistent with the IPCC Guidelines. As a result it is very difficult to compare the results and key data inputs with those of other Parties.

20. Specific concerns in the managed forestry category include: firstly, instead of presenting the number of hectares of forest and annual average growth by type, increments in standing volume and harvested volume were given; secondly, the values given for annual growth in total forest biomass are growth net of harvest rather than gross annual growth; and finally, 100 per cent of harvested wood is considered to be stored and not to produce CO<sub>2</sub> emissions. The last-mentioned point is to be considered in opposition to the observation in paragraph 19(a) that carbon released from biomass burned or disposed of as organic waste is considered as a net emission in Japan's inventory but not in the IPCC format. These two discrepancies offset each other to some degree so that the final results are less different from an IPCC calculation than the intermediate steps, but they none the less make international comparison very difficult. In addition, the large quantity of imported biomass which is burned or disposed of in Japan is not offset, and creates the likelihood of double counting of CO<sub>2</sub> emissions from countries which are the sources of biomass imports.

21. Other minor discrepancies in methodology include: firstly, the fact that the inventories use fiscal year as the basis for calculation as opposed to calendar year as required by the IPCC and INC guidelines; secondly, many of the intermediate data, emission factors, etc., are presented in units which are different from the IPCC requirement and make comparison difficult; and finally, often the presentation format is different from the IPCC standard reporting tables. Their use would greatly facilitate transparency and comparison in the future.

22. Government representatives indicated that the in-depth review process was very useful to them in clarifying the areas of discrepancy with the IPCC and INC guidelines, and stated their intention to move toward elimination of these discrepancies to the maximum extent possible in future inventories. They envision that this will require some effort and time due to

the lengthy process of inter-ministerial discussion and concurrence needed to make changes in major international documents such as the national communication. However, it appears that all of the problems identified in this review can be corrected over time with the exception of use of the fiscal year basis. Japanese experts felt that the latter is deeply imbedded in the basic statistical system of the Government of Japan and would require major efforts to revise. They questioned whether the consistency benefits of such a change would be worth the cost.

23. Japanese experts commented that they found the IPCC and the Convention reporting guidelines to be useful, albeit with some exceptions. In particular, the listing of requirements as "should", "encourage", "may" was considered helpful in clarifying a number of issues. On the IPCC Guidelines, they expressed the hope that future revisions would include more illustrative guidance on NMVOC emissions and new gases such as HFCs, PFCs, and SF<sub>6</sub>.

24. In providing most of the minimum level information required by the IPCC Guidelines in a transparent manner, the 1990 inventory also indicates that many of the emission factors used and virtually all of the activity data are derived from national data sources rather than defaults of international references. This is to be commended and is consistent with the philosophy of the Guidelines that individual Parties are the best judge of which data are most accurate and credible in their contexts, and that local sources of data and assumptions are likely to be more accurate than international defaults.

25. However, there are special difficulties in the case of Japan, arising from the scarcity of translated reference material. More information on approaches, emission factors, data sources, etc., would be extremely useful though not strictly required by the reporting guidelines. Of special interest in this supporting material would be additional background information on the intermediate calculations and the sources of data and emission factors, identifying clearly those emission factors and data which are not taken from internationally accessible sources (perhaps with a table indicating for each category/subcategory where defaults have been used, and where locally developed factors/data are used.) Where local data and factors are used, it would be very useful to present a comparison with international default values and explain the differences. Wider dissemination of more detailed background material would be especially useful in allowing other Parties, as well as the IPCC, to understand more fully the results of the very significant Japanese research on emission inventory methods, while also contributing to future improvements in the IPCC methodology.

26. Following discussions with Japanese experts, the review team has identified several areas which should be priorities for future work. These include:

(a) Preliminary estimates of HFCs, PFCs and SF<sub>6</sub>. Government experts indicated that they were working on data on HFC and PFC emissions, and that some results will likely be included in new inventories to be submitted to the secretariat in 1996 or 1997;

(b) GHG emissions from landfills. A more detailed, time-sensitive methodology for estimating CH<sub>4</sub> especially from this source is needed. The communication used the default

methodology provided in the IPCC Guidelines. However, as discussed during the review, this simplest method is clearly inaccurate when the volume of waste landfilled is changing significantly over time, as is the case in Japan. Even though the estimates presented are technically in compliance with the Guidelines, it is clear that the resulting estimate is of poor quality. This is a clear indication of a flaw in the IPCC Guidelines, as well as a problem in the Japanese inventory. Both should be priorities for future work;

(c) Detailed assessment of N<sub>2</sub>O emissions from adipic acid. This source category is one of the most significant in the national totals for N<sub>2</sub>O emissions. However, the estimate is entirely derived using default emission factors. Some specific local measurements and analysis would be useful to verify the preliminary estimates.

27. The Japanese inventory discusses the development of "bottom-up" as well as "top-down" estimates of CO<sub>2</sub> from energy. The "top-down" calculations are very clearly presented and consistent with the IPCC reference method. However, it is not clear from the national communication precisely how the "bottom-up" estimates were produced. After discussions with national experts it became clear that these estimates were produced by taking sector-level fuel consumption multiplied by the same emission factors as those used for the "top-down" estimates. It was pointed out that the energy data are themselves partly created in a "bottom-up" way by aggregating data collected on energy use at plant or local level to produce sectoral and national fuel consumption totals.

28. The term "bottom-up" is sometimes used by other countries to refer to a very different estimation procedure. In this procedure, emission estimates are prepared at the plant or local level, in much the same way as is done for NO<sub>x</sub> or other traditional air pollutants. This could involve using a number of somewhat different carbon emission factors for specific fuel and combustion technology situations. These carbon emission estimates are aggregated up to arrive at sectoral and national totals. These can then be compared to "top-down" values derived from national energy balance statistics multiplied by carbon emission factors. In many countries the national energy statistics are based on fuel sales data collected separately from the plant-by-plant fuel consumption data used for the "bottom-up" estimates. In future inventories it would be useful to include a clear explanation of "bottom-up" or intermediate-level calculation procedures and to define terms carefully in order to avoid misinterpretation by other Parties.

29. Calculations of carbon stored when energy is used for non-fuel purposes (e.g., feedstocks) are not entirely clear in the national inventory section of the national communication. Japanese experts explained that a single average figure for the percentage of carbon stored in products was used for all products. This is slightly less detailed than the default method provided in the IPCC Guidelines. However, this factor is intended to reflect only the amount of carbon stored in the production processes. Japan's 1990 inventory takes a much more sophisticated approach to tracking and accounting for emissions of carbon from combustion of waste oil, plastics and other products. This is consistent with the basic methodology and encouraged where information is available. Thus, on balance, the Japanese approach is likely to be more accurate than results which would be obtained through the

default method. This is an adequate approach, provided the procedures and assumptions are fully documented.

30. In a related issue, a 95 per cent factor was used for estimating CO<sub>2</sub> emissions from coking coal use. After discussion with national experts, it transpired that this factor takes into account the carbon emitted in the production of coke from coking coal, and from consumption of coke in the steel-making process. That is, 5 per cent of the original carbon actually ends up stored in the steel products and other materials. The review team was also advised that Japan is an exporter of coke, but includes coke in "coal" exports in IEA energy balance tables rather than showing it as a separate item. Thus, what appeared to be an inconsistency may be simply a terminology or labelling difference. This information was forwarded to the IEA for review.

31. There are several categories of emissions required in the Guidelines which were omitted in the national inventory estimates, as noted in the communication. Key omissions include:

(a) CO<sub>2</sub> emissions from land-use change. In the "land-use change" category, only data on sinks in managed forests were provided; actual land-use changes, for example forest clearing, are so small that the resulting emissions are considered negligible;

(b) CH<sub>4</sub> and N<sub>2</sub>O from biomass burning. Together with gross CO<sub>2</sub> emission factors for burning, which were used to estimate CO<sub>2</sub> from this category, the Guidelines also provide default factors which can be applied to estimate CH<sub>4</sub> and N<sub>2</sub>O;

(c) CH<sub>4</sub> from natural gas and oil systems, and from town gas production. No estimates were provided on gas leakages, which are regarded as minimal but not non-existent. To avoid under-reporting of CH<sub>4</sub>, it would be useful to present some data (with sources) and default calculations to show that the emissions are small enough not to warrant further efforts.

32. In addition, the inventory does not estimate CO<sub>2</sub> emissions from aluminium smelting<sup>3</sup> and other industrial processes (except quicklime manufacturing, iron and steel and cement production) which may be GHG sources in Japan. No default methods are provided in the Guidelines, and these calculations are not expected from every country. However, many industrialized countries have provided preliminary estimates for sources of this type. This is a major source of information for the development of expanded default methods in future versions of the IPCC Guidelines. It would be useful for advanced industrial countries like Japan to provide such information whenever feasible.

33. The table on quality of estimates in the Japanese national inventory raised several questions. Both national experts and the review team had difficulty in determining the precise meaning of the categories "low", "medium" and "high" in the data quality table. This indicates the importance of continuing to develop and present quantitative estimates of uncertainty

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<sup>3</sup> CO<sub>2</sub> emissions from aluminium smelting in Japan are considered negligible since apparently there is only one plant, in the Shizuoka prefecture.

wherever possible. Also, more systematic guidance from the IPCC, with examples, would be helpful in encouraging more consistent use of the quality labels in future versions of the guidelines. The results of Japan's efforts to assign confidence levels to individual estimates on a qualitative basis suggest higher than expected confidence in the areas of CH<sub>4</sub> from enteric fermentation and N<sub>2</sub>O from fertilizer use.

34. In discussions with the review team, national experts indicated that they believe they may in fact have much more accurate emission factor values in the case of fermentation, and possibly a better methodology in the case of fertilizer. Japanese experts are to be commended for moving beyond the methods in the IPCC Guidelines. These results need to be carefully documented and analysed. Background documents on both calculations were provided to the review team and have been forwarded to the IPCC/OECD GHG inventory programme for consideration.

35. A few additional minor clarifications were made during the in-depth review which suggest the value of providing slightly more detailed documentation in future, for example:

(a) The emission factor for CH<sub>4</sub> from fuel combustion in fishing vessels is several times higher than for the use of the same fuel in agricultural and construction equipment. This difference is not consistent with the limited (and still uncertain) emission factor estimates provided in the Guidelines. The rationale for the difference should be presented;

(b) It was determined in the review that emission factors for N<sub>2</sub>O from vehicles were based on tests of new vehicles only. Testing of vehicles with older catalytic converters might be important for Japan in future work, as results from other countries show significantly higher emissions from such vehicles.

### III. POLICIES AND MEASURES

36. The national communication (entitled "action Report on climate change") describes Japan's formulation and promotion of the Action Programme to Arrest Global Warming adopted in October 1990, which is the national programme called for in Article 4.1(b) of the Convention.. The Action Programme delineates the Government's near-term policies to promote systematic and comprehensive measures to deal with global warming. Additionally, the national communication sets forth the GHG reduction targets up to 2010, with 2000 as the intermediate target year and builds upon the concepts included in the New Earth 21 programme and the 1993 Basic Environment Law.

37. The communication describes measures aimed at mitigating emissions associated with energy production and use, waste management and land-use, and also for the enhancement of sinks. Measures are presented on a gas-by-gas basis. Those for CO<sub>2</sub> and CH<sub>4</sub> are described on an end-use sector basis. Policies and measures related to CO<sub>2</sub> sinks, N<sub>2</sub>O emissions and

other GHGs are reported by type of programme, for example studies of emissions and information campaigns for the private sector. Moreover, Japan has included measures to promote public awareness, scientific research and international cooperation.

38. The review team found that, compared with other national communications, that of Japan describes policies and measures (P&Ms) in some detail. Sufficient detail is included in most cases to allow a third party to understand the objective, in conformity with the reporting guidelines and requirements of Article 4.2(b). There is considerable room, however, to improve reporting. Objectives and approaches are clearly described on a qualitative basis, yet few details on the anticipated effects of the actions or their current status of implementation have been provided. Consequently, it is difficult to assess which P&Ms the Japanese Government views as most relevant in seeking to achieve its targets under the Convention. In addition, indicators of progress and monitoring of effectiveness are not clearly delineated in the communication or in the supplementary material available in English and provided to the review team.

39. An annual report to the Council of Ministers for Global Environmental Conservation updates the status of implementation of P&Ms and total CO<sub>2</sub> emissions. A provisionally translated summary of the June 1995 report to the Council was provided to the team. It outlines the broad measures in the Action Programme highlighting amendments introduced in the fiscal year 1994, such as the extension of energy consumption labelling to additional products. A few implementation indicators are mentioned, such as the number of alternative fuel vehicles introduced, amount of subsidies provided for solar installations, and level of investment in forestry and urban greenery.

40. Overall, information on the status of implementation of individual P&Ms and the milestones that are used to assess their progress is an area that should be more clearly communicated. Through discussions during the review, it appears that monitoring of some P&Ms does take place, but no results were given and it was not stated whether there is linkage with policy-making. The team suggests that information on the status of implementation, monitoring and expected effects would enhance future communications. The team also remarked that future communications would benefit from having more information on how the various measures interact and complement each other.

41. Industry and environmental non-governmental organizations as well as the general public were provided an opportunity to comment on the draft of Japan's national communication. The team was told that insufficient time was allowed for these comments, owing to time constraints for submission to the secretariat.

42. The Government has solicited the cooperation of local governments by setting guidelines for formulating regional plans to cope with climate change and providing financial assistance for that purpose. As of September 1994, many of the 59 prefectures and designated cities were in the process of formulating such plans.

43. The package of measures generally reflects the structure of the inventory in that 92 per cent of CO<sub>2</sub> emissions are energy-related and the majority of P&Ms directed towards CO<sub>2</sub> mitigation aim at improving the efficiency of energy production, conversion and end-use. Energy conservation is the only area where a level of estimated effects for 2000 is specifically included in the communication: about 36,500 Gg of CO<sub>2</sub> reduction each from the industrial, residential/commercial and transport sectors. Measures to mitigate CH<sub>4</sub> emissions primarily target waste reduction and recycling, which accounted for about a third of CH<sub>4</sub> emissions in 1990. Agriculture contributed about 57 per cent of CH<sub>4</sub> emissions and measures described are research-related.

44. It was explained to the review team that all of the P&Ms mentioned in the communication have been implemented. In a few instances, annual budgets for programmes are mentioned. Officials explained that future programme budgets are decided in the course of the annual budget exercise. There was no discussion of the budget cuts that would threaten the viability of the existing policies and measures.

45. Japan has been pursuing energy conservation in production, transformation and end-use since the 1970s. Consequently, many of the energy-related P&Ms reported were in place prior to the 1990 base year. A number of these measures have subsequently been strengthened and expanded, and particular mention has been made of these enhancements with reference to the fiscal years in which they were implemented.

46. The *Long-Term Energy Supply and Demand Outlook* was provided to the review team as supplementary documentation. The outlook was revised in 1994 to reflect changes in demand trends and Japan's climate change objectives. It was prepared by an advisory committee of the Agency of Natural Resources and Energy (which is part of the Ministry of International Trade and Industry) and served as a basis for projections reported in the national communication. It presents the preferred path toward energy policy goals in line with economic growth predictions and international environmental commitments, including FCCC. The outlook for 2000 and 2010 in a base scenario indicated that accelerated development of fuel mix targets and development of "new" energy sources, as well as additional energy efficiency measures in production and end-use would be needed to achieve the per capita CO<sub>2</sub> target. The "additional measures" scenario has been adopted as the determinant for current energy policies. The estimated effects of the package of CO<sub>2</sub>-related measures are based on this scenario, even though the "additional measures" were not described in the national communication, nor was information on possible new measures provided during the review visit. The outlook emphasized, however, that further efforts including the development of

innovative technology are needed for the stabilization of total CO<sub>2</sub> emissions. It was explained to the team that these additional measures are currently under discussion. The following sections highlight selected P&Ms and do not attempt to give a comprehensive assessment of all measures reported.

#### A. Carbon dioxide

47. Most P&Ms to mitigate CO<sub>2</sub> emissions are energy-related. The focus is on improving energy efficiency in end-use in all sectors and on energy conversion.

## 1. Energy conversion

48. The team found that the energy supply and demand outlook sets targets that are a fundamental component of Japan's climate change strategy. This outlook is the basis for the 2000 projections. Energy demand is forecast to continue to increase in all sectors, albeit at rates lower than in recent years. The supply targets indicate continued efforts to reduce oil dependence and a substantial increase in nuclear power generation. Described in a general way in the communication, the measures aim at improving the efficiency of thermal electricity generation and expanding the use of low-carbon energy sources such as liquefied natural gas (LNG), nuclear power and renewable energy. Demand-side management measures focus on levelling electricity loads through time-of-use rates and load control systems. The outlook is viewed as providing guidance for the behaviour of the energy industry and energy users. To complement this guidance, financial incentives such as low interest loans, tax credits, subsidies for technology development and a tax on electricity are employed.

49. While there is uncertainty about the extent to which these targets will be fulfilled and the timing of their realization, it appears that some measures will have to be strengthened so that their full impacts are achieved by 2000. The review team notes, however, that some of these actions could have significant impacts in the post-2000 period, partly because of the long lead times associated with power plant construction.

## 2. Industry

50. Industry accounted for 46.2 per cent of CO<sub>2</sub> emissions in 1990. This is a sector that has made impressive energy efficiency gains in the last two decades as indicated by reductions in unit energy consumption data. These gains have been achieved through the Energy Conservation Law, which designates certain types of factories as "energy management factories". According to the Law, qualified energy managers must be employed in such factories. The Law also provides for tax credits, special depreciation schemes and low-interest loans. By the end of FY-1993, factories representing 70 per cent of total industrial energy consumption had been designated as "energy management factories". As a result, investments in industrial energy efficiency with large energy savings and cost-effectiveness features have been very successful.

51. The Energy Conservation Law was strengthened in 1993, with some standards for the management plans reinforced to ensure a 1 per cent annual average improvement in unit energy consumption (as an average across operations of a factory). Financial incentives were also strengthened. Annual reporting is now required and a lack of compliance can lead to public disclosure. Within the time-frame of the 2000 CO<sub>2</sub> target, these activities are likely to result in some "fine-tuning" of industrial energy efficiency rather than very large reductions in energy consumption. In the longer-term, technological developments are expected to yield further efficiency improvements.

52. By 1994, voluntary environment plans had been established by companies representing about 60 per cent of total manufacturing sales and which had more than 300 employees. The plans include energy conservation, waste reduction and recycling targets, and measure to curb CO<sub>2</sub> emissions. These plans were voluntarily established in response to requests to 87 major industrial organizations from the Ministry of International Trade and Industry, the aim being to involve the private sector on a partnership basis in Japan's efforts to achieve its commitments under FCCC. These partnerships with the private industrial sector work through a variety of means to achieve sectoral targets and have been a successful policy approach towards energy efficiency.

53. The implementation of energy conservation measures in the industrial sector is expected to result in an approximate reduction of 36,500 Gg of CO<sub>2</sub> in 2000. It is not possible from the information provided to assess progress to date in reducing emissions or the relative contribution of the various measures to this reduction estimate. Additionally, a reduction in CO<sub>2</sub> emissions of about 7,000 Gg by 2000 from non-energy uses in industry is expected from reduced limestone burning for cement and lower steel production levels.

### **3. Residential and commercial sector**

54. CO<sub>2</sub> emissions from this sector accounted for 22.3 per cent of the 1990 total. The outlook indicates an annual average energy demand growth of 2 per cent to 2000 and 1.6 per cent from 2000 to 2010 (compared to an annual average of 4.45 per cent from 1983 to 1993). Overall, this sector's share in total CO<sub>2</sub> emissions continues to increase. CO<sub>2</sub>-related policies and measures for the residential/commercial sector also focus on energy efficiency: building design, energy performance targets for four types of appliances and office equipment, and technology development. Insulation standards and guidelines are in place for housing and buildings, including offices, shops, stores, hotels, hospitals and schools. Some of these standards have been revised and strengthened since 1992. Incentives include financing above an ordinary loan ceiling for energy efficient housing construction, subsidies for solar and advanced technology installations and tax incentives for district heating and cooling systems using waste heat.

55. The residential/commercial sector is one of growing energy demand characterized by a consumer desire for conveniences such as air conditioners, and increasing automation of offices. Policies and measures are designed to improve the energy efficiency of these products. These are yardsticks for manufacturers, not mandatory standards. In addition, energy consumption labelling is required for these products. These measures appear to target those consumption areas that have been experiencing significant energy demand growth. It is not clear how progress in these areas is to be monitored. This is a case where interaction between the various policies and measures could benefit from further explanation. It is particularly relevant here as the uptake of energy efficient appliances, etc. depends on consumers being informed, which is a matter related to the public awareness measures.

#### 4. Transportation

56. Transportation accounted for 18.3 per cent of Japan's 1990 CO<sub>2</sub> emissions. Its share is continuing to rise. The number of motor vehicles increased by 55 per cent between 1980 and 1990. Actual fuel efficiency has declined due to traffic congestion and increasing vehicle size. Japan's transportation P&Ms cover six areas: improving vehicle fuel efficiency; promoting low emission fuels (for example, compressed natural gas and electric vehicles); encouraging mass transit; improving freight efficiency through revitalizing rail and sea transport; rationalizing intra-city as well as inter-city fuel distribution; and improving road infrastructure to ease traffic flow. Measures include fuel efficiency standards, subsidies for alternative fuel vehicles and fuel supply equipment, low-interest loans, tax credits and infrastructure investment. Gasoline consumption taxes are used to support road construction. Measures including the introduction of new energy efficient technology in aircraft are applied to air transport.

57. Fuel economy standards for cars were strengthened in 1993. The target for 2000 is an 8.5 per cent average improvement compared to 1990 levels for new passenger vehicles. These are targets, not mandatory regulations. The mandatory fuel economy labelling requirements were also reinforced in 1993. A 5 per cent target for average improvement in fuel efficiency by 2003 was set for gasoline trucks as compared with 1990 levels. The team noted that some intermediate indicators of progress such as the number of alternative fuel vehicles and distribution centres built are included in the communication and in supplementary materials. In the near term, transport P&Ms focus on making individual vehicle use more efficient through fuel economy, periodic vehicle inspections, driver education, and road construction. Though increasing road capacity may lead to reduced congestion, experience in many countries indicates that road construction leads to more vehicles and more kilometres driven. In addition, current deregulation is likely to reduce the price of gasoline, which may stimulate demand as a result. Measures to promote modal shifts are longer-term in nature but infrastructure investments are under way. The effects of some of these measures are typically long-term in nature, which may mean that the bulk of reductions expected from them will likely be realized after 2000.

58. Insufficient details are provided to assess the potential effectiveness of the transport measures to achieve the projected 36,500 Gg of CO<sub>2</sub> reduction by 2000. The target to reduce transport energy demand growth to 1 per cent per annum is ambitious compared to the 2.4 per cent annual trend in the 1990s. During the review process, the team was informed that a report on the feasibility of reaching the target was planned.

#### 5. Municipal waste

59. Japan aims to reduce municipal waste volume by 30 per cent by 2000 to cut CO<sub>2</sub> emissions by about 9,000 Gg. Measures are in place to promote recycling in all sectors. Manufactured products ranging from paper to video cameras are designated to promote the use of recyclable materials through voluntary standards and labels. Eco-mark labels applied to 2,538 product brands in 1994. The aim is to increase the recycled-resource utilization ratio of

manufactured goods by 2.2 per cent annually to 1998. Financial incentives such as interest subsidies and tax credits are employed. Overall indicators of progress or evaluation techniques have not been devised.

## **6. Carbon dioxide sinks**

60. Measures to enhance carbon removals are based on Japan's national forest plan. They focus on improved forest management, afforestation and the designation of "protection" forests. Financial support for planning and implementation is provided. Measures are also being taken to promote efficient wood processing and manufacturing, as well as to increase demand. The use of biomass for energy is not promoted in the plan. Other CO<sub>2</sub> sequestration measures promote urban greenery. Degree of implementation indicators for some measures in the form of budgets and number of hectares under management are mentioned. The projected effects of measures contained in Japan's national forest plan are estimated to be roughly 92,000 Gg of CO<sub>2</sub> in 2000, compared with 136,000 Gg from the expected effects of all P&Ms currently adopted. It is not possible with the information provided to determine how the removals have been calculated. The national communication explicitly states that further efforts will be needed to meet the established targets.

### **B. Methane**

61. P&Ms focused largely on CH<sub>4</sub> reductions in waste management, which accounted for about 34 per cent of emissions in 1990. The target is to reduce waste volume by 30 per cent by 2000. This goal could be partially offset by the parallel aim to increase waste incineration. At the local level, measures include recycling promotion, waste disposal fees (35 per cent of municipalities charged disposal fees as of 1992) and waste treatment facilities. Financial support is available from the national Government. Manufacturing and distribution industries participate on a voluntary basis to promote resource recovery and reduce waste volume. Energy production from waste incineration and digester gas is encouraged through financial support and tax incentives. Progress indicators are insufficient to assess the feasibility of achieving the 30 per cent volume reduction. The team noted that this is the key area based on the projections to meet the CH<sub>4</sub> target in 2000. It should be noted that the method used for calculating CH<sub>4</sub> emissions from landfills ignores important time-lags. This could cause projected reductions to be overstated.

62. Agriculture contributed about 57 per cent of 1990 CH<sub>4</sub> emissions. The report entitled "Long-term prospects for the demand and production of agricultural products" projects an increase in these emissions. Research and evaluation characterize the approach. The team noted that Japan's research on CH<sub>4</sub> emissions from rice paddies contributed to the development of its national activity data for the inventory. Possible effects of these efforts were not reported.

### C. Nitrous oxide

63. Studies of emissions from waste management, industry, fertilizer use and motor vehicles are under way. The N<sub>2</sub>O emissions estimate is based on the energy efficiency and waste reduction measures. Emissions are projected to increase. The Government acknowledges that more work is needed to identify emission sources and emission control technologies.

### D. Other greenhouse gases

64. Ambient air quality standards have been established and strengthened for NO<sub>2</sub> and CO emissions based on the Basic Environment Law. They establish administrative policy goals rather than regulatory standards. Regulatory emission standards have also been set and strengthened for NO<sub>x</sub>, CO from stationary sources and motor vehicles, and hydrocarbons including NMVOCs from motor vehicles, according to the Air Pollution Control Law. Further measures related to the contribution of these gases to global warming were not included. Studies are under way, however, to improve implementation of existing standards. There are no specific measures for HFCs, PFCs or SF<sub>6</sub>.

## IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

65. In preparing its projections for GHG emissions for year 2000, the Government of Japan deviated from the recommended FCCC reporting guidelines. Moreover, a "without measures" scenario was not provided, making it difficult to assess the comparative relevance of mitigation policies and measures in place. The team was informed during the visit that projections included effects of the measures described in the national communication, **as well as additional measures** introduced since the communication was prepared. No information, however, was provided about these new measures or their specific effects.

66. The team believes that projections would be significantly improved by the inclusion of a "without measures" scenario. Whilst not strictly required by the reporting guidelines, its preparation is encouraged and it has been presented in communications submitted by most other Parties. The one scenario that was provided did not include a sectoral breakdown nor did it contain an explanation of the methodologies used. From this scenario, it was also not possible to assess the effects of measures contained in the communication. The team recommended that the reporting guidelines be followed to ensure transparency and comparability of results among Parties. In response to a request, data on the sectoral breakdown of future emissions were submitted to the secretariat in April 1996.

67. The team has identified deficiencies in three main areas in which closer attention is required in preparing future projections.

68. Firstly, because energy projections are presented at a highly aggregated level, CO<sub>2</sub> emissions are based on very crude average emission factors for coal, oil and gas. It is clear that the modelling process used to make projections of energy consumption and fuel mix in

future years includes some detail on rates of economic growth and energy consumption by fuel and by economic subsector. However, many of the detailed results associated with the projections were not made available during the review. The CO<sub>2</sub> emission figures resulting from the energy scenarios are calculated based solely on projections published by Ministry of International Trade and Industry. These consist of total energy supply (projected production plus net imports) for three broad fuel categories - coal, oil and gas.

69. Based on the limited amount of information available, and to the extent possible, a logical and transparent method of calculating future emissions was developed. Aggregate emission factors were derived in two steps. Total emissions from consumption of oil and oil-derived fuels and fuel products were calculated in the 1990 inventory. This was then divided by the total energy supply to the Japanese economy for the same year. The result is an aggregate emission factor for oil and related fuels and derived products. This aggregate factor was then applied to the projected total demand for oil and oil products by the Japanese economy in 2000 to provide the projected emissions for that year. This aggregate factor would be expected to provide an accurate projection of emissions if (a) the mix of oil products used in 2000 is basically the same as in 1990 and (b) the ratio of exports of refined oil products to total oil products supplied to the economy remains the same. The energy projections used do not take in account the changes in the mix and ratios of import and export of oil products which are expected from the deregulation measures in place. The assumption made is that no change takes place<sup>4</sup>.

70. It is difficult for reviewers to judge whether these assumptions introduce significant biases into the projections. It is reasonable, however, to conclude that the procedures used and the information reported in the communication create significant difficulties for other Parties to understand projections of CO<sub>2</sub> from energy consumption, or to compare them with those of other Parties. The actual procedures used were not explained in the communication and were only clarified in discussions with the review team. These data were partially provided to the review team in April 1996. The review team welcomed this progress based on the in-depth review of Japan's national communication. However, owing to the very late submission, the team could not review the data in detail. The team, therefore, strongly recommends that such data be included in the next communication. In doing so, there should at least be some discussion of expected changes or lack of change in fuel mix and exports, the rationale for these changes and how they affect the emissions expected for the projection year.

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<sup>4</sup> Government policy has *in effect* limited the import of refined oil products for many years. As part of the gradual deregulation of the oil sector, and in response to public outcry about the high price of gasoline, import controls on refined oil products were expected to be lifted in early 1996. The Ministry of International Trade and Industry expects imports of refined products to create pressure on the Japanese downstream industry to become more competitive. The Ministry of International Trade and Industry also sees opportunities for refiners in Japan to begin exporting refined products to the Asia-Pacific region. The ratio of exports of refined products to total oil products supplied is bound to change and probably in a substantial way in the next couple of years.

71. The second deficiency relates to the way projected emissions from waste disposal were estimated. They were based on a very crude default methodology, which considerably underestimates future emissions from existing landfills. The projection follows the default methodology used in the national inventory, which created problems in the base year estimates, as discussed in chapter II. However, in the projections the problems are compounded once the effects of a very significant policy effort to reduce the amount of waste landfilled are included. In this situation, as discussed in the IPCC Guidelines, the default method would clearly underestimate the emissions. This estimation method may obscure an important area for future policy measures, namely the recovery of methane from existing landfills. A revised methodology for estimating landfill emissions which accounts for the time-lag between waste disposal and actual emissions should be developed as a high priority for Japan, and used for both 1990 emissions and projections. In this connection, international efforts are needed to improve the IPCC Guidelines regarding waste disposal.

72. The third deficiency lies in the difficulties encountered in understanding the way projections of forest sinks were prepared. It was felt that further clarification is needed of data relating average growth rates by forest type to biomass increments and data on harvesting used for calculations of sinks. Relevant additional material was provided during the review, but the projections reflect the same deviations from IPCC Guidelines as were noted in chapter II above. As numbers are projected into the future, it becomes even more important to clarify which and how assumptions were made.

73. A major concern was expressed by government officials that if projections were disclosed for individual sectors this could be interpreted as official commitments for which the Government of Japan would have overall responsibility. The team, however, stressed the fact that projections are by definition preliminary and a mere outlook rather than sectoral targets. Furthermore, emission projections serve as a parameter against which progress can be measured and policy objectives evaluated.

74. The team strongly suggested that basic information be provided as soon as possible on the new relevant measures that were not described in the communication, as well as on their specific mitigation effects. The team also recommended that projections for 2000 be submitted with a breakdown per economic sector in the next communication, in accordance with the reporting guidelines.

## V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

75. Japan's GHG projections are based on gas-by-gas national targets and centred on CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. Japan's *Long-Term Energy Supply and Demand Outlook*, revised in 1994, was instrumental in deriving GHG projections and in understanding assumptions made in the estimation of activity data in 2000. However, a review of key data points was not possible since major activity data for 2000, for example the number of transport vehicles by mode, estimated steel production, estimated value added levels, and projected floor space, were not available during the review period.

76. The revised 1994 energy outlook sets the goal of securing a stable energy supply and sharing responsibility for the prevention of global warming. Final energy consumption is expected to increase annually by 1.2 per cent from 1990 to 2000, although in the past ten years energy demand has increased by 4.2 per cent annually in the residential and commercial sector and 3.7 per cent in the transportation sector. Nuclear power and natural gas are expected to play a greater role in total primary energy supply in 2000, each increasing its share in that supply from 10 to 12 per cent. The share of oil is projected to decline from the current 58 per cent to 53 per cent in 2000 and 50 per cent in 2010. Total CO<sub>2</sub> emissions are expected to increase by 2.3 per cent between 1990 and 2000, while per capita CO<sub>2</sub> emissions remain stable at 9.5 tonnes (or 2.6 tonnes of carbon per capita). These projections postulate achievement of the CO<sub>2</sub> per capita stabilization target. Energy demand increased in 1992-1994 at rates higher than estimated (as confirmed in the recent GHG inventory data). Furthermore, the economy grew by 0.1 per cent in 1993, 0.5 per cent in 1994 and, according to OECD estimates, about 0.3 per cent in 1995. These growth rates differ significantly from expectations in the energy outlook. According to recent OECD reports, Japan's macroeconomic targets have been revised, but this information was not available during the period of this review.

77. According to the additional CO<sub>2</sub> inventory data for fiscal years 1991 to 1993 provided to the team, CO<sub>2</sub> emission levels have increased in the residential, transportation, industrial processes and waste sectors and decreased in industrial fuel combustion, primarily due to the scanty growth in 1993. Preliminary data for fiscal year 1994 show an increase in CO<sub>2</sub> emissions as economic activity picked up slightly. Another reason lies in the fact that Japan experienced a particularly hot summer, which triggered increased oil burning to meet peak electricity demand. For CH<sub>4</sub> and N<sub>2</sub>O, preliminary inventory data for fiscal years 1991 and 1992 show that emission levels were virtually stable when compared to 1990 levels, with the exception of N<sub>2</sub>O emissions from transportation.

78. Since projections were not provided for individual sectors, the assessment of the effectiveness of measures has not been possible. It is unclear how much is expected from individual measures in terms of GHG emission reductions. As a result, although the communication assumes that measures it describes will be fully implemented by 2000, it is not possible to verify progress in the implementation of most measures.

## **VI. EXPECTED IMPACTS OF CLIMATE CHANGE**

79. The INC guidelines indicate that national communications should review briefly the expected impacts of climate change for the Party concerned and outline the actions taken to implement Article 4.1(b) and (e) with regard to adaptation" (see A/AC.237/55, decision 9/2, annex). Neither of these is provided in the communication. During the review, government experts provided a copy of a report on impacts which contains some of this information. The report is the work of the advisory committee on climate change, which was set up by Japan's Environment Agency and which examined several expected impacts based on IPCC scenarios, including impacts on water resources, agriculture, forests, flora, coastal zones, the energy

sector, urban centres and health. Among the findings was an estimate that the long-term rate of increase in Japan's average annual temperature is 0.9°C per 100 years. The Government, however, indicated that there had not been enough time to arrive at an inter-ministerial consensus on including such material in the first national communication. Indications are that future communications from Japan will contain the requested material.

## **VII. ADAPTATION MEASURES**

80. No adaptation measures are currently being carried out or planned in Japan. However, relevant basic research has been reported, for example, on the analysis of rice genomes and application of gene-recombination technologies in agriculture and on the effects of rising sealevels on barrier islands.

## **VIII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER**

81. The team noted with appreciation the increase in Japan's total official development assistance (ODA), from roughly US\$ 11.4 billion in 1993 to US \$13.4 billion in 1994, a 17.4 per cent increase. As a result, the ratio of ODA to gross national product (GNP) increased from 0.27 per cent in 1993 to 0.29 per cent in 1994, even though that is still lower than the 0.32 per cent recorded in 1991. Japan, however, remains the largest ODA contributor of the OECD Development Assistance Committee countries. Although it is difficult to assess the share of ODA devoted to climate change-related activities, it was noted that global environmental issues are one of the priorities in the country's foreign aid. Japan has contributed US\$ 48 million to the trust fund of the Global Environment Facility (GEF) pilot phase. It has also provided parallel ODA loans to GEF pilot phase projects in Thailand and Morocco. During the review, the team was informed that Japan had contributed roughly US\$ 415 million to the GEF first phase, with no distinction made among the four areas covered by the Facility.

82. Japan has made major efforts to enhance regional cooperation in technology transfer with an emphasis on feasibility studies rather than technology demonstration. The largest programme directly related to GHG mitigation is afforestation, although significant efforts have focused on energy efficiency and renewable energy technologies.

83. Technology cooperation centres on international programmes such as those of the Japan International Cooperation Agency, as well as the Green Aid Plan and the Climate Technology Initiative. These programmes focus on joint research activities, human resource development in developing countries, and demonstration projects for recipients of Japanese aid. The Agency's activities include feasibility studies on energy conservation opportunities in developing countries and on energy supply facilities in countries with economies in transition as a basis for cooperation and future investment. The Green Aid Plan supports cooperative research and training primarily related to air pollution abatement in countries such as China, India, Indonesia, Malaysia, the Philippines and Thailand. In China, a promising project is

introducing desulphurization technology and energy conservation techniques. The Climate Technology Initiative is seen as important particularly for new and renewable energy technology development. The New Earth 21 programme launched in 1990 emphasizes the role of technological breakthroughs as a basis for Japan's international cooperation. In addition, progress was reported on the Japan Fund for Global Environment, established to support activities of non-governmental organizations for global environment preservation. None the less, during the review it was felt that further steps are required beyond training, joint research and feasibility studies to realize the objectives of technology transfer to developing countries.

84. For the second communication, the Government may wish to elaborate on its programmes for developing an inventory of environmentally sound and economically viable technologies as well as activities carried out on climate-related issues by the private sector. It would be very useful to consider related initiatives currently undertaken by other Parties, and discuss possible coordination with Japanese programmes.

## **IX. RESEARCH AND SYSTEMATIC OBSERVATION**

85. Consistent with the requirements of the Convention, and the INC guidelines, the Japanese communication contains a very comprehensive summary of research, monitoring and observation activities. The summary presents an impressive programme of research on scientific issues, impacts and adaptation measures, and technologies being carried out by Japan. The Comprehensive Programme for Global Environment Research, Monitoring and Technology Development includes a variety of projects specifically related to global warming. They include research and information exchange with foreign institutes as part of IPCC activities, and promotion of research focusing on the Asia-Pacific region. Basic research on emission factors is currently being carried out, as well as climate impact assessment including studies on socio-economic impacts.

## **X. EDUCATION, TRAINING AND PUBLIC AWARENESS**

86. Japan has fulfilled the requirements of the Convention in reporting a range of public information and awareness programmes being undertaken both domestically and internationally. A higher level of participation by various sectors of society in the formulation and implementation of ongoing and future measures could be an effective way to enhance the Government's mitigation and sink enhancement efforts. In particular, measures in the transportation, waste management and recycling sectors as well as those related to residential/commercial energy consumption will require a wider public participation to be successful.

87. The first national communication does not explain how public input was included in its preparation, although during the review the team was informed by the Government that the communication had been distributed and comments considered. In view of the apparent lack of

information on emission projections and the status of ongoing measures, there has been some concern as to whether it is possible for the wider public to evaluate the effectiveness of measures currently being implemented.

88. Programmes to improve environmental education and to promote energy conservation, recycling and afforestation are funded largely by the national Government and implemented by local public authorities. Linkages between the public education measures and the sectoral goals such as waste volume reduction are not specifically mentioned in the communication. Future communications would be enhanced by a discussion of the interactions of these policies and measures.

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