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Report of the in-depth review of the national communication of Italy

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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 upon 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 33 national communications from Annex I Parties was prepared (FCCC/CP/1996/12 and Add. 1 and 2).

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 Italy and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary¹

1. The in-depth review of Italy was carried out between November 1996 and February 1997 and included a visit to Rome from 11 to 15 November 1996. The review team included experts from the Islamic Republic of Iran, Colombia and the United Kingdom of Great Britain and Northern Ireland.

2. Italy has fulfilled its reporting commitment under FCCC Articles 4 and 12. During the in-depth review of Italy's first national communication, which was conducted with a high level of transparency, a considerable amount of additional relevant information was shared with the review team, greatly improving the understanding and comparability of information provided with the national communication. Through a series of in-depth discussions between the review team and government officials the overall understanding of several critical points was substantially improved, including recent developments in Italy's economy, its energy programmes and vulnerability to climate change, as well as the way carbon dioxide (CO₂) forest sinks have been estimated and emissions projections prepared.

3. The communication was approved by the Interministerial Committee on Economic Planning (CIPE) chaired by the Minister of Budget and Economic Planning and it largely confirms Italy's commitment to meeting the European Union (EU) target to stabilize carbon dioxide (CO₂) emissions by 2000 at 1990 levels. Italy, however, has avoided establishing its own national target regarding GHG emissions. Italy's general climate policy seeks to meet its part of the EU-wide commitment through burden sharing with other EU members. During the review, it remained unclear whether there is an overall coordination or monitoring mechanism for the implementation of climate change policies and measures described in the communication.

4. Italy is a member of the G-7 group of countries, with a large and buoyant economy and a gross domestic product (GDP) of over \$1,100 billion (the third largest economy within the European Community after Germany and France). Its population has stabilized at the 57 to 58 million mark. Italy comprises three very different regions: the rich north, the intermediate central region and the poorer south. In 1990, Italy's level of energy-related CO₂ emissions per capita was roughly 7.5 tonnes, compared to the EU and OECD averages of 9 and 12 tonnes, respectively. Italy's level is among the lowest within the EU and the lowest among G-7 countries. Italy also has a per capita energy consumption which is lower than the EU average and a relatively low level of energy-related CO₂ emissions per unit of GDP when compared with other European economies.

¹ In accordance with decision 2/CP.1 of the Conference of the Parties, the full draft of this report was communicated to the Government of Italy, which had no further comments.

5. Italy is heavily dependent on fossil fuels -- which account for 90 per cent of primary energy needs -- and also very dependent on imports, as over three quarters of primary energy, including oil, coal, natural gas and electricity, is currently imported. During the 1990s, while the share of other energy sources in Italy's energy balance has remained about constant, natural gas has filled an increasing share of energy needs. This trend is likely to continue up to (at least) 2000, and additional gas supplies will come to match any increase in domestic demand. By 2000, natural gas should account for roughly one third of Italy's primary energy requirements, with consequent positive effects on total CO₂ emissions as final consumption of other more carbon-intensive fossil fuels is reduced.

6. Italy's first communication under FCCC is largely based on the National Programme for the Limitation of CO₂ Emissions approved in February 1994 and on the 1988 national energy plan. The energy plan has been implemented through specific legislation, in particular Laws 9 and 10 of 1991. There have been partial reviews of the plan since its enactment, but no actual formulation of new energy policies. As Italy's latest national energy plan it has so far proved to be a resilient instrument for managing national energy supply. While it will remain relevant up to 2000, a fresh set of decisions affecting Italy's energy policies may be expected into the new century -- especially if the privatization programme of ENI (Italy's national oil and natural gas board) and ENEL (national electricity board) is implemented as planned and a national energy authority is established as expected in 1997. This process has been driven by the deliberate decision to involve greater private participation in the energy sector, as well as to ensure consistency with a EU decision which calls for deregulation in national energy markets.

7. The review team considered the Italian greenhouse gas (GHG) inventory to be substantially complete for the main direct and indirect greenhouse gases, subject to the observations made in chapter II below. Omissions identified by the review team include CO₂ emissions from land-use change, CO₂ from incineration of carbon in waste, N₂O from the manufacture of inorganic chemicals and N₂O from animal wastes. The methodology used is mainly the CORINAIR² default methodology, although in some cases procedures were developed to reflect national conditions. There has so far been relatively little basic research on inventories and there is a need for some extra work on activity data, for example, in land-use change statistics. The remaining gaps should be filled as soon as possible and it is strongly recommended that a technical report be produced separately from the next national communication and be kept updated annually using the full Intergovernmental Panel on Climate Change (IPCC) minimum data tables. The inventory is fairly transparent for most energy-related emissions, though cross-referencing between activity data and emission factors is less easy than it would have been if the IPCC standard data tables had been completed.

² CORINAIR is the component dealing with air emissions inventories of the European Community's CORINE programme (Coordinated Information System on the State of Natural Resources and the Environment).

Transparency for the more complex areas could be improved by providing the suggested technical report on inventories. The estimated CO₂ uptake rate in Italian forests of about 5 per cent appeared to be too high, especially since the review team was told that estimates include mature forests, coppice and Mediterranean scrub. The in-depth review proved to be a useful exercise to review estimates of the national CO₂ sink capacity.

8. Preliminary CORINAIR emission inventories for 1991-1994 were provided during the review. Although these are still subject to change, more reliable energy-related CO₂ emissions have also been estimated using the top-down approach suggested by IPCC. Emissions of CO₂ were marginally lower in 1993 than in 1990, primarily because of the recession combined with the effects of fuel switching. Based on the new CORINAIR data, however, CO₂ emissions were 0.4 per cent higher in 1994 than in 1990. If these new estimates are confirmed, higher emissions, despite the increased use of natural gas, would most probably be due to a sharp increase in emissions in the transport sector and higher overall energy consumption as economic growth resumed in 1994³.

9. Italy has reported on an array of policies, measures and directives which should ultimately limit the growth of GHG emissions in the decade. These policies contain mostly "no-regrets" measures, which could be subdivided into "supply-side" and "demand-side" ones. However, most of the laws and directives discussed are either very general (with no direct fiscal or other economic incentives attached to them) or seriously under-funded, hindering the achievement of their initial objectives and potential mitigation effects. Nevertheless, Italy's array of policies and measures will eventually have an impact on the mitigation of GHG emissions -- albeit not as widespread as expected. Italy does not have a strong and concerted national action plan to mitigate climate change. At this stage, it could be said that the main thrust of Italy's policy for mitigating GHG emissions lies in the future replacement of solid and liquid fuels by natural gas and the expected improvement in energy efficiency resulting from this shift.

10. Laws 9 and 10 (both of 1991) are the cornerstone of Italy's climate-related energy policies. They constitute the enabling acts for energy supply-side (Law 9) and demand-side (Law 10) policies and the framework within which the Ministry of Industry and Energy formulates specific regulatory measures, tax incentive proposals and other specific measures directed towards the laws' objectives. The transport sector is Italy's perennial weak point. Reducing fuel consumption, with the introduction of effective measures, would have an important effect on GHG emissions, but will be challenging in this sector that emits over a quarter of total CO₂ emissions. Promising new measures were announced to the team as being under formulation. The team recommends that the description of policies and measures

³ Recent estimates prepared according with the simplified IPCC top-down approach indicate that energy-related CO₂ emissions in 1995 were 3.3 per cent higher than in 1990, due to resumed economic growth and reduced hydroelectric production.

be updated in the second communication to account for major developments that have occurred since mid-1994.

11. The CO₂ projections for 2000 were made in the communication using net emission levels, i.e. the estimated sequestration by the forestry sink has been subtracted. This is a deviation from the reporting guidelines adopted in 1994 for Annex I Parties, which stipulate that removals by sinks should be provided separately from emission sources in inventories and projections.

12. The aggregate mitigation effects of approved policies and measures were fed into a simple economic model which calculated that: (a) assuming a business-as-usual (without measures) scenario, Italy's gross CO₂ emissions would increase by 14 per cent in 2000 compared to the 1990 level; (b) if approved "supply-side" policies are fully implemented the increase in such emissions would be of 8.3 per cent and, (c) if in addition "demand-side" measures are also fully implemented, the increase would be further reduced to only 3.4 per cent in the decade. Hence, even in the best case scenario, Italy does not foresee stabilizing CO₂ emissions at their 1990 level by 2000. And as neither the "business-as-usual" nor best case scenarios are expected to come about (but rather some scenario in between), the final increase will end up somewhere between 3.4 and 14 per cent. Moreover, as Italy has no well-defined national GHG emissions target, stabilization of emissions by 2000 is not perceived as a national goal.

13. Substantial additional information was provided to the review team on the methodology used and assumptions made in each projection scenario. The team found that such information greatly improved the understanding of projections of Italy's CO₂ emissions for 2000 and strongly recommends that projections be thoroughly revised in a transparent manner for the second communication, taking into account developments in the energy sector since 1994 as well as CO₂ emissions originating in sectors other than fuel combustion.

14. The expected impacts of climate were estimated using IPCC emission scenarios. The findings suggest that endangered spots include the Po delta and the Venice lagoon. Some land ecosystems are threatened in the long term and coastal freshwater resources might be in danger in the case of further sea-level rise. Finally, desertification might constitute a real threat in the future in parts of the more vulnerable southern regions.

15. Italy has contributed its full share to the Global Environment Facility (GEF), providing approximately US\$ 64 million to the pilot phase and US\$ 105 million to the restructured GEF. As the sixth largest contributor, its contributions to the restructured GEF accounts for five per cent of total pledges. Official development assistance (ODA) as a percentage of GNP has varied in recent years from 0.34 to 0.27 per cent. In absolute terms 1994/1995 ODA was US\$ 2,705 million, having declined over the last few years.

16. There is a significant amount of research on climate change and sources of CO₂ taking place in universities, institutes and research centres in Italy. However, the research being done lacks overall coordination towards the objectives of the FCCC. Very little research into the economic costs of climate change, including the cost of adaptation, has been undertaken. Efforts to increase public awareness of climate change have been very limited and mostly carried out through programmes of the Ministry of Education.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

17. Italy ratified the Convention on 15 April 1994. The secretariat received Italy's first national communication on 4 April 1995. The in-depth review of the national communication was carried out between November 1996 and February 1997, and included a country visit to Rome from 11 to 15 November 1996. The review team consisted of Mr. Morteza Samsam Bakhtiari (Islamic Republic of Iran), Ms. Eunice Ñañez (Colombia), Mr. James Penman (United Kingdom of Great Britain and Northern Ireland), Mr. James Grabert (UNFCCC secretariat) and Mr. Lucas Assunção (UNFCCC secretariat, Coordinator). The team met with the experts of the Ente Nazionale per le Energie Alternative (ENEA) -- who had been in charge of compiling the national communication and organizing the in-depth review visit -- with representatives of several ministries as well as with prominent members of the scientific and academic community and representatives of non-governmental organizations.

18. Italy's first communication under FCCC is largely based on the National Programme for the Limitation of CO₂ Emissions approved in February 1994 and on the 1988 national energy plan. The communication was approved in 1994 by the Interministerial Committee on Economic Planning (CIPE) chaired by the Treasury and it largely confirms Italy's commitment to meeting the European Union (EU) target -- established in October 1990 -- to stabilize carbon dioxide (CO₂) emissions by 2000 at 1990 levels. The Ministry of the Environment is responsible for coordinating climate change policy while the Ministry of Industry and Energy has a supporting role for energy-related measures. ENEA, which is a research institute linked to the Ministry of the Environment and created in 1962 to oversee the implementation of Italy's nuclear industry, is responsible for preparing greenhouse gas (GHG) inventories and projections. During the review, it remained unclear whether there is an overall coordination or monitoring mechanism for the implementation of climate change policies and measures described in the communication.

19. Italy is a member of the G-7 group of countries and is the third largest economy in the EU (after Germany and France). It has faced up to its share of the responsibility for global environmental problems, including by meeting its reporting commitments under FCCC. Italy's population has stabilized at 57 to 58 million inhabitants with no expectation of net growth in the near future. The economy went through a recession from 1990 to 1993 before recovering in 1994 (2 per cent growth), in 1995 (3 per cent growth) and in 1996 (expected 1 per cent growth). The gross domestic product (GDP) reached \$1,163 billion (in current 1990 lire) in 1995.

20. Italy comprises three distinct regions: (a) the rich north, centred on the Po valley (from where most of the country's industrial and agricultural output originates), (b) the intermediate central region centred on the Appenines mountain range, and (c) the poorer south, the so-called "Mezzogiorno", which after half a century of generous subsidies, has not yet caught up with the north. This regional segmentation has had an undeniable bearing on many facets of the country's potentials and economic perspectives.

21. Even though ENEA is to be commended for arranging the submission of additional information by the different ministries and although it chaired all meetings during the review visit, it is clear that interministerial coordination in the implementation of FCCC by Italy still leaves room for improvement.

22. The 1988 national energy plan was implemented through specific legislation, in particular Law 9 (on energy efficiency and renewable energy) and Law 10 (on supply side and fiscal rules for the national energy market). There have been partial reviews of the energy plan since its enactment, but no actual formulation of new energy policies. The review team was told that the adoption of a new updated energy plan would need to wait until the process of privatizing Italy's sizeable national electricity and hydrocarbon utilities (ENEL and ENI) has been fully implemented. This process has been driven by the deliberate decision to involve greater private participation in the energy sector, as well as to ensure consistency with a EU decision which calls for deregulation in national energy markets. To that effect, an independent energy regulating authority one of whose appointed heads, Mr. Sergio Garribba, met with the review team in Rome will be established in early 1997 to make sure that the energy market functions properly. Also during the review, it was announced that an environment agency has been created separately from the Ministry of the Environment, to focus on the control of industrial pollution. These important changes bring into question certain assumptions made in the national communication regarding the implementation of climate-related policies, for example, the elements of Laws 9 and 10 relying on subsidies have not been implemented to anything like the extent originally envisaged.

23. Italy has avoided establishing its own national target regarding GHG emissions. Italy's commitment refers to the EU-wide CO₂ stabilization goal and its general climate policy seeks to meet part of its commitment through burden sharing under a EU arrangement. During this review, however, it remained unclear whether Italy's arguments are accepted by other EU States, given the importance of its economy within the EU. The national communication remains ambiguous as to whether the CO₂ stabilization is a national commitment or only part of a EU bubble. On the other hand, Italy has a per capita energy consumption which is lower than the EU average and a relatively low level of energy-related CO₂ emissions per unit of GDP when compared with other European economies.

24. Italy's arguments for being a beneficiary of burden sharing within the EU are based on a perceived high cost for emissions abatement in the country, primarily because of the current

low energy intensity of the economy, its low reliance on coal, high domestic energy prices and existing infrastructure restrictions for the unlimited expansion in the use of natural gas.

25. The 1995 primary energy mix shows that oil accounts for 60 per cent of total energy needs (and about the same level is expected by 2000), gas for 27 per cent (expanding by 2000), coal for 7 per cent (decreasing by 2000), hydro for 5 per cent and renewable sources of energy for 0.4 per cent. Nuclear power is unlikely to be revived in Italy due to a national referendum in 1987 which banned it in the country.

26. Even though formal interministerial coordination exists regarding the Government's general climate policy, ENEA's apparent difficulty in securing representation from different ministries during the review visit might suggest a need to strengthen interministerial coordination and distribute responsibilities at an intermediate level in working towards the FCCC goal. Many of the assumptions upon which the communication is based seem no longer to apply, primarily owing to structural changes under way in the Italian energy sector and to the fact that funding anticipated for certain measures under enabling legislation has not been forthcoming. Moreover, economic growth in Italy from 1990 to 1995 averaged 1.1 per cent per year (or 5.7 per cent over the 1990-1995 period, in constant 1990 lire), rather than the 2 per cent anticipated in the communication. In this connection, the review team strongly recommended that for the second communication, projections be thoroughly revised as a matter of priority, and the impact of policies be reassessed to take the changing national circumstances into account.

27. Following Italy's 1987 ban on nuclear energy -- which triggered the dismantling of its nuclear industry -- Italy's energy strategy for the 1990s has been solely based on the national energy plan sanctioned in 1988. The team was told that the plan's predictions have proved to be an accurate set of parameters for energy developments in the country. An illustration of this was that the plan projected primary energy supply in 1995 to be 170 million tonnes of oil equivalent (Mtoe), while the actual supply figure remained within a range of minimum error at 171.8 Mtoe. Over the 1990-1995 period, actual primary energy supply grew by 5.4 per cent. The only divergence between plan and execution came as natural gas took the lion's share of growth while solid fuels, which were originally expected to increase as well, remained stagnant (see table). The rising share of natural gas in the Italian energy mix is seen as the main pillar of the national energy strategy and most of the future increase in energy supply will be in the form of imported natural gas. The share of gas in primary energy supply is scheduled to rise from 26 per cent in 1995 to 33 per cent in the year 2000. It is worth noting that in 1995: (a) Italy's dependence on fossil fuels was around 90 per cent of total primary energy needs; (b) roughly 77 per cent of these fuels were being imported, the individual dependence on imports by energy sources being: 90 per cent for petroleum, 64 per cent for natural gas and 91 per cent for solid fuels; and (c) Italy's per capita energy consumption (on primary sources) of 3.0 toe per year was the lowest amongst the G-7 countries. In 1990, Italy's level of energy-related CO₂ emissions per capita was roughly

7.5 tonnes, compared to the EU and OECD averages of 9 and 12 tonnes, respectively. Italy's level is among the lowest within the EU and the lowest among G-7 countries.

Italy's primary energy supply for the years 1990 and 1995, with a forecast for 2000

Resource	1990		1995		2000	
	(actual)		(actual)		(forecast)	
	Mtoe	%	Mtoe	%	Mtoe	%
Solid fuels	15.8	9.7	13.8	8.1	14.5	7.8
Petroleum	92.5	56.8	95.4	55.5	91.8	49.5
Natural gas	39.1	24.0	44.9	26.1	60.6	32.7
Hydro-electric	7.9	4.8	9.5	5.5	11.7	6.3
Renewables	0.3	0.2	0.3	0.2	0.5	0.3
Net electricity imports	7.4	4.5	7.9	4.6	6.3	3.4
Total	163.0	100.0	171.8	100.0	185.4	100.0
Final consumption	120.5		127.5		137.0	

28. As far as energy supply predictions for the 21st century are concerned, Italian petroleum companies have made some very preliminary forecasts (193.9 Mtoe in 2005 and 201.2 Mtoe in 2010), but given the uncertainties the review team took the view that for the first decade of the new century Italy would probably need a fresh energy plan -- especially bearing in mind that major state-owned energy and power companies such as ENI and ENEL are bound to be fully privatized. (ENI's second offering of shares in 1996 was very successful and ENEL's first sale is scheduled for 1997). Moreover, a national energy authority will be set up in 1997 to regulate Italy's privatized energy sector. Although it is doubtful that this privatization programme will radically alter the Italian energy balance, it is sure that these fundamental changes will leave their mark on future energy policies and consequently on Italy's GHG emission profile.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

29. Italy's communication provided 1990 inventory data for CO₂, methane (CH₄), nitrous oxide (N₂O), carbon monoxide (CO), nitrogen oxides (NO_x), and non-methane volatile organic compounds (NMVOC). Italy has relied on the CORINAIR methodology for most of these inventory estimates. The CORINAIR source categories have been mapped on to the

IPCC summary report, but neither the required IPCC standard data tables nor any supporting information have been provided. Italy has, however, reported both the methodology used for the mapping and the emissions levels by CORINAIR source categories, which provide more detail than the IPCC standard data tables. ENEA representatives referred to the detailed CORINAIR tables during the meeting and used them effectively to answer detailed questions raised by the review team. The CITEPA⁴ conversion software had been found too difficult to use in Italy in translating between CORINAIR and IPCC source categories. The CORINAIR 1994 inventory procedure will in future automatically provide data on the IPCC basis.

30. Since the default CORINAIR methodology is being used, ENEA has not seen the need to produce a separate detailed technical document. However, some IPCC source categories (such as land-use change, forestry, landfills and waste water treatment) are not estimated in CORINAIR, and for some CORINAIR categories, such as methane emissions from gas distribution and GHG emissions from agriculture, national emission factors and methodologies are being used. Methods reflecting national circumstances are able to improve emissions estimates, but do need full documentation if they are to be understood and used by the international community to improve inventory calculation procedures. The review team found that these are good reasons for Italy to produce a separate technical report on emissions estimation with the next communication. This report could also provide IPCC standard data tables, as required in the reporting guidelines. Italy should also start to provide annually to the FCCC secretariat the updated inventory data in conformity with decision 3/CP.1 of the Conference of the Parties.

31. In 1990, Italy's gross carbon dioxide emissions were estimated at 432,613 Gg CO₂. The largest share of these emissions came from the energy and transformation sector (32 per cent), followed by transport (22 per cent), industry (21 per cent) and the residential/commercial sector (16 per cent). There is a relatively low level of uncertainty on CO₂ emission estimates thanks to the reliable statistic data available on fuel use and emission factors. The communication provides historical inventory data from 1988 to 1993 for CO₂ from energy only, using the IPCC reference top-down approach. The energy-related CO₂ emission level for 1990 differs by about 3.5 per cent between the national inventory estimate and the IPCC reference approach. This divergence is due to different emission factor assumptions and statistical differences. Data for years following 1990 for other gases were not provided in the communication, but the review team was given data for CO₂ and other gases from 1985 to 1992 and 1994 (provisional) using the 11 summary source categories of CORINAIR. Preliminary estimates of gross CO₂ emissions for 1994 amounted to 438,580 Gg CO₂. Comparing with 1990 CORINAIR-based inventories, the provisional 1994 data show CO₂ up 0.4 per cent, CH₄ down 0.8 per cent, N₂O down 3 per cent.

⁴ Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique.

32. Italy has provided a qualitative indication of the reliability of data in the emissions inventory, but has not attempted a quantitative assessment of uncertainty levels. The team was informed that in some cases, such as GHG emission levels from the forest and agricultural sectors, data collection was a major problem since forest and agricultural policy are prerogatives of each Italian region with no central focal point for technical information.

33. Summary data on coverage are provided, but at a lower level of detail than in the IPCC summary tables. Therefore, although the team considered Italy's GHG inventory substantially complete for the gases specified in the 1994 reporting guidelines, completeness cannot be fully assessed from the communication. Omissions identified by the review team include CO₂ emissions from land-use change, CO₂ from incineration of carbon in waste, N₂O from the manufacture of inorganic chemicals and N₂O from animal wastes.

34. The communication gives data on simple energy-related emission factors and energy-related activity data but the two are not cross-referenced as they would have been if the IPCC standard data tables had been completed. This makes the inventory less transparent. The CORINAIR programme for estimating road transport emissions (COPERT) was used to estimate non-CO₂ transport-related emissions. Some extensions to COPERT were made, although these are not described in detail. Providing a technical report on inventories would give an opportunity to do this. Technologically disaggregated calculations of CO₂ from transport were not made; this will not of course affect the overall accuracy of the CO₂ emissions estimate for this sector, but the data, if available, could be of use in assessing transport sector policy options.

35. The communication provides CO₂ projections for 2000 by IPCC source category, but source categories used for the projections are not quite the same as those in the national inventory. This means that the 1990 data corresponding to the projected inventory differ slightly from the 1990 national inventory itself. This results from the fact that those responsible for the communication made two independent assessments of the emission inventory using a national methodology and the standard CORINAIR one. The two estimates generated very similar results with a difference of about 5,000 Gg of CO₂, or less than 1 per cent of total emissions. The review team pointed out, however, that cross-referencing between tables is made somewhat more difficult because of this. The communication also provided projections by IPCC source category for CH₄ and N₂O and these projections are also slightly different from the 1990 national inventory.

36. Emissions from international marine and aviation bunker fuels loaded in Italy are provided separately from other emissions, as required by the 1994 Guidelines. The team was told that this had been relatively straightforward for marine fuel, where separate totals were already known for international bunker fuel loadings. However, a special correction had had to be made for fuel used by domestic aviation, which is given combined with international aviation fuel in the Italian energy statistics. The correction was based on numbers of domestic flights, plus an assumed average domestic flight distance and airline data on flight

fuel consumption, including landing and take-off. Italy is not alone in needing to make calculations of this type. Fuel consumption by military aviation and shipping is not included in the inventory.

37. 1990 emissions of CH₄ amounted to 3,900 Gg, with the bulk (1,860 Gg) coming from the agricultural sector (i.e. enteric fermentation and animal waste) and from landfill wastes (1,530 Gg). Estimated leaks from the natural gas pipeline network (for which a breakdown was presented) amounted to 200 Gg per year, half of which originates from the old residential (low-pressure) network that is being gradually replaced with steel pipes.

38. N₂O emissions were estimated at 120 Gg with roughly half coming from the use of fertilizers in the agricultural sector. As the use of nitrogen fertilizers is levelling out in Italy (consumption of 879,000 tonnes both in 1990 and 1994), N₂O emissions are likely remain stable.

39. 1990 emissions of carbon tetrafluoride (CF₄) and hexafluoroethylene (C₂F₆) from the aluminium industry were estimated at 14 and 1.4 tonnes respectively. As the production of aluminium in Italy is falling gradually (from 232,000 tonnes in 1990 to roughly 190,000 tonnes in 1995), emissions of carbon fluorides should diminish accordingly. Plans for further aluminium output reduction should, if implemented, yield national production levels of 160,000 and 120,000 tonnes in 2000 and 2005 respectively, and thus further reduce fluoride emissions. Specific measures to reduce emissions through control of anode effects were not discussed. Emissions estimates were also provided for hydrofluorocarbons (HFCs⁵), but not for sulphur hexafluoride (SF₆), the reasons given being lack of data on end-uses and (by analogy with European arrangements for reporting production data under the Montreal Protocol on Substances that Deplete the Ozone Layer) commercial confidentiality. However, as pointed out by the review team, Montreal Protocol arrangements do not actually apply to SF₆, and the new IPCC methodology should be used in future to provide emissions estimates.

Land-use change and forestry

40. The University of Florence, under contract to the Ministry of Agriculture and Forestry, has estimated the carbon reservoir in forests to be 268,000 Gg of C. The communication estimates an annual accumulation of 50,800 Gg of CO₂ (equivalent to 13,800 Gg of C), which was reduced to 40,400 Gg of CO₂ in the inventory to account for the estimated annual forest harvest. The estimated CO₂ uptake rate is therefore about 5 per cent of the existing carbon in standing biomass, which seems high, especially since the review team was told that estimates include mature forests, coppice and Mediterranean scrub. The conversion of Mediterranean scrub into woodland may help account for the apparently high accumulation ratio of standing biomass. However, the team questioned the differentiation between "coppice

⁵ HFC emissions in Italy are negligible.

forests" and "mature forests" --- with the former accounting for roughly 58 per cent of woody mass in Italian forests and the latter for 42 per cent . It seems unlikely that "coppice forests" fix around 5 per cent of carbon as in mature forests. Additional data presented during the review indicated that Italian forests covered an area of 6.8 million ha and that programmes for replanting some 141,000 ha of forest per year were well under way.

41. The communication indicates that European agricultural set-aside regulations may lead to an additional 10,000 Gg CO₂ per year (2,800 Gg C per year) of carbon accumulation in expanded forest area by 2000. This is reflected in the projections for 2000. This also seems high relative to the increase in forested area reported in the forestry statistics, which is about 17,000 ha per year. Supplementary data provided to the team during the review suggested that EU regulations on forest management might lead to a further 8,000 to 14,000 Gg CO₂ accumulation over 15 years, an average of 1 to 1.8 tonnes of carbon per hectare per year, though the impact on the carbon sink by 2000 was thought to be insignificant.

42. Italy has good forestry statistics and an excellent forestry inventory for 1985 published by the Ministry of Agriculture and Forestry. Also, several academic papers have been published on the accumulation of carbon in forests. Nevertheless the review team found it difficult to review the sink estimates without a single systematic account of the assumptions and calculation procedures used to obtain the estimates given in the communication. Therefore, it would be useful to provide full technical details of the calculations involved and to report the emissions using the IPCC standard data tables. Italian officials recognized the need for a technical account of the forest sink estimate, and a report from the University of Padua has been commissioned in this area. The technical account could be incorporated into an annual technical report on the inventory.

43. Estimates of CO₂ emissions from land-use change have not been made, because the land-use change data are unavailable. Regional coordination is a problem here and procedures to rectify this need to be established. The team strongly recommends that the IPCC reporting tables (and default methodology) be used in revising Italy's sink capacity in the next communication.

III. POLICIES AND MEASURES

44. Italy has no concerted national action plan to mitigate climate change and has not yet defined a national target for CO₂ or any other greenhouse gas emissions. However, in response to the EU Ministerial decision of October 1990, the Interministerial Committee on Economic Planning (chaired by the Treasury) approved in February 1994 a national programme for the limitation of CO₂ emissions at 1990 levels by the end of the decade. This programme enlists measures already envisaged under the 1988 national energy plan and does not introduce any additional measure with an explicit mitigation purpose. With no strict commitment to stabilize emissions at the national level, Italy relies on a range of policies and measures that will, hopefully, limit the expected growth in CO₂ emissions in the decade and

beyond. Only limited additional information was provided during the review on policies and measures described in the national communication. However, during the detailed discussions on how inventories and projections were prepared, the team was informed on how some measures had been implemented and, in some cases, what are the emission reductions expected from their full implementation.

45. It is also relevant to note that, in its efforts to prepare for the EU monetary union, the Italian Government has made large budget cuts in recent years in order to reduce the public deficit. Such austerity measures may continue to impair the implementation of some of the policies and measures described in the communication, especially those related to Law 10 of 1991. The team recommends that the description of policies and measures be updated in the second communication to account for some major developments that have occurred since mid-1994.

46. Laws 9 and 10 (both of 1991) are the cornerstone of Italy's climate-related energy policies. They constitute the enabling acts for energy supply-side (Law 9) and demand-side (Law 10) policies and the framework within which the Ministry of Industry and Energy formulates specific regulatory measures, tax incentive proposals and other specific measures directed towards the laws' objectives. The two laws do not fix specific targets, nor do they include direct funding commitments. Rather, they call upon ministries to take action and allocate funds for specific measures related to their areas. It is extremely difficult to obtain a clear assessment of the extent to which Laws 9 and 10 and their related subsidiary legislation have been implemented. A logical proxy suggested during the review has been a comparison of anticipated versus actual expenditure.

47. Italy regards Law 9 as well advanced in its implementation and expects it to lead to an estimated reduction of 23,000 Gg CO₂ in 2000. This has been achieved by requiring ENEL to buy electricity from renewables-fuelled and cogeneration plants at a specified price (180 lire per kWh for wind and 110 lire per kWh for combined heat and power (CHP)) over a specified period (eight years) during which it is assumed that the capital cost will be recovered. After eight years, the price falls to 80 lire per kWh, which is ENEL's avoided cost. This scheme is financed partly by ENEL, which pays the avoided cost, and partly by a general fixed tariff of 3 lire per kWh that all customers must pay. Under resolution 6 (1992) of the Interministerial Committee on Economic Planning (CIPE 6), about 3000 MW of such plants were already contracted and options are being sought for a further 3000 MW. CIPE 6 under Law 9 also allows for the construction of combined cycle gas turbine plants by setting concessional prices to ENEL. Finally, Law 9 directives are responsible for an increasing consumption of natural gas in the residential sector, as it is taxed 45 per cent less than heating oil. This is a significant incentive, since oil for domestic heating is extremely heavily taxed in Italy. The national communication does not give emissions reduction estimates for each of the Law 9 components, but the overall emissions reduction looks credible and Law 9 measures seem likely to continue to be effective after 2000. For environmental reasons other than climate change, there has additionally been a practical "ban" on coal in Italy's urban

centres since the early 1990s, with a strong policy option (since 1991) favouring the use of natural gas and CHP.

48. Italy has a tradition of very high energy taxation and electricity tariffs for the domestic sector set a limit to reasonable power consumption at 3 kW, beyond which extra charges are paid. Also the charge per unit of electricity increases on the whole bill for annual consumptions above 1500 kWh, while further steps are taken for higher levels of consumption. These demand-side management measures pre-date the national communication, but are also likely to be effective in reducing emissions.

49. Law 10 and related implementation decrees, on the other hand, provide the framework for energy efficiency measures, focused on grants for energy efficiency and renewables investments, and regulations concerning efficiency standards, labelling and requirements for energy managers and users. The funding of Law 10, however, has been reduced since 1993 to about one tenth of the original 2,500 billion lire. But some elements (those not requiring government subsidies) are in place, notably (a) revised building regulations, (b) mandatory inspection and certification of domestic heating appliances, (c) tax incentives for building to higher thermal standards than the regulations require, and (d) tax incentives for the use of renewable energy in buildings. In industry, four refineries are building integrated gasification combined cycle plants to burn petroleum tar consistent with the Law 10 requirement to make use of industrial residues. No attempt has been made to assess the mitigation effects of such measures. On the other hand, government officials had foreseen the probability of reduced Law 10 funding before the first national communication was finalized, and they explain that for that reason the original estimate that Laws 9 and 10 will together reduce emissions by 23,000 Gg CO₂ by 2000 is still regarded as feasible.

50. The establishment of the new independent energy authority is expected to promote rational energy management and ensure clearer rules for national energy (demand and supply) markets in line with the objectives of the 1988 national energy plan. The creation of the authority inaugurates the construction of Italy's future energy market, in which tariffs should internalize environmental costs and address equity aspects of extreme complexity in the country. It also introduces some uncertainty over the future of both the domestic electricity tariff and the arrangements for supporting investment in renewable energy and CHP plants. The review team, in an interview with one of the appointed heads of the authority, was told that there was no intention to introduce changes in this regard in the next few years and that the authority would take environmental matters into account as a matter of principle when deliberating on Italy's energy tariff structure. The team noted that both measures are crucial to Italy's GHG emission limitation strategy, and the effect that any relaxation would have on emissions needs assessing.

51. Last but not least on the supply side is the growing role to be played by natural gas on the Italian energy scene. Italy is determined to increase the share of gas in its energy balance from the present 26 per cent to around 33 per cent in the year 2000 or, in other words, from

the present 54.4 billion cubic metres to 72-75 billion cubic metres in 2000. In order to achieve this, Italy has already finalized a number of fresh supply deals, for example with Algeria (4 billion cubic metres of liquified natural gas (LNG) and 6 billion cubic metres from the second Trans-Med pipeline), with Russia (5.5 billion cubic metres) and with the Netherlands (2 billion cubic metres). Moreover, negotiations are under way for LNG to be purchased from Nigeria (3.5 billion cubic metres), gas from Norway (6 billion cubic metres, via Dunkirk in France) and gas from the Libyan Arab Jamahiriya (3.5 billion cubic metres). Part of these new supplies will go to ENEL, as the company intends to increase its natural gas consumption from the present 6.5 billion to 16 billion cubic metres in 2000. During the review, however, concern was expressed about the current limits on national capacity to import so much more natural gas. If new pipelines and distribution networks are not in place the projected substantial increase in natural gas use might be impeded.

52. The privatization of the twin state-owned energy and electricity monopolies, ENI and ENEL, is projected to lead to higher efficiencies in the oil, natural gas and electricity sectors, and hence to a gradual decline in national CO₂ emissions. The subsequent creation of a national energy authority (foreseen for early 1997, operating independently under the aegis of the Italian parliament) to regulate the domestic electricity market would further add to the efficient operation of the national gas and power utilities. There is an emerging consensus that ENEL and ENI have fulfilled their original missions and that the market should gradually take a greater role. Unbundling of the electricity production, transmission and distribution of ENEL is expected by 1997. On the other hand, ENI -- which controls 45 per cent of the oil market and roughly 97 per cent of the natural gas market through SNAM -- has since 1993 published its balance sheet as a first step towards greater transparency and competition in the oil and gas markets. These privatization processes are expected to lead to greater energy efficiency and gradual internalization of environmental costs.

53. The main measures in the transport sector are the building of high-speed rail links, extension of Alpine road and rail tunnels (rather than passes), building of urban metro/light rail systems in 13 urban areas, urban traffic management and reduced taxation on compressed natural gas and liquified petroleum gas as fuel. The total number of passenger-kilometres (in all modes) increased by about 17 per cent over the past five years, and is expected to increase at about 2 per cent per year over the next five years. This growth is a function of the improvement of consumption patterns of the population, the increase in commuting distances in dense urban centres and Italy's perennial dependence on road transport with the rest of Europe. With the full implementation of proposed measures in the transport sector, plus the recent EU decision on car fuel efficiency of 5 litres per 100 km, CO₂ emissions from passenger transport might only stabilize by 2010. This estimate incorporates the best available assessment about the effect of different measures and their interactions.

54. Diesel penetration is also likely to increase from the present roughly 10 per cent, provided the present tax structure is maintained. Vehicle road tax increases linearly with engine size. Fuel taxes are high, which has led to the production of more fuel-efficient cars

but has not been enough to constrain demand. Cities are now required to make traffic management plans, and access by cars to city centres may be restricted. Parking has traditionally been free in city centres, but parking fees have recently been introduced into parts of Rome, which has led to a significant increase in the use of public transport. There have been no new initiatives on urban planning restrictions as a way to regulate decentralization/suburbanization.

55. Improved waste management measures were first introduced in Italy in 1982 through Decree 915 and Law 10 of 1991 introduced incentives for the conversion of waste into energy. Decree 915 promotes better solid urban waste disposal and differentiated waste collection. Subsequent agreements between the Ministry of the Environment and regional authorities forced all existing waste landfills to have devices to capture CH₄ emissions for energy purposes. The Government expects to reduce dependence on landfilling of waste from 90 per cent in 1990 to 42 per cent by 2000. It is projected that total CH₄ emissions from the waste sector could be reduced by 6 per cent in the decade.

56. All in all, the array of policies and measures described which might mitigate the growth of CO₂ emissions -- although quite impressive as originally envisaged -- might well fall short of its ambitious goals because of pressing budgetary restrictions. In this respect, the review team noted that: (a) some of the policies and measures introduced in Italy remain general legislative acts with little funding or directives to enforce implementation, and no incentives for compliance; (b) funds allocated to various laws (especially to Law 10) were later drastically reduced, thereby reducing their potential effects; (c) the eventual impact of measures adopted was sometimes slightly overestimated; (d) nevertheless, the package of policies and measures set up by Italy in the early 1990s was a useful step in the right direction, and even though their full weight might not be felt by 2000, they will nonetheless have an undeniable impact on the mitigation of future CO₂ emissions.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

57. The GHG emission projections were explained to the review team in a transparent manner. Plausible assumptions are made for key variables such as the international price of oil and the forecast rate of growth for the European economy. Projections were prepared for energy-related CO₂ emissions only and in consistency with the most recent national energy plan approved in 1988. Starting from Italian energy consumption levels in 1990, ENEA reproduced the results of the 1988 energy plan which originally projected total primary energy supply (TPES) to be between 180 and 188 Mtoe in 2000. This range included the possible effects of energy savings measures envisaged in the energy plan, as well as a forecast of 3 per cent annual GDP growth in the 1990s (and an assumed oil price of US\$ 30 a barrel by 2000).

58. The methodology used to project total energy needs in 2000 and the resulting CO₂ emissions was based on a simple economic model which took into account the fact that Italy

has a very high tax level on oil products at the consumer level. Consequently, the significance of the world oil price in the estimation of future domestic energy demand is lessened. Major devaluations of the lira in 1991 and 1994 made the comparison of GDP figures (in nominal terms) in the 1990s very difficult. In constant 1990 values, GDP grew by only 5.7 per cent from 1990 to 1995 (roughly 1.1 per cent a year)⁶. The projections assumed an annual 2.1 per cent growth in GDP from 1995 through 2000, a figure considered during this review to be too high by ENEA officials. Energy projections beyond 2000 are very difficult to provide in light of the forthcoming structural changes in Italy's energy sector, with the deregulation of electricity production and the privatization of ENI and ENEL.

59. The baseline 1990 figure used in projections of CO₂ emissions in 2000 was derived from a top-down estimate prepared by the Ministry of Industry and Energy, rather than the 1990 total reported in the (CORINAIR-based) national GHG inventories. The business as usual scenario (without measures) projected total (gross) emissions of 486,110 Gg of CO₂ by 2000, an increase of 14 per cent over the 1990 level. The communication reported two alternative scenarios which included the effects of current and/or planned measures. Based on the model mentioned above, scenario 2A projected a TPES level of 186 Mtoe in 2000 and the implementation of a few measures/interventions in the supply side of the energy sector. Scenario 2B assumes the full implementation of scenario 2A measures, as well as a TPES of 179 Mtoe by 2000, as a consequence of measures to be implemented or under implementation in the demand side of the energy sector, namely in the industrial, residential, commercial and transport sectors. During the review, it was disclosed that measures in place in industrial sectors are not expected to result in any significant emission reductions and that funding for the pursuit of Law 10 objectives has decreased substantially since 1993, as a result of major government budget cuts.

60. Substantial additional information was provided to the review team on the methodology used and assumptions made in scenarios 2A and 2B. The team found that such information greatly improved the understanding of projections of Italy's CO₂ emissions for 2000 and recommends that projections be revised in a transparent manner for the second communication, taking into account major developments in the energy sector since 1994 as well as CO₂ emissions originating in sectors other than fuel combustion.

61. Given the high uncertainty associated with estimates of the annual CO₂ uptake by Italian forests (as discussed in chapter II above) and the fact that, as requested in the reporting guidelines, official projections for CO₂ should be based exclusively on gross emission levels, estimates for scenarios 2A and 2B were revised during the review. Using the 1990 gross CO₂ emission total derived from the energy plan (427,446 Gg) and the projected gross emissions in scenario 2A (463,000 Gg), Italy's CO₂ emission total will be

⁶ In constant 1990 values, GDP grew by 1.1 per cent in 1991, 0.5 per cent in 1992, minus 1.2 per cent in 1993, 2.1 per cent in 1994 and 3 per cent in 1995. At the time of this review, GDP in 1996 was forecast to grow by only 1 per cent.

8.3 per cent higher in 2000 compared with 1990. Scenario 2B (442,000 Gg by 2000) projects a growth of 3.4 per cent in total gross CO₂ emissions by 2000.

62. Projections were also provided for CH₄ taking into account measures being implemented in the waste sector. Total CH₄ emissions in 2000 are expected to be roughly 6 per cent lower than the 1990 levels as a consequence of increased CH₄ removal from landfills for energy purposes and a probable reduction in total waste disposed of in landfills.

63. Projections for nitrous oxide forecast a decrease of 3.5 per cent in N₂O emissions by 2000 compared to 1990 levels. This decrease is the result of the implementation of a "no-regrets" measure to reduce nitrate pollution of water streams in agricultural areas by cutting down the use of nitrogenous fertilizers. The measure involves providing advice to farmers on good management of fertilizer application, consistent with the relevant EU directive number 91/676.

64. The methodology used in preparing current GHG projections in Italy has been published by ENEA. CO₂ projections rely on point elasticities assessed from historical data using GDP and oil price as independent variables, although devaluations and the level of domestic energy taxation have, in practice, made this system difficult to apply. The GDP elasticity is taken as one. The procedure has a term for energy intensity but this is kept at unity in the existing projections (i.e. the economic structure and energy efficiency of technologies are assumed constant or mutually compensating). At first sight, these assumptions may have led to an overestimation of emissions in the base case, although the process of reconciliation with the projections in the 1988 energy plan complicates the matter. Projected gross emissions are 14 per cent higher in 2000 than in 1990 with business as usual, and between 3.4 and 8.3 per cent higher depending on the degree of implementation of laws 9 and 10.

65. For the next communication, an effort should be made to assess more thoroughly the effects of individual measures. For example, it was possible during the review to quantify the reduction foreseen for the impact of measures in the transport sector, if fully implemented, at approximately 8,500 Gg CO₂.

V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

66. With the recovery in economic activity since 1994, there was a 4 per cent increase in final energy consumption from 1994 to 1995, with a sharp increase in energy-related CO₂ emissions. Though still subject to change, preliminary CORINAIR-based estimates for 1994 CO₂ emissions show an increase of 0.4 per cent over the 1990 level. Recent estimates prepared according with the simplified IPCC top-down approach indicate that energy-related CO₂ emissions in 1995 were 3.3 per cent higher than in 1990, due to resumed economic growth and reduced hydroelectric production.

67. Italy has no well-defined target for the year 2000, but rather a set of policies and measures that are expected to result in the mitigation of GHG emissions. Italy's energy policy for the remainder of the decade envisages a roughly constant share of most major primary energy sources in the energy balance, except for natural gas, the supply of which is expected to increase considerably. Total primary energy supply is expected to rise by a yearly average of 1.4 per cent between 1995 and 2000, from a total of 171.8 to 185.4 Mtoe. Over this period, petroleum is expected to fall from 55.5 to 49.5 per cent, with natural gas taking the slack and rising from 26 to around 33 per cent. Every Mtoe of natural gas replacing its equivalent in liquid fuels is estimated to lead to a net CO₂ emission saving of around 700 Gg; and in the case of solid fuels a saving of roughly 1,700 Gg per Mtoe replaced. In this sense, it could be said that the main thrust of Italy's policy for mitigating GHG emissions lies in the future replacement of solid and liquid fuels by natural gas and the expected improvement in energy efficiency resulting from this shift.

VI. EXPECTED IMPACTS OF CLIMATE CHANGE AND ADAPTATION

68. The national communication contained a detailed assessment of possible impacts of climate change on Italy. The assessment was largely based on emission scenarios developed by the IPCC, and general circulation models (GCMs) were used to evaluate the expected impacts of climate change in the different regions of the country. The findings show the major impacts of climate change to be sea-level rise, increasing average temperatures, lower precipitation levels in the summer throughout Italy, and a possible increase of precipitation in northern Italy in the winter. These impacts are expected to have negative effects on several of Italy's ecosystems, and on various sectors of society and the economy.

69. Even though there have been no systematic studies of the impacts of climate change on Italy's territory, the main effects are thought likely to be increased desertification and water shortage in the south, and an increased likelihood of flooding in the north, especially in areas prone to subsidence, such as the Venice lagoon. The north would probably be more vulnerable to extreme events. Rising temperature and changing levels of precipitation may lead to increased degradation of soil and water resources, resulting in substantial impacts on agriculture, hydraulic works, energy production and human settlements, including possible health effects such as an increase in the incidence of malaria. Marginal relict Alpine ecosystems in the Apennines would also be vulnerable to climate change. Alpine glaciers are retreating, with a strongly negative mass balance in the 1980s, although in recent years this trend was reduced slightly, following increased precipitation.

70. The team was informed that, despite efforts to make a thorough assessment of the impacts of climate change, the assessment provided was limited because of the lack of national-level coordination of research in this area. Although there still appears to be no plan for coordination of research, in order to further assess the possible impacts, the Ministry of Environment has commissioned a group of researchers at Columbia University in New York to undertake an in-depth study of climate change impacts on Italy.

71. Italy has also used a number of GCM models (namely, the Hadley Centre model for South Europe, the MPI and NCAR models) to simulate climate change impacts on southern Europe. These simulations have shown that Italy would not fare worse than its southern European neighbours. However, with some 7,500 km of coastline (of which 3,250 km are beaches) Italy is particularly vulnerable to climate change, especially its coastal supplies of fresh water, with some coastal aquifers such as those near Ravenna having already been contaminated.

72. The predicament of the Po delta and the Venice lagoon was extensively discussed during the review, but the team felt that the question of the Po river floodings and the possible melting of glaciers in northern Italy had not been given the exposure they deserved. The south of the country could still turn out to be the most vulnerable region to global climate change because of the serious threat of Mediterranean desertification. It was hinted during the review that this process could have already begun and brought about signs of potential desertification in the south.

73. Although mention was made of the areas where adaptation measures would be necessary, no such measures are being implemented or planned in Italy. The only exception concerns the Venice lagoon. The first law on the protection of the lagoon dates back to 1973 and since then extensive research work has been carried out on its predicament. In the meantime, the local urban population has halved. But it is still doubtful whether in the long term this unique city can be saved from the floods.

VII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

74. In accordance with Article 4.5 of the Convention, Italy contributed 105 billion lire (approximately US\$ 64 million) to the pilot phase of the Global Environment Facility (GEF) and subsequently another 159 billion lire (roughly US\$ 105 million) to the GEF first phase. The contributions represent approximately 5 per cent of total pledges to the restructured GEF, making Italy the sixth largest contributor to the facility.

75. The level of net disbursements by Italy as contributions to multilateral institutions decreased by 34 per cent from 1992 to 1993, as reported in the communication. The team noted with appreciation the effort made in the communication to provide a breakdown of such contributions by the various organizations and funds. The ratio of overall official development assistance (ODA) to GNP was 0.31 in 1990 and 0.34 in 1992, declining to 0.27 in 1994. ENEA officials have promised to submit updated ODA figures for 1995 and 1996 with the second national communication.

76. The team was made aware of difficulties encountered in the coordination of data collection in Italy and in the assessment of official aid flows towards climate change-related activities. Despite these difficulties, efforts are being made to improve the information to be provided in the next communication.

77. In the field of cooperation and technology transfer, Italy has financed a solar power project in Crete and through its support of European Union programmes has provided assistance to Central and Eastern European energy sectors. Furthermore, attempts to gather information on technology transfer in the private sector, specifically by closer cooperation with industry associations were also highlighted.

Activities Implemented Jointly (AIJ)

78. Italy has participated actively in the intergovernmental negotiations on the creation of a joint implementation mechanism under FCCC. The Italian Government strongly believes that AIJ projects could result in cost-effective mitigation measures as well as in effective sink enhancement projects. It postulates that the current AIJ mechanism should give consideration to possible Annex I emission stabilisation targets through technology cooperation between Annex I Parties and Parties with economies in transition, as well as with Non-Annex I Parties.

79. Italy has made the first moves in this general direction by providing trust funds for the formulation of future pilot AIJ projects in Belarus and Egypt. Also ENEL participates in "E-7" (a group formed by seven large power companies in the world) and in this capacity Italy is exploring possible power-related AIJ projects in Indonesia, Jordan and Zimbabwe. However, no concrete AIJ projects have yet been signed. The Italian Government is keen to initiate AIJ projects (especially those including technology transfer), but the industrial sector seems less enthusiastic about such initiatives. Approaches by the Ministry of the Environment have so far failed to persuade industrialists to commit themselves to specific joint projects.

VIII. RESEARCH, MONITORING AND SYSTEMATIC OBSERVATION

80. Scientific research on climate change and sources of CO₂ emissions in Italy is being carried out by government experts and scientists at the ENEA and the various CNR (National Research Council) research centres and in a number of Italian universities in Rome, Turin, Catania, Naples, Bologna and Florence. Research projects can be broadly grouped under climate modelling, applied research, interaction between the climate and human activities and climate monitoring. These projects, however, seem to lack both a joint objective and overall coordination towards achieving the objectives of the Framework Convention on Climate Change. The review team strongly recommended an overall coordination of such valuable efforts. It noted that only limited work has been done at the national level to address the economic costs of climate change.

81. "Containment of the CO₂ emission level in the atmosphere" is one of the most interesting research projects currently being carried out in Italy. It began in 1992 with a budget from the Ministry of Agriculture and Forestry and some preliminary results show that average atmospheric CO₂ concentrations (measured at the Monte Cimone station) increased from 338.2 parts per million (ppm) in 1981 to 355.6 ppm in 1991, with an average increase

of 1.74 ppm per year. Moreover, the lowest and highest CO₂ concentrations throughout the country's main stations (in the period 1992-1994) were recorded at Udine (332 ppm) and S. Pietro a Grado (380 ppm) respectively. During the review it was mentioned that Italy has one of the oldest records of systematically measured climatic data in the world, stretching back some 300 years. If put to proper use, this unique database could prove invaluable.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

82. Public awareness in Italy about environmental problems is fairly limited and frequently only associated with environmental emergencies. Awareness about climate change and its causes is not significant and is most commonly linked with low-lying countries such as Bangladesh. The team felt that programmes destined to enhance awareness about the country's contribution to the causes of climate change could be launched, especially in the mass media. The main effort to increase public awareness of climate change in Italy is carried out through the Ministry of Education, which promotes the inclusion of the subject in both school and university curricula. A "dictionary of climate change" is under preparation and once published ENEA will be charged with the task of distributing it widely, including to the press and the school system.

83. A brief review of the activities of some Italian environmental non-governmental organizations gave the overall impression that these organizations were not aggressive enough and needed closer ties to their public to be able to seriously foster their auditors' awareness. As an illustration, a survey conducted by one of those organizations among the general public showed surprisingly that only 5 per cent of respondents linked transport to climate change.

84. Some organizations consider, however, that much more could be done, particularly in relation to the transport sector and the promotion of higher energy efficiency standards at the consumer's end. The high potential in Italy for direct action by municipal governments was highlighted.

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