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**Report of the in-depth review of
the first national communication of Turkey**

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a national communication by 1 January 2006. This report reflects the results of the in-depth review of the first national communication of Turkey conducted in accordance with relevant provisions of the Convention.

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I. Introduction and summary

A. Introduction

1. Turkey has been a Party to the Convention since 2004. By its decision 26/CP.7, the Conference of the Parties (COP) decided to amend the list in Annex II to the Convention by deleting the name of Turkey. The same decision invites the Parties to recognize the special circumstances of Turkey, which place Turkey, after becoming a Party, in a situation different from that of other Parties included in Annex I to the Convention (Annex I Parties). Turkey has become a Party to the Kyoto Protocol in August 2009.

2. With the technical support of the United Nations Development Programme (UNDP) and financial support from the Global Environment Facility (GEF), Turkey prepared its first national communication under the Convention (NC1) between August 2005 and December 2006. The secretariat received the NC1 on 20 February 2007. In accordance with decision 7/CP.11, an in-depth review (IDR) was carried out between September 2008 and August 2009, including a visit to Ankara from 20 to 24 October 2008. The IDR was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Christopher Lamport (Austria), Mr. Daniel Martino (Uruguay) and Mr. Hristo Vassilev (Bulgaria). The review was coordinated by Mr. Harald Diaz-Bone and Mr. Vitor Gois Ferreira (UNFCCC secretariat).

3. The expert review team (ERT) had a number of meetings and discussions on all aspects of the climate policy of Turkey as outlined in the NC1. During these meetings with government officials, academics, business and industry non-governmental organizations (NGOs) and environmental NGOs, the team was given a wealth of additional materials and information which supported and updated the information provided in the NC1.

4. During the IDR, the ERT examined each part of the NC1. A draft version of this report was communicated to the Government of Turkey, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Summary

5. The ERT noted that Turkey's NC1 complies in general with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines). The ERT acknowledges that the NC1 provides a comprehensive picture of the implementation of the Convention in Turkey.

1. Completeness

6. The ERT noted that the NC1 covers all sections required by the UNFCCC reporting guidelines. However, a number of reporting elements were not provided (e.g. the total effect of policies and measures (PaMs) and projections for non-energy sectors).

2. Timeliness

7. The NC1 was submitted on 20 February 2007. Decision 4/CP.8 requested Parties to submit their national communications by 1 January 2006.

3. Transparency

8. The ERT acknowledged that Turkey's NC1 is comprehensive and structured following the outline contained in the annex to the UNFCCC reporting guidelines. The NC1 provides comprehensive information on many aspects of implementation of the Convention. In the course of the review, the ERT formulated a number of recommendations that could help the Party to further increase the transparency of its reporting, such as a recommendation to clearly identify the status of PaMs as planned, adopted or implemented, and to include in the 'with measures' scenario only those PaMs that have been implemented and/or adopted.

II. National circumstances relevant to greenhouse gas emissions and removals

9. In its NC1, Turkey has provided a description of its national circumstances, how these national circumstances affect greenhouse gas (GHG) emissions and removals in Turkey, and how national circumstances and changes in national circumstances affect GHG emissions and removals over time. The ERT noted that the list of most important drivers of emission trends in Turkey included demographic developments, overall economic activity, and changes in primary energy use. The ERT noted that Turkey has the lowest per capita primary energy consumption and the lowest per capita GHG emissions, among Annex I Parties (average for 1990–2005). Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

Table 1. Indicators relevant to greenhouse emissions and removals for Turkey

	1990	2005	2006	Change 1990–2006 (%)	Growth rate 1990–2006 (%/year)	Change 2005–2006 (%)
Population (million)	56.20	72.07	72.97	29.84	1.64	1.25
GDP (2000 USD billion using PPP)	309.57	543.67	576.82	86.33	3.97	6.10
TPES (Mtoe)	52.94	85.46	94.00	77.56	3.65	9.99
GDP per capita (2000 USD thousand using PPP)	5.51	7.54	7.90	43.38	2.28	4.77
TPES per capita (toe)	0.94	1.19	1.29	37.23	2.00	8.40
CO ₂ emissions without LULUCF (Tg CO ₂)	139.59	241.88	273.70	96.07	4.3	13.16
GHG emissions without LULUCF (Tg CO ₂ eq)	170.06	296.60	331.76	95.08	4.26	11.85
GHG emissions/removals by LULUCF (Tg CO ₂ eq)	-44.09	-69.49	-76.10	72.60	3.47	9.51
GHG emissions with LULUCF (Tg CO ₂ eq)	125.97	227.11	255.66	102.95	4.52	12.57
CO ₂ emissions per capita (Mg)	2.48	3.36	3.75	51.21	2.62	11.61
CO ₂ emissions per GDP unit (kg CO ₂ per 2000 USD using PPP)	0.45	0.44	0.47	4.44	0.27	6.82
GHG emissions per capita (Mg CO ₂ eq)	3.03	4.12	4.55	50.17	2.57	10.44
GHG emissions per GDP unit (kg CO ₂ eq per 2000 USD using PPP)	0.55	0.55	0.58	5.45	0.33	5.45

Sources: (1) GHG emissions data: Turkey's 2008 GHG inventory submission; (2) Population, GDP and TPES data: 2008 database of the International Energy Agency.

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table

10. **Geography.** Turkey is situated at the meeting point of three continents and stands at the crossroads between Europe and Asia. Turkey is the thirty-fourth largest country in the world with a total land area of 783,562 km², which is classified as agricultural land (35 per cent), forests (27 per cent), pastures and meadows (18 per cent) and other uses (20 per cent). Inland waters cover 1.6 per cent of the country's surface. Turkey has a 8,333 km coastline, most of it suitable for tourism. Mountain ranges run parallel to Turkey's Black Sea and Mediterranean Seacoasts.

11. Turkey is located in the **Mediterranean macroclimate region** that lies between the temperate and subtropical zones at western parts of continents, with widely diverse regional and/or seasonal variations ranging from extremely harsh winters to very hot and dry summers.

12. The country has **indigenous energy resources**, consisting primarily of large deposits of lignite found in almost all regions. Hard coal reserves total 1.3 billion tonnes; mineral oil reserves are estimated at 940 Mt in already explored areas; natural gas reserves are 20.1 billion m³ with recoverable reserves of 14.1 billion m³. The economically recoverable hydropower potential of Turkey is about 130 TWh. There is also great potential for the use of other renewable energy sources (RES) – wind, solar, geothermal and biomass energy.

13. **Demography.** During 1990–2006, the population of Turkey grew from 56.2 to 73.0 million (+29.8 per cent). Almost all of this population growth took place in urban areas, which increased the urbanization rate (i.e. the share of urban population in total population) in Turkey from 52.9 to 62.7 per cent during this period. The ERT noted that this is the highest growth rate in both total and urban populations amongst Annex I Parties. The average population density in Turkey of 184 person/km² doubles in coastal

provinces, where 70 per cent of industrial production units are located. Continuous migration towards coastal urban areas is expected to increase environmental pressures in these areas.

14. **Economy.** During 1990–2007, the gross domestic product (GDP) of Turkey increased by 86.3 per cent. In 2007, Turkey was the fifteenth largest economy in the world. The services sector produced almost two thirds of GDP (63 per cent), followed by industry (28 per cent) and agriculture (9 per cent).

15. Turkey underwent a successful deregulation of economy since 1989. Economic resources have started to be used more efficiently since privatization schemes reduced the influence of the public sector in the markets. The Turkish economy, mainly the private sector, has proved to be competitive in international markets. Economic stability and predictability have been substantially improved since the 2001 economic crisis. Inflation, which has been high, has come down to historic lows and the institutional and regulatory framework has been brought closer to international standards.

16. **Energy.** Over the period 1990–2006, Turkey's demand for energy, particularly electricity, sharply increased at annual rates of 3.7 and 7.2 per cent, respectively. Owing to limited domestic energy resources, the country is highly dependent on energy imports (76.8 per cent in 2006). The most significant change in energy consumption in Turkey was an increase in electricity and natural gas consumption. During 1990–2006, the share of natural gas in the final energy consumption increased from 5.4 to 27.6 per cent, and the share of electricity from 9 to 15 per cent. In 2006, about 25 per cent of electricity was produced from coal, mainly domestic lignite, 45 per cent from natural gas and 25 per cent from renewable sources. Table 2 shows the main energy indicators and fuels.

Table 2. Main energy indicators

	1990 (Mtoe)	2006 (Mtoe)	Change 1990–2006 (%)	Share in 1990 (%)	Share in 2006 (%)
Energy production	25.81	26.33	2.0	-	-
Energy imports	30.04	75.76	152.2	-	-
Energy exports	1.96	6.75	244.4	-	-
Energy sources					
Mineral oil	23.58	31.36	33.0	44.6	33.4
Hard coal	16.91	26.45	56.4	31.9	28.1
Natural gas	2.85	25.97	811.2	5.4	27.6
Hydropower	1.99	3.80	90.9	3.8	4.1
Renewable energy sources	7.61	6.41	-15.8	14.5	7.0
Total primary energy supply	52.94	94.00	77.6	100.0	100.0

Source: 2008 database of the International Energy Agency.

17. **Political structure.** Turkey is a parliamentary democracy. The Turkish Constitution vests legislative power in the Grand National Assembly of Turkey, a one-chamber parliament with 550 members. The President represents the country at the international level and is elected by general vote (public vote) for a five-year period. The Council of Ministers, chaired by the Prime Minister, is responsible for domestic and foreign policy and, together with the President, exercises control of the executive power.

18. **Institutional arrangements.** The Ministry of Environment and Forestry (MoEF) is responsible for, inter alia, the protection and rehabilitation of the environment and forestry, ensuring the most appropriate and efficient use of natural resources, and pollution control. Other ministries and State organizations with responsibilities in the field of climate change include the Ministry of Energy and Natural Resources (MENR), the Ministry of Public Works and Settlement (MoPWS), the Ministry of Agriculture and Rural Affairs (MARA), the Electricity Generation Corporation (EUAS) and the Turkish Electricity Transmission Corporation (TEIAS). Provincial governments have an important role in the implementation of policies and measures.

19. The inter-ministerial **Coordination Board on Climate Change** (CBCC) is responsible for inter-ministerial coordination of climate change related activities. Established in 2001, CBCC has the overall responsibility for the implementation of mitigation and adaptation policies. The Board has a key role in strengthening the dialogue among the different stakeholders involved in the field of climate change. The Party

is planning to further strengthen its institutional arrangements on climate change, including: the establishment of two additional working groups; the establishment of climate change focal points in all institutions represented in the CBCC; and the identification of a single national entity with responsibility for the inventory submission. The ERT recommends that Turkey provide more transparent explanations of the institutional arrangements in its next national communication.

20. In its NC1, Turkey has provided summary information on GHG emission trends for the period 1990–2004. This information is broadly consistent with the Party's 2006 national GHG inventory submission. Recalculations made in the land use, land-use change and forestry (LULUCF) sector since the 2006 submission explain the difference between the emission trends in the national communication and those reported in the 2008 submission. Summary tables, including trend tables for emissions in carbon dioxide equivalent (CO₂ eq) (given in the common reporting format), are provided in an annex to the NC1.

Table 3. Greenhouse gas emissions by sector for Turkey, 1990–2006

	GHG emissions (Tg CO ₂ equivalent)						Change (%)		Shares ^a by sector (%)		
	1990	1995	2000	2004	2005	2006	1990–2006	2005–2006	1990	2004	2006
1. Energy	132.1	160.8	212.5	227.4	241.4	258.2	95.4	6.9	77.7	76.7	77.8
A1. Energy industries	34.1	47.5	77.0	76.4	88.8	90.9	166.2	2.3	20.1	25.8	27.4
A2. Manufacturing industries and construction	37.7	42.2	60.2	68.7	67.5	77.3	104.9	14.6	22.2	23.2	23.3
A3. Transport	26.3	33.3	35.5	41.2	41.3	44.4	68.9	7.5	15.5	13.9	13.4
A4–5. Other	32.5	36.4	38.2	39.9	42.4	44.0	35.3	3.9	19.1	13.4	13.3
B. Fugitive emissions	1.4	1.4	1.6	1.2	1.5	1.6	13.0	9.0	0.8	0.4	0.5
2. Industrial processes	13.1	21.6	22.2	26.4	25.4	27.1	107.5	6.8	7.7	8.9	8.2
3. Solvent and other product use	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4. Agriculture	18.5	18.0	16.1	15.2	15.8	16.4	-11.4	3.4	10.9	5.1	4.9
5. LULUCF	-44.1	-60.7	-65.6	-73.2	-69.5	-76.1	72.6	9.5	-25.9	-24.7	-22.9
6. Waste	6.4	20.3	29.0	27.5	29.8	30.1	370.8	1.1	3.8	9.3	9.1
GHG total with LULUCF	126.0	160.0	214.3	223.4	242.9	255.7	102.9	5.2	74.1	75.3	77.1
GHG total without LULUCF	170.1	220.7	280.0	296.6	312.4	331.8	95.1	6.2	100.0	100.0	100.0

Source: 2008 greenhouse gas emission inventory submission of Turkey under the Convention.

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NE = not estimated.

Note: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

^aThe shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

21. According to the 2008 GHG emission inventory, total GHG emissions, excluding emissions and removals from LULUCF, increased by 95.1 per cent between the base year and 2006, whereas total GHG emissions, including net removals from LULUCF, increased by 102.9 per cent (see table 3). This was mainly attributed to CO₂ emissions, which increased by 96.1 per cent over this period. Emissions of methane (CH₄) increased by 72.3 per cent, while emissions of nitrous oxide (N₂O) increased by 265.4 per cent. Emissions of fluorinated gases accounted for 0.9 per cent of total GHG emissions in 2006. Table 3 provides an overview of GHG emissions by sector from the base year to 2006 (see also discussion of sectoral trends in section III).

22. In its NC1, Turkey has provided limited overall explanations of the **factors underlying GHG emission trends**, with a simple comparison of the trend of total GHG emissions with the trend in economic development (GDP), primary energy source consumption and population growth. More detailed explanations are provided only for some sectors (mostly LULUCF and the road transport category). The ERT recommends that Turkey carry out a more detailed analysis of the emission trends, including explanations for the evolution of per capita emissions and emissions per GDP (para 8 of the UNFCCC reporting guidelines).

III. Policies and measures

23. As required by the UNFCCC reporting guidelines, Turkey has provided in its NC1 comprehensive information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention. Each sector has its own **textual description of the principal PaMs**. For energy and

transport, the textual description is supplemented by **summary tables** on PaMs by sector. However, the ERT noted that Turkey did not provide the following reporting elements required by the UNFCCC reporting guidelines: **summary tables** on PaMs for industry, agriculture, forestry and waste management (para. 17 and footnote a to table 1 of the UNFCCC reporting guidelines); information on each of the following subject headings: **name** and **short description** of the policy or measure; **objectives** of the policy or measure; the **GHG affected**; **type** or types of policy or measure; **status** of implementation (para. 22); and information on how Turkey believes its PaMs are modifying **longer-term trends** in anthropogenic GHG emissions and removals consistent with the objective of the Convention (para. 25).

24. The ERT noted that Turkey, as an Annex I Party, attaches importance to the implementation of PaMs, although it has no emissions limitation target under the Kyoto Protocol. In spite of national circumstances which follow the typical patterns of developing countries (e.g. relatively low per capita energy use and GHG emissions, high growth rates in population and GDP, when compared with other Annex I Parties), considerable efforts have been undertaken in selected areas to contribute to GHG mitigation. However, the effectiveness of most of the PaMs described in NC1 could not be assessed by the ERT and needs to be demonstrated in the future.

25. The ERT noted some PaMs which might have significant mitigation effects. These include promotion of RES (mainly for electricity generation), an upcoming energy efficiency plan, improvement of building codes with regard to heating demand, as well as the existing fuel and vehicle taxation scheme. The ERT encouraged Turkey to intensify its efforts to estimate GHG mitigation effects, either for individual or combinations of such PaMs. Such quantitative information is of utmost importance with regard to the assessment of GHG emission projections.

26. A **National Climate Action Plan** was under preparation at the time of the in-country review. Turkish representatives explained to the ERT that, to that end, an adequate process has been initiated with the CBCC, and appropriate institutional arrangements were put in place. Table 4 provides a summary of the reported information on Turkey's PaMs.

Table 4. Summary information on policies and measures

Major policies and measures	Examples / comments
Framework policies and cross-sectoral measures	
Energy taxation	Turkey applies comparably high taxes for the use of mineral oil products, especially for transport fuels, where tax rates are among the highest in the world
Support of research and development	New technology and mitigation projects of the TUBITAK-MAM Energy Institute in the fields of carbonate fuel cells, microgas turbines, hydrogen and renewable energy technologies
Harmonization of Turkish environmental legislation with European Union (EU) laws	Improvement of air quality standards and emissions control measures
Policies and measures by sector	
Energy	
Energy supply security	Diversification of energy sources, e.g. by promoting domestic resources (hydropower, but also lignite); fuel switch to natural gas
Combined heat and power generation	Up to 20 per cent of electricity from autoproducers may be fed into the public electricity grid in accordance with the Energy Market Law
Renewable energy sources	RES Law (2005); certified electricity from renewable energy sources; feed-in tariffs and obligations; obligatory prioritized use of geothermal energy at the local level, where resources are available
Energy efficiency improvements	Energy Efficiency Law (2007); amendment of building regulations; appliance standards and labelling; targets for reducing energy intensity; rehabilitation of power plants; public campaign launched in 2007 on energy efficiency and awareness-raising
Transport	
Vehicle and fuel taxes	Special consumption tax, favouring less cylinder capacity/lower fuel consuming passenger cars
Alternative vehicle fuels	Promotion of alternative fuels (liquefied petroleum gas, compressed natural gas, ethanol etc.), fuel quality improvements (EU directive on quality of petrol and diesel fuels) and increased use of biofuels
Public transport systems	Public transport improvements in main urban areas (Istanbul, Ankara, Izmir)
Integrated transport planning	Major investments in rail infrastructure and harbours
Industry	
Energy efficiency improvements	Regulation (1995) on energy management systems for industry installations with annual energy consumption of 2,000 tonnes of oil equivalent or more; financial incentives (soft loans) for energy-saving investments in small and medium-sized enterprises
Integrated prevention and pollution control	Use of best available technologies and techniques
Agriculture	
	Agriculture Strategy Paper (2006–2010 Sustainable Agriculture Measures); the Agricultural Reform Implementation Project; the Organic Agriculture Law No. 5262; Livestock Decree No. 2005/8503
Waste	
	Introduction of landfill and recycling methods; raising public awareness among the local administrations and the public regarding solid waste recycling; increase the share of municipalities with landfill facilities
Forestry	
	The Turkish National Forest Programme 2004–2023; Afforestation and Soil Erosion Mobilisation Action Plan 2008–2012

A. Policy framework and cross-sectoral measures

27. The Government of Turkey established a Ministry of Environment in 1991. In 2003 it was merged with the Ministry of Forestry to form the MoEF, which is responsible for the main parts of environmental legislation; other ministries are responsible for integrating general environmental objectives into policies in their respective fields of responsibility. MoEF has core responsibilities with regard to air quality management (which includes climate change), waste management, soil management and forestry. Energy policy falls under the responsibility of the MENR, transport policy under the responsibility of the Ministry of Transport and agriculture policy under the responsibility of the MARA. The Ministry of Industry and Trade is responsible for industry-related activities as well as the labelling of electrical appliances, although the MENR also has a role in implementing energy efficiency measures in industrial installations. Additional authorities under the MENR, in particular the Electrical Power Resources Survey and Development Administration (EIE), contribute to the effective implementation of policies with regard to energy efficiency and renewable energies. The MoPWS has responsibilities with regard to planning of urban, rural, coastal areas and for the building and construction sectors; its General Directorate of Disaster Affairs has responsibility on adaptation to climate change.

28. The **inter-ministerial coordination of climate change related policies** is carried out by MoEF. In 2001, a Coordination Board on Climate Change was established. All relevant ministries as well as the Turkish Union of Chambers and Commodity Exchanges (TOBB) are represented on the board, which is chaired by the MoEF. Ten thematic working groups cover all relevant aspects such as research on the effects of climate change, mitigation and adaptation, the GHG emissions inventory, technology transfer and education and public awareness. Turkey receives considerable funding from international organizations, namely the

GEF, UNDP and the European Union (EU), enabling the country to set up appropriate institutional arrangements and fulfil obligations under the Convention.

29. In view of a future **accession to the EU**, Turkey is undertaking considerable efforts to comply with EU environmental legislation on, inter alia, air quality and emissions control standards, waste management, energy performance of buildings, CO₂ emissions from passenger cars and labelling of electrical appliances. No preparatory steps have been undertaken yet with regard to the EU emissions trading scheme. The Turkish cross-sectoral policy framework also includes energy taxation, applied on a broad variety of energy sources. The taxation of transport fuels is notable for being among the highest in the world.

30. The ERT encourages Turkey to intensify cooperation among all relevant ministries and other stakeholders, including environmental NGOs, with a view to elaborating and adopting an integrated climate change mitigation strategy in the near future. Monitoring of the implementation of PaMs and evaluation of their effectiveness should be done on a regular basis. Institutional arrangements established by MoEF together with other ministries (CBCC) seem to be appropriate and support efforts to achieve these goals.

B. Policies and measures in the energy sector

31. In 2006, the **energy sector** was the largest source of GHG emissions in Turkey, totalling 258,206.6 Gg CO₂ eq. Emissions from the sector increased by 95.4 per cent between 1990 and 2006. The key driver for the rise in emissions was the growing economy leading to a large increase in energy demand. In 2006, the major source of emissions was energy industries (35.2 per cent), followed by manufacturing industries and construction (29.9 per cent), transport (17.2 per cent), residential and services sector (17.2 per cent) and other sector (17.0 per cent). The Party explained that the inter-annual variations in emissions for the years 1994, 1999, 2000 and 2001 were due to **economic crises and climate variations (droughts) affecting hydro-electric power production**. The NC1 provides explanations of the emission trend in the transport sector, and in particular for the reasons underlying the tendency towards a more efficient energy consumption in the sector: alternative fuel use with increased use of diesel oil and liquefied petroleum gas, and early retirement of old vehicles following the introduction of tax incentives (see para. 38 below).

1. Energy supply

32. One of the strategic goals of the **Turkish energy policy** is energy security and decrease of dependency from imports (see table 2). Domestic energy sources (mainly lignite) and RES therefore hold an important share in the energy mix, especially in electricity production. In order to meet the fast increasing demand for electricity, high investments in both hydropower and lignite power capacities have been undertaken and will be made in the future. Energy efficiency is also a crucial goal; however, the ERT noted that success towards achieving this goal has been limited – between 1990 and 2006 total primary energy supply (+77.6 per cent) increased almost in line with GDP (+86.3 per cent, see table 1). During the review, the Party linked this observation to the fact that Turkey was still in the mid stages of development, and in this stage development is driven by growth in both economic activity and domestic population.

33. Turkey attaches importance to the promotion of ‘new’ **renewable energy sources**, e.g. wind, geothermal energy, biomass and small hydropower. The ERT noted that certification and a feed-in tariff system so far has shown limited effect. Much attention is also given to the use of geothermal energy for heating purposes, including compulsory prioritization, at places where resources are available. Biomass energy use decreased both in relative and absolute terms since 1990, mainly as a result of migration from rural to urban areas.

34. Turkey was able to considerably increase the share of **combined heat and power (CHP)** in electricity and heat production, mainly from industrial autoproducers; CHP reached a level of 10 per cent of total power production in 2005.

2. Energy demand

35. Notable efforts were also made in the **building sector** through the reduction of permitted maximum heating demand for new buildings. However, in the residential and services sector, improvements in thermal insulation and fuel switch from coal to gas could not outweigh the growing number of dwellings, which roughly doubled between 1990 and 2006, the improved living standard and the increasing floor area of commercial premises.

36. The ERT noted that adoption of the 2007 **Energy Efficiency Law** could result in considerable efficiency improvements, but it is not yet possible to determine the effectiveness of secondary legislation (e.g. Law on Energy Performance of Buildings in accordance with a related EU directive, energy efficiency promotion for small and medium-sized enterprises).

37. **Energy use in industry.** The ERT did not identify any sector-specific policy or measure, although available data showed a reduction of CO₂ intensity or an improvement of energy efficiency in iron and steel production (integrated steelworks) as well as in cement and clinker production.

38. **Energy use in transport.** Between 1990 and 2006, the numbers of **registered vehicles** increased from around 3 million to more than 10 million; about 60 per cent of vehicles are passenger cars. Nevertheless, passenger car ownership rate remains low with 92 cars per 1,000 inhabitants.

39. **Taxation of transport fuels** in Turkey is a notable policy with respect to the magnitude of tax rates. No detailed information was available on the impact of fuel prices on fuel demand, but it can be assumed that this policy, together with other vehicle-related taxes (e.g. special consumption tax), has significant impacts on car ownership, average mileage and fuel efficiency. According to information provided during the review, a considerable rebate on the special consumption tax to replace old cars has been very successful (4.9 per cent reduction in CO₂ emissions from passenger cars).

40. Huge **investments in transport infrastructure** are under way to improve and expand the railway network, both in urban areas and on long-distance connections (including transit routes, e.g. to Georgia). Maritime shipping is also a priority of national transport policy. The ERT noted that these investments in transport infrastructure will support the strong growth in transport demand and related GHG emissions.

41. The ERT noted that several PaMs under implementation in Turkey, especially with regard to energy efficiency, renewable energy sources and sustainable transport modes, are **contributing towards the goal of mitigation of GHG emissions**. The ERT encourages the Party to improve its assessment of the environmental and economic effectiveness of its PaMs and to provide the results in its next national communication. The ERT noted with some concern that, following a clear strategic goal of energy policy in Turkey to increase energy security and decrease dependency on energy imports, **power production from domestic coal is given preferential treatment**. The ERT noted that this policy might lead to higher levels of GHG emissions and recommends that the Party report on actions taken to implement commitments under Article 4, paragraph 2(e)(ii) of the Convention, which requires that Parties identify and periodically update their own policies and practices which encourage **activities that lead to greater levels of anthropogenic GHG emissions** than would otherwise occur (para. 16 of the UNFCCC reporting guidelines). The ERT further recommends that Turkey provide the rationale for such actions in its next national communication.

C. Policies and measures in other sectors

42. In 2006, the **industrial processes** sector accounted for 27,125.3 Gg CO₂ eq, or 8.2 per cent of total national GHG emissions. Emissions from this sector increased by 107.5 per cent between 1990 and 2006, mainly driven by the production of mineral products (cement and clinker). However, inventory information on industrial processes seems to be incomplete, for example with respect to emissions from iron and steel production. NC1 does not provide any detailed explanations for the emission trend nor any policies or measures addressing emissions from industrial processes. Emissions of **fluorinated gases** have grown from 273.8 Gg CO₂ eq in 1996 to 3,134.3 Gg CO₂ eq in 2006. Turkey has provided limited explanations for the

trend in emissions of HFCs, with reference to the phasing out of CFCs under the Montreal Protocol, while the trend in sulphur hexafluoride is not explained.

43. **Agriculture.** Emissions from agriculture in 2006 (16.4 Mt CO₂) accounted for 5 per cent of total GHG emissions, down from an 11 per cent share in 1990. However, the Party acknowledged during the review that GHG emissions from agriculture had been underestimated due to missing sub-sectors in this category. The ERT noted this would imply that sectoral GHG emissions (and the share of agriculture in total GHG emissions) would be much higher than reported by the Party.

44. In spite of having a decreasing share of total GDP (from 24 per cent in 1980 to 11 per cent in 2005), agriculture is an increasingly important economic sector in Turkey, which is undergoing several changes with potential implications for GHG emissions. Some of these changes would cause a reduction in emissions (e.g. a decrease in the cropland area and in non-dairy cattle and sheep populations; an increase in the area of woody crops), while other factors would cause an increase in emissions (e.g. an increase in the dairy cattle and poultry populations; degradation of cropland and grazing land). In addition, some practices, such as increasing the area under irrigation, may bring about mixed effects (e.g. by increasing emissions from energy use or from soil processes, and by increasing CO₂ removals).

45. The ERT noted that several of the practices normally used in agriculture in Turkey (e.g. excessive tillage and fertilizer use; stubble burning; poor management practices in meadows; inefficient use of energy, which is mostly fossil-fuel-based) cause relatively high levels of GHG emissions. These findings provide clear opportunities for the implementation of PaMs leading to a reduction in GHG emissions.

46. No **projections** for the future evolution of GHG emissions in the agriculture sector of Turkey were provided in the NC1. The ERT noted that Turkey is implementing a policy for the creation of 2.7 million ha of bioenergy dedicated crops. This may cause a further increase in GHG emissions, not only in the agricultural sector (e.g. by increased fertilizer use, reduction of carbon stocks in land converted to cropland) but also in the transport and industry sectors.

47. The ERT noted that PaMs in agriculture as reported in the NC1 are not climate-specific, although some of them may result in positive impacts on mitigation. No information was provided in the NC1, or during the review, on the estimated GHG mitigation effect to be achieved by application of these PaMs. The ERT encourages Turkey to strengthen its capacity for producing accurate estimations and projections of emissions; and to develop climate-specific PaMs for the agriculture sector, particularly for the most relevant sources (N₂O from soils, enteric methane) and potential sinks (soil organic carbon, farm trees).

48. The ERT noted that the working groups operating under the CBCC do not include one on agriculture, and that this sector is covered by the LULUCF working group. The ERT suggests that Turkey consider establishing a separate **working group for agriculture** given that the emissions, and thus the mitigation potential, from this sector are in practice higher than previously thought.

49. **Forestry.** The forestry sector was a net sink of 53.9 Mt CO₂ in 2006. This value was 22.2 per cent higher than the net removals in this sector in 1990. There are nearly 21 million ha of forests in Turkey, with a growing stock of 1.3 billion m³ of wood and an annual increment of 36 million m³. Nearly 50 per cent of the forest area is classified as non-productive, mostly owing to degradation caused by unsustainable practices in the past. Wild fires, illegal logging, agricultural activities in the forests (e.g. grazing) and pest or disease outbreaks were factors contributing to such degradation.

50. Forestry is an important economic activity in Turkey, and forest products and services provide livelihoods for 15 per cent of the country's population living in more than 20,000 villages. The State owns 99 per cent of the land occupied by forests and, therefore, is fully responsible for forest health and conservation.

51. The **increase in net CO₂ removals by forests** occurring in Turkey results from a combination of factors, including reduced population pressure resulting from emigration to urban areas, the suppression of all illegal logging, a better monitoring system for prevention of wildfires and pest and disease outbreaks, and the

implementation of measures to increase the forest area and productivity. These factors prevail over other factors that tend to increase emissions, such as conversion of some areas from forest land to settlements.

52. The ERT noted that Turkey has a **Forestry Master Plan** for the period 1990–2009, which was reviewed and updated by the Turkish National Forest Programme (NFP) in 2004. The main focus of the NFP is on sustainable forest management, forest conservation, multiple uses of forests and stakeholder participation in the design and monitoring of sectoral policies. The main policies developed under the NFP deal with the protection of forests, conservation of their biodiversity, protection against the negative impacts of biotic and non-biotic agents, improvement of existing forests and expansion of the forest land area, and optimization of wood and non-wood products and services. Action plans for the application of these policies are prepared by the Directorate General of Forests at MoEF.

53. A key climate change mitigation measure implemented under the NFP is the **Afforestation and Erosion Control Mobilization Action Plan 2008–2012 (AECMAP)**, which calls for the implementation of activities over a total area of 2.3 million ha of land, with a total investment of 2.7 billion Turkish lira (TRY), to be funded by the State (nearly two thirds) and by other actors. Such activities include rehabilitation of forests (75 per cent of the land area), soil erosion control (14 per cent of the land area) and afforestation (11 per cent of the land area). The ERT noted that, while this action plan promotes highly positive climate change mitigation activities, it lacks a full evaluation of potential impacts on water resources. The ERT felt that improved coordination with other relevant institutions such as State Hydraulic Works (DSI) could help to enhance the GHG mitigation effect of this action plan.

54. Sufficient and timely seedling production is essential for the success of the AECMAP. The ERT noted that the seedling production capacity of Turkish tree nurseries has been increasing, including the growing participation of the private sector, and that it is well on track to reach the target of producing the more than 400,000 seedlings that are needed every year. No estimates of the GHG mitigation expected to result from the implementation of the AECMAP were provided in the NC1. However, during the review, the Party informed the ERT that the above mentioned afforestation campaign has a target of 2.3 million hectares of land in a 5-years period and 181.4 Mt CO₂ are expected to be sequestered in the first 20 years.

55. **Other measures** being implemented include the expansion of protected areas, currently at 7.7 million ha; the plantation of 6,691 ha of urban forests; and the improvement of forest monitoring in order to control and prevent wildfires and pest and disease outbreaks, which annually affect between 500,000 and 800,000 ha, with a total expenditure of USD 500 million per year.

56. The **waste sector** is a major contributor to CH₄ emissions, responsible for 30,064.9 Gg CO₂ eq, having experienced an increase of 370.8 per cent since 1990. In its NC1 Turkey explains the stabilization pattern seen after 2000 with the increasing use of controlled landfill sites in densely populated areas.

57. Waste management is a relatively new policy in Turkey that clearly follows sustainability principles (waste avoidance, minimization, reuse, recycling, pre-treatment including incineration and landfilling). Considerable progress has been made since 1990 in waste management, however, in 2006, only 37 per cent of municipal waste is disposed of under controlled circumstances. Turkey is about to adopt new legislation on waste management in accordance with respective EU directives. The biggest barriers to implementation of waste management policies are the extremely high estimated costs for rehabilitation of uncontrolled landfills and construction of new pre-treatment and landfilling facilities.

58. The ERT encourages Turkey to expand its reporting on climate change specific PaMs, including their estimated impacts on GHG emissions and removals, in its next national communication.

IV. Projections and the total effect of policies and measures

A. Projections

59. The NC1 provides a set of projections of the future levels of GHG emissions, including a ‘with measures’ scenario and a ‘without measures’ scenario, based on model calculations. It includes projections by

gas and by sector, and also projections of overall emission levels. The time horizon for projections is 2020 and emission levels are projected for the years 2010 and 2015. The ERT noted some gaps in reporting in relation to the UNFCCC reporting guidelines. In particular, projections do not cover emissions from agriculture, LULUCF, waste and some industrial processes. Projections of emissions from international bunkers were not reported separately. The ERT recommends that the Party provide a complete set of projections in its next national communication.

60. The ERT acknowledged that projections in the 'with measures' and 'without measures' scenarios were broadly consistent with the inventory data that had been submitted in 2006. The base year for these projections is 2005. The projected data are presented relative to actual inventory data for the preceding years, as requested by the UNFCCC reporting guidelines. The overall GHG emissions were presented as a total, and expressed in CO₂ eq, using global warming potential factors.

61. Overall responsibility for the Turkish GHG emission projections lies with MoEF. Projections of emissions in the energy sector were commissioned by MoEF, MENR, EUAS and TEIAS in close collaboration with, and with support from, Argonne National Laboratory's Center for Energy, Environmental and Economic Systems Analysis.

62. During the review, the ERT was provided with additional background information on Turkey's GHG emission projections. The study was supported by UNDP within the framework of PIMS 3367, Turkey's first national communication project. The industry sector was analysed separately by the GEF project TOBB ETU-EIE 2006 – "Estimation of Carbon Dioxide Gas Emissions in the Turkish Iron and Steel Industry". The UNDP-GEF project "Cost-Benefit Analysis of Measures for Improving Energy Efficiency and Reducing GHGs in the Turkish Cement Industry", also provided input for projections in the cement industry. The main developer in this project was Gazi University, with the assistance of EIE, TOBB and the Turkish Cement Manufacturers' Association.

B. Scenarios, input assumptions and methodology

63. The NC1 presents two main scenarios: a 'without measures' or reference scenario, which comprises all implemented and adopted PaMs within the period 1900–2004, and a 'with measures' scenario, which takes into account the planned PaMs as developed in the demand-side management (DSM) scenario. The ERT noted that, based on the DSM scenario, the Party has identified PaMs with a mitigation potential for total GHG emissions by 10–15 per cent of the 1990 levels by 2020. These are referenced in the NC1 as a part of the project PIMS 3367 and as sensitivity scenarios.

64. The 'without measures' scenario describes a strong economic development in accordance with the official economic outlook. It assumes relatively high GDP growth rates (5.5 per cent in the early years, increasing to 6.4 per cent by 2020), and a steady increase in energy demand. The ERT noted that both assumptions are at the higher end compared with the most recent data that became available during the review.

65. The main assumption for the 'without measures' scenario are:

- (a) No additional domestic reserves of fossil fuels will be available;
- (b) No limits are placed on crude oil, natural gas or hard coal import;
- (c) No major changes will be made in the country's energy pricing policies;
- (d) No additional major energy efficiency or RES programmes will be implemented;
- (e) Demand for energy and for electricity production grows at an annual rate of 6 per cent and 7.1 per cent, respectively.

66. The 'with measures' scenario places emphasis on the energy sector, in which the PaMs are elaborated using DSM to reduce peak load and overall energy demand. The main assumption is a reduction in energy demand by 15 per cent in the industrial sector and 10 per cent in the residential sector. The related investments

in energy efficiency measures are calculated to be approximately TRY 100 million annually, starting from 2008. By 2020, total final energy consumption is assumed to drop by 16.2 Mtoe or 9.2 per cent, while the share of RES remains at the same level as in the ‘without measures’ scenario. Use of hard coal is assumed to drop 16.4 per cent, while oil products decrease by 2.8 per cent, as the transport sector is not affected by use of DSM.

67. **Further key assumptions** for both scenarios include a forecast for 4,500–5,000 MW nuclear power installed capacity to be available after 2015. The ERT noted that projections for fuel prices were not reported in the NC1. However, such prognoses are completed in the report PIMS 3367. Key assumptions used for projections are shown in Table 5.

Table 5. Key assumptions for preparation of the ‘without measures’ scenario

Macroeconomic indicators	2005	2010	2015	2020
Population (million)	73.10	78.46	83.34	87.76
GDP (2000 USD billion using PPP)	543.67	710.55	968.95	1321.33
Annual GDP growth rate (%)	NA	5.5	6.4	6.4
GDP per capita (2000 USD thousand using PPP)	7.43	9.05	11.62	15.05
Primary energy supply, (ktoe)				
Hard coal	16 153	25 170	31 653	49 477
Lignite	11 301	18 509	24 712	32 372
Oil	34 071	42 212	49 576	60 215
Natural Gas	20 331	30 455	41 054	51 570
Hydropower	3 602	4 903	7 060	9 419
Nuclear	NO	NO	8 230	8 230
Renewables	6 820	7 312	8 243	10 323
Net electricity import	NO	NO	NO	1 398
Total primary energy supply	92 281	128 562	170 528	223 003

Abbreviations: GDP = gross domestic product, ktoe = kilotonnes oil equivalent, NA = not applicable, NO = not occurring, PPP = purchasing power parity.

68. The ERT noted that a quantitative sensitivity analysis of uncertainties in the input assumptions was not available. The Party works with only one macroeconomic scenario, which assumes a significantly higher GDP growth rate for the period 2005–2020 than for the period 1990–2005. The ERT noted that, given the economic impact of the global recession that started in 2008, these GDP growth rates might be unrealistic and encouraged the Party to provide a sensitivity analysis for assumptions on GDP growth in its next national communication.

69. **Methods used.** The main software used was the Windows version of the ENPEP package, consisting of several modules: BALANCE, WASP and VALORAGUA. BALANCE is a non-linear equilibrium model that matches supply and demand in the energy sector and all its subsectors using a market-based simulation approach. WASP is a dynamic optimization model that is used to determine the least-cost power system expansion schedule, with respect to various constraints in the system such as number of plant units, combination of new, rehabilitated and old units, interest rate, fuel price rate and other economical and technical parameters. The start year (base year for the study) of BALANCE is 2003. The purpose of the VALORAGUA module is to determine the operation of the hydropower plants producing electricity.

70. For **road transport** two different models were used: one to calculate emissions based on vehicle fleet and the other to calculate emissions based on transport fuel demand. Both models are directly correlated with a GDP forecast and assume an increase in railways of 3 to 6 per cent of land transport.

C. Projected emission trend by sector

71. Aggregate emissions from the **energy sector** in the ‘without measures’ scenario are projected to grow from 246,122 Gg CO₂ eq in 2005 to 615,667 Gg CO₂ eq in 2020, which means an increase of 150.1 per cent in the period 2005–2020, or 6.4 per cent annually. Table 6 shows the total fuel consumption in the ‘without measures’ scenario for the period 2003–2020.

Table 6. Total fuel consumption under the ‘without measures’ scenario for the period 2003–2020

Sector	Fuel consumption (ktoe)				
	2003	2005	2010	2015	2020
Industry	26 117	27 003	41 646	55 508	76 408
Transport	19 634	21 648	29 015	38 503	47 542
Agriculture	12 395	14 298	19 915	26 541	34 037
Residential	3 086	3 475	4 368	5 441	6 751
Non-energy use	2 098	2 202	2 514	2 844	3 220
Own-Use	4 558	4 807	5 967	6 997	8 593
Total	67 887	73 433	103 425	13 5834	176 551

72. Aggregate emissions for the ‘with measures’ scenario are projected to grow from 246,122 Gg CO₂ eq in 2005 to 539,025 Gg CO₂ eq in 2020, which means an increase of 119.0 per cent in the period 2003–2020, or 5.49 per cent annually. Table 7 shows the aggregated emission projections for both scenarios by sector.

Table 7. Aggregated greenhouse gas emission projections by sector under ‘without measures’ and ‘with measures’ scenarios

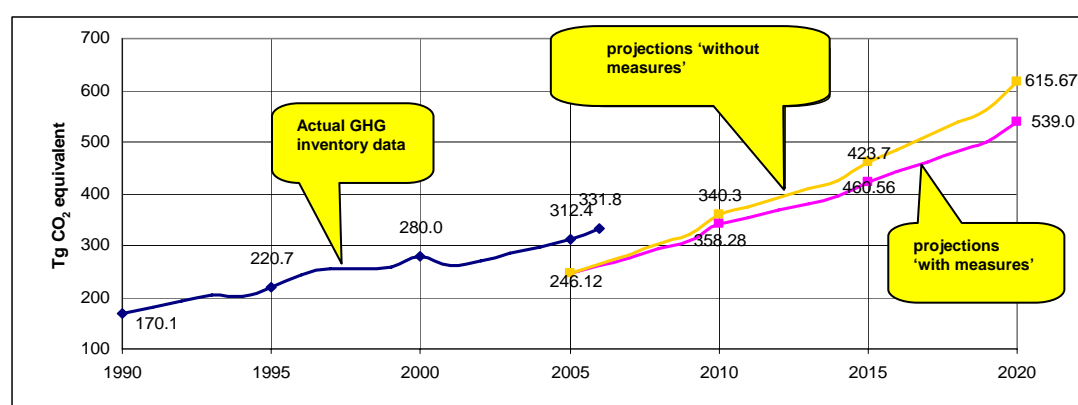
Sector	Greenhouse gas emissions (Gg CO ₂ eq)						
	2005	2010 WOM	2010 WM	2015 WOM	2015 WM	2020 WOM	2020 WM
Electricity production	82 058	116 919	110 215	152 308	140 650	222 756	185 372
Industry	75 695	116 090	107 902	147 340	128 865	197 515	168 654
Transport	43 424	60 454	60 454	80 477	80 477	103 010	103 010
Residential	33 671	48 883	45 959	60 956	54 636	68 749	58 990
Agriculture	9 586	12 055	12 055	15 056	15 056	18 714	18 714
Others	1 687	3 881	3 737	4 425	4 068	4 923	4 285
Total	246 122	358 283	340 322	460 562	423 753	615 667	539 025

Abbreviations: WOM = ‘without measures’, WM = ‘with measures’.

Source: NC1 projections supplemented by additional background information on Turkey’s GHG emission projections (see para 62).

73. The ERT noted that the difference in projected emission levels for 2020 between the ‘without measures’ and the ‘with measures’ scenarios amounts to 76,642 Gg CO₂ eq, or 31.1 per cent of the 2005 emission level. The GHG emission projections and trends for both scenarios are presented in the figure below. The ERT noted that the data gap between historical and projected emissions results from recalculations of the Turkish GHG 2008 emission inventory.

Projections of GHG emissions from energy for ‘without measures’ and ‘with measures’ scenarios



Note: The projections do not include GHG emissions/removals by LULUCF.

74. Projections of GHG emissions from **industrial processes** (excluding energy-related emissions) were provided only for iron and steel production and cement production.

75. The Turkish **iron and steel industry** is being restructured; steel production from basic oxygen furnaces (BOFs) and from electric-arc furnaces (EAFs) is projected to increase by 138 per cent and 34.5 per cent, respectively, during 2004–2020. Accordingly, CO₂ emissions from steel production from BOFs

and EAFs are expected to increase by 100.7 per cent and 34.4 per cent, respectively. In 2020, 78.4 per cent of emissions are projected to result from BOFs.

76. Projected CO₂ emissions from **cement production** are calculated based on an aggregated model of the Turkish cement industry. In 2004, 39 Mt cement was produced in 40 plants; this production is expected to increase by 130.7 per cent, to 90 Mt cement, by 2020. In its NC1, the Party presented three different scenarios for developing technologies in the future (1990 technology fix, 2004 technology fix and energy efficiency improvements after 2004) resulting in three different CO₂ emission levels for 2020 (58.3, 54.6 and 51.0 Gg CO₂, respectively). The ERT noted a mitigation potential from energy efficiency improvements in cement production of up to 7.3 Gg CO₂, or 12.5 per cent.

D. Total effect of policies and measures

77. In its NC1, Turkey did not provide the following reporting elements required by the UNFCCC reporting guidelines: the estimated and expected **total effect of implemented and adopted policies and measures** (para. 39 of the UNFCCC reporting guidelines), an estimate of the **total effect of their policies and measures**, in accordance with the 'with measures' definition, compared to a situation without such policies and measures, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis), in 1995 and 2000, (para. 40), relevant **information on factors and activities for each sector** for the years 1990 to 2020 (para. 48). The ERT recommends that the Party follow the UNFCCC reporting guidelines more closely and provide these reporting elements in its next national communication.

78. The ERT noted that the **total effect of implemented PaMs in the energy sector** can be calculated from the difference between the '**without measures**' and '**with measures**' scenarios in 2020. This difference amounts to 76,642 Gg CO₂ eq, or 31.1 per cent of the 2005 emission level (see para. 73 above). For the period 2010–2020 an average annual reduction of 35–40 Tg CO₂ eq is projected to result from the implemented measures. The ERT noted that the sum of individual effects of PaMs for the energy sector differs from the total sectoral effect, as reported in the NC1 chapter on projections.

V. Vulnerability assessment, climate change impacts and adaptation measures

79. In its NC1, Turkey has provided comprehensive and transparent information on past climate trends, with full geographic coverage and high spatial resolution; however, no information has been included on trends in inter-annual variability. In addition, the NC1 provides the required information on expected impacts of climate change in Turkey, but only a limited number of adaptation options. The ERT noted that Turkey did not provide an outline of the action taken to implement Article 4, paragraph 1(b) and (e) with regard to adaptation (para. 49). Table 8 summarizes the information on vulnerability and adaptation to climate change presented in the NC1.

80. The main impacts and vulnerabilities identified by Turkey are: (a) an increased risk of drought, with Turkey being one of the most vulnerable countries in this regard; (b) decreased per capita water availability (concurrent with increased demand for water); (c) an increase in the frequency and intensity of floods associated with extreme rainfall events; (d) an increased risk of desertification, particularly in South-East Anatolia and the continental interior; and (e) loss of biodiversity in several ecosystems where case studies were performed. Several case studies included in the NC1 assessed other possible vulnerabilities (e.g. increased frequency of malaria or Crimean-Congo haemorrhagic fever, sea level rise), but did not reach clear conclusions.

Table 8. Summary information on vulnerability and adaptation to climate change

Vulnerable area	Examples / comments/ adaptation measures reported
Biodiversity and natural ecosystems	Vulnerability: Various negative effects identified in terrestrial ecosystems, lakes and wetlands Adaptation: NA
Coastal zones	Vulnerability: Overall not critical for Turkey. Still, flooding, erosion and intrusion of saltwater are likely to occur as a result of rising sea levels, potentially causing damages to roads and communications infrastructure Adaptation: NA
Drought	Vulnerability: Increased drought frequency has been identified as the main factor of vulnerability in Turkey, mainly affecting agriculture production Adaptation: Implementation of the "Action Plan and Strategy to Struggle with Agricultural Drought" at MARA; expansion of agricultural areas under irrigation; development of drought tolerant or resistant crop varieties
Desertification	Vulnerability: Increased aridity index, particularly in the Aegean part of the Mediterranean region. 86.5 per cent of land territory and 73 per cent of arable land at risk of erosion, land degradation and desertification, particularly in South-East Anatolia and the continental interior Adaptation: NA
Forests	Vulnerability: Increased impacts of fire, pests and diseases Adaptation: Forest health monitoring system
Human health	Vulnerability: Possible increase in occurrence of malaria, leptospirosis and Crimean-Congo haemorrhagic fever Adaptation: NA
Water resources	Vulnerability: Decrease in per capita water availability and increased demand for water Adaptation: Replacement of flood irrigation in agriculture by more efficient systems (sprinkler and trickle irrigation); investments in water reservoirs and water transportation and distribution systems; rationalization of water demand
Floods	Vulnerability: Increased flood frequency, due to more intense rainfall events, has been identified as a vulnerability factor during the review (not included in the NC1). Adaptation: Construction of flood protection facilities, afforestation of river basins

Abbreviations: MARA = Ministry of Agriculture and Rural Affairs, NA = not available, NC1 = first national communication.

81. In its NC1, Turkey did not provide information about an adaptation plan or programme. However, during the review the Party informed the ERT about plans to prepare a national adaptation plan to be reported in its second national communication, with funding to be provided by UNDP through the Millennium Development Goals Achievement Fund. The ERT welcomes this plan.

82. The ERT encourages Turkey to complete, with a view to inclusion in its second national communication, a full vulnerability assessment addressing the impacts of climate change on, for example, hydropower production capacity, increased electricity demand, required investments in water storage and transportation, tourism and forests.

VI. Research and systematic observation

83. In its NC1, Turkey has provided information on its general policy on and financing of research and development, and on its actions relating to research and systematic observation; both domestic and international activities, including limited participation in the Global Climate Observing System (GCOS), are addressed. During the review, the Party clarified that the NC1 provides a complete picture of its national and international activities on research and systematic observation.

84. Investment in general research and development in Turkey is projected to increase sharply from the 2006 level of 0.8 to 2.0 per cent of GDP by 2010, with 63 per cent of the funding coming from the public sector. Tubitak is the entity responsible for coordinating research and development. Given the high profile of climate change on the State agenda, the current policy for research and development constitutes a good opportunity for strengthening climate change research and systematic observation activities. Availability of trained human resources has been identified as one of the main barriers for making good use of this opportunity, and the ERT encourages Turkey to maximize the efforts for implementing education and training of scientific and technical personnel, and for conducting a thorough process for research needs planning.

VII. Education, training and public awareness

85. In its NC1, Turkey has provided information on its actions relating to education, training and public awareness, as required by the UNFCCC reporting guidelines (para. 65).

86. **Education and training.** The NC1 presents a variety of environmental education programmes in primary, secondary and higher education as well as training programmes and participation in international activities. Climate change training is an important vehicle that is used to communicate climate change concerns. MoEF has been involved in the development of training programmes for managers, planners and technical experts. The strong connection between energy consumption and climate change is used to build issue awareness and promote additional efficiency improvements.

87. **Public awareness.** The NC1 demonstrates that attention has been given to the education of the general public. The ERT was informed that MoEF enabled public access to general information on the Kyoto Protocol, joint implementation and climate change in general. For this purpose, it used a variety of vehicles, including a series of articles in newspapers and journals, and television and radio broadcasts, special events and greater use of web-based communication (e.g. the MoEF website). Web-based communication is preferred to printed materials because of its lower costs, although it was noted that most of the population does not yet have Internet access. The ERT was informed that because of limited funds and capacities, the involvement of NGOs in the preparation of the NC1 was limited. Nonetheless, the ERT noted that good cooperation between MoEF and some major NGOs has been established and encourages the Party to involve these partners in the preparation of “future national communications”.

88. **Participation in international activities.** With the assistance of external funds, government representatives, NGOs and other Turkish experts are building capacity and participate in UNFCCC activities (e.g. attendance at sessions of the COP and meetings of its subsidiary bodies; reviews of inventories and national communications). UNDP is currently supporting a national capacity assessment of the three Rio Conventions on biodiversity, desertification and climate change.

VIII. Conclusions

89. Turkey is a relatively new Party to the Convention and is in a situation that is different from that of other Annex I Parties: Its **national circumstances** follow the typical patterns of developing countries. Accordingly, Turkey has the lowest per capita primary energy consumption and the lowest per capita GHG emissions, among Annex I Parties (average for 1990–2005). It also has the highest growth rates in both total and urban populations within this group. Turkey underwent a successful deregulation of economy since 1989. During 1990–2006, the GDP of Turkey increased by 86.3 per cent.

90. **Total GHG emissions**, excluding emissions and removals from LULUCF, increased by 95.1 per cent between the base year and 2006, whereas total GHG emissions, including net removals from LULUCF, increased by 102.9 per cent. This was mainly attributed to CO₂ emissions, which increased by 96.1 per cent over this period. According to the ‘with measures’ scenario, GHG emissions are projected to increase by 119.0 per cent during 2005–2020. However, the ERT noted that these projections are based on assumptions that are at the higher end for GDP growth compared with the most recent data.

91. In the context of the preparation of the NC1, **a number of studies** were carried out in Turkey. These studies include an analysis of potential PaMs to mitigate GHG emissions, an assessment of the potential impact of climate change in Turkey, the development of a proposal for adaptation measures, a cost-benefit analysis of various energy policy alternatives, an evaluation of the human capacity in the areas of scientific and technical advice, and a plan for improving the institutional set-up, including through the establishment of a permanent national data network for information on climate change. The ERT welcomed these activities and acknowledged the efforts undertaken by Turkey in the field of climate change. The ERT noted that, compared to other Annex I Parties, Turkey is in an initial stage of identifying its PaMs as the core of its future climate policy. It encourages Turkey to continue working towards full implementation of the Convention, taking into account its special national circumstances.

92. In the course of the IDR, the ERT formulated a number of recommendations relating to the completeness and transparency of Turkey's reporting under the Convention. The key recommendations¹ are that Turkey, in its next national communication:
- (a) Work further on the analysis of its sectoral emission trends, and include explanations for the evolution of per capita emissions and emissions per GDP;
 - (b) Clearly identify the status of PaMs as planned, adopted or implemented, and to include in the "with measures" scenario only those PaMs that have been adopted and/or implemented;
 - (c) Report on actions taken to implement commitments under Article 4, paragraph 2(e)(ii) of the Convention, which requires that Parties identify and periodically update their own policies and practices which encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur; and to provide the rationale for such actions;
 - (d) Provide a complete set of projections, covering all sectors, including all non-energy sectors, and gases, as required by the UNFCCC reporting guidelines; and an estimated and expected total effect of implemented and adopted PaMs;
93. Furthermore, the ERT encourages the Party to:
- (a) Intensify cooperation among all relevant ministries and other stakeholders, including environmental NGOs, with a view to elaborating and adopting an integrated climate change mitigation strategy in the near future. Monitoring of implementation and evaluation of effectiveness should be done on a regular basis;
 - (b) Improve its assessment of environmental and economic effectiveness of its PaMs;
 - (c) Improve the coordination with relevant institutions for the implementation of the "Afforestation and Erosion Control Mobilization Action Plan 2008–2012";
 - (d) Expand its reporting on climate change related and climate-specific PaMs for all sectors, including their estimated impacts on GHG emissions and removals;
 - (e) Provide a sensitivity analysis for assumptions on GDP growth on GHG emission projections;
 - (f) Complete, with a view to inclusion in its NC2, a full vulnerability assessment addressing impacts of climate change on, for example hydropower production capacity, increased electricity demand, required investments in water storage and transportation, tourism and forests;
 - (g) Enhance the efforts for implementing education and training of scientific and technical personnel, and for conducting a thorough process for research needs planning;
 - (h) Involve NGOs in the preparation of future national communications.

¹ For a complete list of recommendations, the relevant sections of this report should be consulted.

Annex

Documents and information used during the review

A. Reference documents

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

FCCC/ARR/2006/TUR. Report of the individual review of the greenhouse gas inventory of Turkey submitted in the year 2006. Available at <<http://unfccc.int/resource/docs/2007/arr/tur.pdf>>.

First national communication of Turkey. Available at <<http://unfccc.int/resource/docs/natc/turnc1.pdf>>.

2008 GHG emission inventory submission of Turkey. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur_2008_crf_21aug.zip>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Evren Turkmenoglu (Ministry of Environment and Forestry), including additional material on greenhouse gas emission projections.
