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Arab Region State of Implementation on Climate Change

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DRAFT

Arab Region State of Implementation on Climate Change*

I. Introduction

In accordance with its multi-year programme of work, adopted by the General assembly at its nineteenth special session, the Commission on Sustainable Development (CSD) will consider at its fourteen session issues related to the protection of the atmosphere/air pollution, climate change, energy, and industry development, in addition to the cross-cutting issues. These thematic clusters of issues will be addressed in an integrated manner, taking into account economic, social and environmental dimensions of sustainable development. The second Implementation Cycle will take place from 2006-2007, where CSD-14 will be a Review Session, and CSD-15 will be a Policy Session.

Significant progress has been achieved in addressing the uncertainties and improving the scientific basis for decision-making with regard to the global climate change. The third assessment report (SAR) of the intergovernmental Panel on Climate Change (IPCC) has stated that there is now stronger evidence for a human influence on climate than at the time of the second assessment report published in 1995, and it is likely that increasing concentrations of greenhouse gases have contributed substantially to the observed global warming over the past 50 years. The IPCC report notes that the concentration of atmospheric carbon dioxide has now risen to over 360 parts per million from a pre-industrial level of about 270 parts per million. Carbon dioxide has an effective lifetime in the atmosphere of about 100 years, so its global mean concentration responds only very slowly to changes in emissions. Of the anthropogenic greenhouse gases, carbon dioxide makes the largest direct additional contribution to radiative forcing at present and is likely to do so for some time into the future. Stabilization of carbon dioxide emissions at current levels would slow down the consequential projected climate change but would still result in rising atmospheric concentrations. Emissions reductions of 60-70 per cent from current levels would be needed to prevent carbon dioxide concentrations from rising further. The work of the United Nation Framework Convention on Climate Change (UNFCCC), and in particular the implementation of the Kyoto Protocol, will be crucial for reducing the emissions of greenhouse gases with the goal of stabilizing and ultimately reducing the atmospheric concentrations of these gases.

This report aims at taking stock of the actions taken by the Arab countries to respond to the challenge of climate change, and to meet their obligations under the UNFCCC. It was meant to feed into the UN Secretary General's State of Implementation report on Climate Change for CSD-14, and to be presented at the forthcoming Regional Implementation Meeting in Cairo.

Due to severe time limitations, this report heavily relied on the online resources presently available at the UNFCCC secretariat's website.

2. Climate change

Since the industrial revolution, the concentration of CO_2, one of the major greenhouse gases, in the atmosphere has increased significantly. This has contributed to the enhanced greenhouse effect known as 'global warming'. The CO_2 concentration in the atmosphere is currently about 370 parts per million (ppm) — an increase of more than 30 per cent since 1750. The increase is largely due to anthropogenic emissions of CO_2 from fossil fuel combustion and to a lesser extent land-use change, some industrial processes, and biomass combustion (IPCC 2001a). Greenhouse gas emissions are unevenly distributed between countries

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and regions. In general, industrialized countries are responsible for the majority of historical and current emissions. Industrialized countries (Organization for Economic Cooperation and Development - OECD) contributed more than half of CO_2 emissions in 1998, with an average per capita emission of about three times the world's average. However the OECD's share of global CO_2 emissions has decreased by 11 per cent since 1973 (IEA 2000).

The UNFCCC, adopted at the United Nations Conference on Environment and Development (UNCED) in 1992, has the ultimate objective of 'stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system' (UNFCCC, 1992). Being a framework treaty, the UNFCCC contained only a non-binding recommendation for industrialized countries to return to the 1990 emission levels of CO_2 and other greenhouse gases (not controlled by the Montreal Protocol) by the year 2000. The Kyoto protocol, adopted in 1997, contains, for the first time, greenhouse gas reduction targets for most industrialized countries. The targets, however, range from an obligation to reduce emissions by 8 per cent (for the European Union and many Central European countries) to a permission to increase emissions by 10 per cent (Iceland) and 8 per cent (Australia). Overall, industrialized countries are required to reduce their aggregated emissions to at least 5 per cent below the 1990 level in the period 2008–12 (UNFCCC, 1997). Meeting the Kyoto targets will be just a first step in coping with the problem of climate change because it will have a marginal effect on the greenhouse gas concentration in the atmosphere. Even if, in the long term, a stabilization of atmospheric greenhouse gas concentrations is achieved, global warming will continue for several decades, and sea levels will continue to rise for centuries with serious consequences for millions of people (IPCC 2001a, b). The impacts that global warming may have upon the environment, human survival and development, are copious and pervasive, some of which may be adverse and irreversible, including changes in the global sea level, the availability of fresh water supplies, agriculture and the food supply, global ecosystems, and human health.

3. The Arab energy sector

The Arab energy sector has been playing a crucial role in the socioeconomic development of the Arab countries. It is characterized by a huge oil and gas sector and a large electric power sector dominated by thermal power generation. The oil and gas sector represents the largest economic sector in most of the Arab countries especially in the Gulf region. Over the past three decades the GCC countries, the major oil exporters, have witnessed an unprecedented economic and social transformation. Oil proceeds have been used to modernize infrastructure, create employment, and improve social indicators. Thus, The GCC countries have become an important center for regional economic growth (UNEP, 2003). The Arab countries hold 61% of the world oil reserves, and 26 % of the world gas reserves. They produce nearly 30 % of the oil production, and 11 % of the world gas production. Together, the GCC countries account for about 45 percent of the world's proven oil reserves and 25 percent of crude oil exports (Saudi Arabia is the largest world oil exporter), and possess at least 17 percent of the proven global natural gas reserves. Algeria is the fifth world gas producer in 2002, while Qatar has become the fourth-largest exporter of liquefied natural gas (IEA, 2003).

A. Renewable Energy Resources

The Arab region enjoys tremendous potential for renewable energy resources with 8967 MW of installed hydro-electric capacity and solar resources varying between 1460-3000 KWh/m^2/year. Large Hydropower stations exist in Egypt and Iraq, while small hydropower exists in Tunisia, Syria, Algeria, Jordan, Sudan, Lebanon, Mauritania, and Morocco. Table (1) displays the hydropower potential in the Arab countries (CSD, 2001). The production of hydro electricity in 2001 reached nearly the equivalent of 8.4 millions toe. Wind resources are available in several Arab countries mainly in Egypt, Jordan, Syria, Morocco and Mauritania. Grid connected wind power exists in Egypt, Jordan, Syria, and Morocco, while stand alone wind units are in use in Morocco, Jordan, and Syria. Solar Energy applications though have not been widely promoted in the region yet, some solar water heaters, and small scale photovoltaic applications are in use in some countries such as Tunisia, Morocco, Syria, Egypt, and Jordan. Enormous biomass resources in the form of Biogas, agriculture residues, and wood fuel exist in Jordan, Syria, Sudan, Egypt, and Algeria. In addition, large reserves of oil shale are proven in Jordan, Syria, Morocco and Palestine.

B. Energy consumption

The Arab energy sector is characterized by heavy reliance on fossil fuels. As a result, the sector has adverse environmental impacts on air, water and land resources. Total CO2 emissions from the energy use is estimated at around 900 million tons in 2001, with an average per capita share of 3.1 mt/year, compared to a world average, of 3.87 mt/capita (CAMARE). Correlation between per capita energy consumption and human development indicators of the Arab countries indicates that per capita energy consumption increases in the countries ranked high in the human development scale.

TABLE 1: HYDROPOWER RESOURCES IN THE ARAB REGION

Country	Gross Theoretical Capability (TWh/yr)	Technical exploitable capability (TWh/yr)	Economical Exploitable capability (TWh/yr)
Egypt	125	50	50
Tunisia	1	N	N
Algeria	12	5	
Morocco	12	5	4
Lebanon	2	1	
Iraq	225	90	67
Sudan	48	19	2
Syria	5	4	4

Urban population growth in most Arab countries is high, especially in the Gulf area. The percentage of urban population in year 2000 varied widely across the region. It varied between as low as 25.7 % in Yemen to as high as 96 % in Kuwait. Thus, the increase in future demands for modern energy services are expected to accelerate proportionately. In addition, in Arab rural areas, where the rural population accounts for about 46 % of the total population, traditional energy use, mainly in the form of unprocessed biomass, dominates the energy sector. This low consumption of commercial energy and high dependence on traditional fuels thus became a measure of poverty levels in some parts of the Arab Countries. Therefore, access to clean; reliable, and sustainable energy is vital to socio-economic development and poverty eradication in the Arab world.

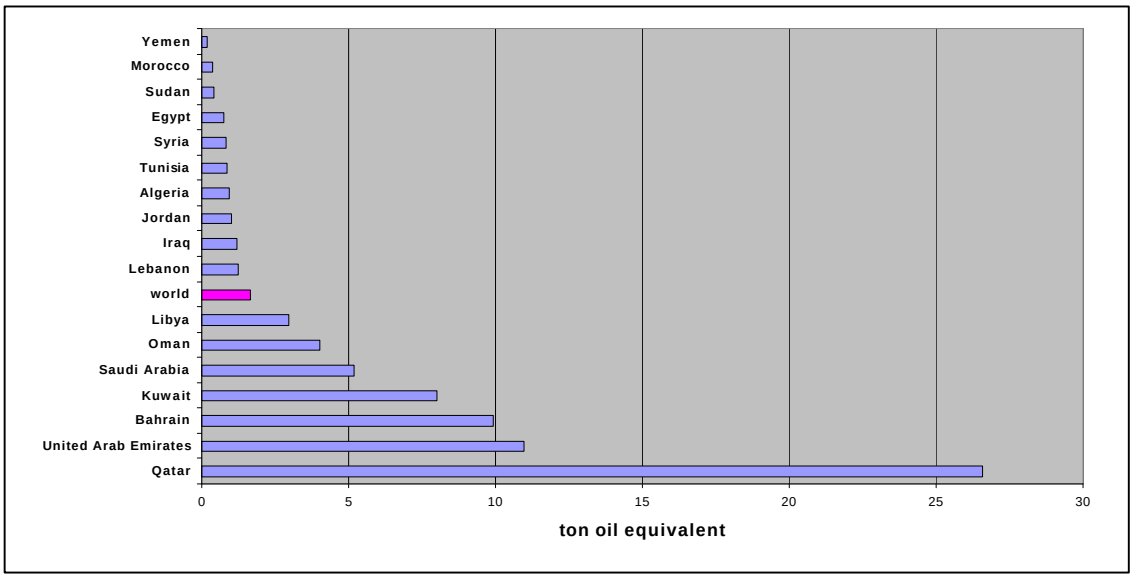
Per capita energy consumption varies greatly between oil producing countries and non-oil producers. Figure (1) shows that Qatar has the highest per capita consumption (26.57 toe), that is six fold the consumption level of the OECD countries (4.68 toe). On the other hand, the per capita consumption of 12 Arab countries is lower than the world average, some of which is as low as 0.2 toe in Yemen. The same figure displays the existing disparities between the Arab countries in energy consumption levels that reflects different levels of development, and thus different quality of life. Almost one-fifth of the Arab population relies on traditional fuels – wood, dung and agricultural residues – to meet their daily heating and cooking needs, particularly in Comoros, Mauritania, Djibouti, Sudan, and Yemen.

C. Disparities in Energy Situations in the Arab countries.

It is obvious from the preceding discussions that there have been disparities between the Arab oil producing countries and those which have no sizable hydrocarbon reserves. Those disparities include the levels of Per capita income, abundance of commercial energy services that reflects on high rates of electrification, and high per capita energy consumption. In addition, oil rich countries, especially in the Gulf area, experience very high rates of urbanization that are considered one of the highest worldwide. Prospects of developing renewable resources in those countries are very low in the short and medium terms. On the other hand, small oil producing countries or some oil importing countries have higher prospects of renewable energy development in rural and remote areas. Countries such as Egypt, Tunisia, Morocco, Syria and others have been developing ambitious plans and programs of renewable energy resources for many years. These disparities impose several challenges that should be addressed to achieve sustainable development. Among the major challenges facing the Arab energy sector are: improving accessibility to modern energy services to eradicate poverty and improve quality of life especially in rural areas, meeting the growing demand on energy resulting from population and economic growth, and urbanization and switching from fossil fuel

based economies to sustainable energy systems. It has been recognized that a number of barriers needs to be overcome. These barriers are: lack of information, lack of market incentives, weak institutional capacities, lack of financing mechanisms, and weak research and development capabilities.

Fig 1. Per capita energy consumption in the Arab countries (2001)



4. State of implementation of the Arab countries

Paragraph 1of Articles 4, and 12 of the UNFCC, require all countries to the Convention to communicate information to the Conference of the Countries (COP). Article 12, paragraph 5, specifies that each Party not included in Annex I to the Convention (non-Annex I Party) shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4, paragraph 3. Countries that are least developed countries (LDCs) may make their initial communication at their discretion. Non-Annex I countries would follow the guidelines for the preparation of initial communications by Countries not included in Annex I to the convention (UNFCCC, 1996 a)

As of the time of preparation of this report (June, 2005), 18 Arab countries have ratified or accessed the UNFCCC (Table 2), only Egypt has ratified the Kyoto protocol, and 12 other Arab countries have accessed it (Table 3). Amongst those countries that are parties to the UNFCCC, Bahrain has not accessed the protocol together with Syria, Lebanon, Mauritania and Libya. Currently, only 12 counties have submitted their first national communication (Table 4) with Jordan as the first country to do so. The last country that submitted its first national communication is Bahrain which is also the only country of the Gulf Cooperating Council (GCC) to do so. Morocco is the only Arab country that submitted an addendum to its first national communication, and a national action plan for environment as well. None of the Arab countries has submitted a second national communication. Following ratification of the UNFCCC, National Climate Change Committees were established and some countries have started to monitor air quality and meteorological parameters. National inventories of greenhouse gases have been completed for several countries and work is underway in others. The UNFCCC secretariat has reported that no information is available about the status of preparation of the national communication of Kuwait, Libya, Syria, Somalia, UAE and Saudi Arabia while the remaining countries are in the process of preparations of their national communications (UNFCCC, 2004).

TABLE 2. STATUS OF RATIFICATION OF UNFCCC (MAY, 2005)

Country	Signature	Ratification, Accession
Algeria	13 – 6 - 92	9 – 6 – 93 (R)
Bahrain	8 – 6 - 92	28 – 12 – 94 (R)
Djibouti	12 – 6 - 92	27 – 8 – 95 (R)
Egypt	9 – 6 - 92	5 – 12 – 94 (R)
Jordan	11 – 6 - 92	28 – 5 – 93 (R)
Kuwait		28 – 12 –94 (Ac)
Lebanon	12 – 6 - 92	15 – 12 – 94 (R)
Libya	29 – 6 - 92	14 – 6 – 99 (R)
Morocco	13 – 6 - 92	28 – 12 – 95 (R)
Mauritania		
Oman	11 – 6 - 92	8 – 2 – 95 (R)
Qatar		18 – 4 –96 (Ac)
Saudi Arabia		28 – 12 –94 (Ac)
Sudan	9 – 6 - 92	19 – 11 – 93 (R)
Syria		4 – 1 –96 (Ac)
Tunisia	13 – 6 - 92	15 – 7 – 93 (R)
United Arab Emirates		29 – 12 –95 (Ac)
Yemen	12 – 6 - 92	21 – 2 – 96 (R)

Source: UNFCCC website: (Accessed 26th June, 2005)
http://unfccc.int/files/essential_background/convention/status_of_ratification/application/pdf/ratlist.pdf

TABLE 3: STATUS OF RATIFICATION OF THE KYOTO PROTOCOL (27 MAY, 2005)

Country	Signature	Ratification, Accession
Algeria		16 – 2 – 2005 (Ac)
Djibouti		12 – 3 – 2002 (Ac)
Egypt	15 – 3 - 1999	12 – 1 – 2005 (R)
Jordan		17 – 1 – 2003 (Ac)
Kuwait		11 – 3 – 2005 (Ac)
Morocco		25 – 1 – 2002 (Ac)
Oman		19 – 1 – 2005 (Ac)
Qatar		11 – 1 – 2005 (Ac)
Saudi Arabia		31 – 1 – 2005
Sudan		2 – 11 – 2004 (Ac)
Tunisia		22 – 1 – 2003 (Ac)
United Arab Emirates		26 – 1 – 2005 (Ac)
Yemen		15 – 9 – 2004 (Ac)

Source: UNFCCC website: (Accessed 26th June, 2005)
http://unfccc.int/files/essential_background/convention/status_of_ratification/application/pdf/ratlist.pdf

TABLE 4: LIST OF ARAB COUNTRIES THAT SUBMITTED THEIR NATIONAL COMMUNICATION (MAY, 2005)

Country	Date of Submission
Algeria	30 – 4 – 2001
Bahrain	20 – 4 – 2005
Comoros	4 - 2003
Djibouti	6 – 6 – 2002
Egypt	19 – 7 – 1999
Jordan	6 – 3 – 1997
Lebanon	2 – 11 – 1999
Mauritania	30 – 7 - 2002
Morocco	1 – 11 – 2001
Sudan	7 – 6 – 2003
Tunisia	27 – 10 – 2001
Yemen	29 – 10 - 2001

Source: UNFCCC website: (Accessed 26th June, 2005)
http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php

A. National circumstances and social economic development

The UNFCCC recognizes the common but differentiated responsibilities, as well as the specific needs and special situations of several groups of countries. In examining national circumstances to determine if any special circumstances exist, reference is made to the ranking of Arab countries in the 2003 Human Development Index (HDI) prepared by the United Nations Development Programme (UNDP, 2003) and to the inclusion of some Arab countries in the list of LDCs prepared by the United Nations Commission on Trade and Development (UNCTAD). Six Arab countries are included in the world's 50 LDC list. They are namely Comoros, Djibouti, Mauritania, Sudan, Somalia and Yemen (UNCTAD, 2004). Djibouti, Sudan and Yemen have accessed the Kyoto protocol, and all of the Arab LDC, but Somalia has submitted their first national communications. It is noticeable that while poor Arab LDC countries have submitted their first national communications, only one country of the GCC group, namely Bahrain, has done so.

The total population of the Arab countries in 2002 was estimated at 300 million, or 4.8 percent of the world population. Population size varies remarkably between the countries of the region leaded by Egypt whose population alone made up 23.5 percent of the region's total population (70.5 million). Countries of the smallest population size were Qatar, Djibouti, Bahrain and Comoros with each population making only up to 0.2 percent of the total. In the last two decades, the Arab population grew at an average rate of 2.6 percent per annum, compared to 1.5 percent of the rest of the world. Table (5) shows some human development indicators for the Arab countries including per cent population below poverty lines of 1$/day and 2$/day. In five countries in the region the GDP/capita is about 1$/day, while almost 85.0 million or 30% of the region's population are below the poverty line of 2$/day. This indicates clearly the different levels of development and poverty situations in the Arab countries. The HDI in countries of the region ranges from 0.482 (Yemen) to 0.843 (Bahrain) compared to an average 0.651 for the Arab States (CAMRE).

TABLE 5: HUMAN DEVELOPMENT INDICATORS AND POVERTY

Countries	HDI (2000)		% Population below income poverty line (1993 PPP USD) 1983 - 2000		GDP/capita ($/yr) 1999
	Rank	Value	%<1 $/day	% < 2 $/day	
Jordan	99	0.717	< 2	7.4	1,713
UAE	46	0.812	-	-	17,318
Bahrain	39	0.831	-	-	8,244
Tunisia	97	0.722	< 2	10	2,211
Algeria	106	0.697	< 2	15.1	1,600
Comoros	137	0.511	N.A.	N.A.	357
Djibouti	149	0.445	N.A.	N.A.	833
Saudi Arabia	71	0.759	-	-	6,903
Sudan	139	0.499	N.A.	90.0	319
Syria	108	0.691	N.A.	19.0	1,234
Somalia			LICUS		-
Oman	78	0.751	-	-	6,000
Qatar	51	0.803	-	-	-
Kuwait	45	0.813	-	-	16,444
Lebanon	75	0.755	-	12.0	4,807
Libya	64	0.773	-	-	-
Egypt	115	0.642	3.1	52.7	1,422
Morocco	123	0.602	< 2	7.5	1,240
Mauritania	152	0.438	28.6	68.7	383
Yemen	144	0.479	15.7	45.2	400

B. Physical geography

Physical geography is essential to understanding the local climate and weather situation. Arab countries have their own different specific aspects of climatic circumstances including variations in rainfall and their effects on water resources. It is worth to mention that out of the 22 Arab countries, 15 are among the water stressed countries with water percapita is less than 1000 cu.m (UNDP, 2002). Geography also defines exposure to extreme weather events such as droughts and flooding in, for example, Djibouti, Sudan, Jordan, Syria, Somalia and Morocco, flash floods in Algeria and the Arabian Peninsula, arid and semi-arid regions of the west Asian countries; and as parts of the Sahara such as Mauritania. Two Arab countries, Bahrain and Comoros are islands states.

C. Inventories of anthropogenic emissions and removals by sinks of greenhouse gases

In accordance with Articles 4, paragraph 1 (a), and 12, paragraph 1 (a), of the UNNFCCC, 12 Arab countries have provided information on their national inventory of anthropogenic emissions by sources and removal by sinks of GHGs not controlled by the Montreal Protocol. This section of the report covers inventory information and methodological and analytical issues and problems identified by those 12 Arab countries listed in Table (4).

(1). Methodological issues

All Countries that submitted their first national communications (Table 4) followed the UNFCCC guidelines (UNFCCC, 1996 a) and, with the exception of Morocco, Sudan, and Comoros, took into account the conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA), at its fourth session, which encouraged countries to apply the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (UNFCCC, 1996 b). All Countries followed the IPCC Guidelines in compiling their national GHG inventories, three of them used the Revised 1996 IPCC Guidelines, and Egypt used the 1995 IPCC Guidelines. All Countries estimated emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), and some has reported emissions of other gases.

(2). Emission factors

The IPCC Guidelines encourage the development and use of local emission factors. Most Arab Countries reported that the default emission factors provided by the IPCC Guidelines often did not reflect national circumstances well, so their use in inventory calculation led to uncertainties in the estimates. IPCC default emission factors were specifically reported to be inappropriate for the agriculture and waste sectors mainly and, to a lesser extent, for the energy sector. Developing national emission factors is an area where Arab countries need to build capacity to improve the quality of GHG inventories.

(3). Aggregate GHG emissions expressed in terms of CO2 equivalent

Table (6) exhibits the GHG emissions of selected Arab countries as reported in their national communications. Because only 12 countries have done so, and as some of their reports neither available online nor available in English, data of GHG emissions available in earth trends (WRI, Earth trends) were also used here for the rest of the Arab countries. While reading Table (6), care should be taken, as the data presented are highly heterogeneous. Only Egypt used 1990/1991 as the base line, Sudan used 1995 and the majority (Comoros, Jordan, Tunisia, and Morocco) used 1994 for the same purpose. Emission data from Earth trends are those of 1998, which made them suitable for cross-country comparisons.

CO_2 was the primary GHG for almost all Arab countries. Both CH_4 and N_2O were not as important contributors to the total GHG emissions. The energy sector was the largest source of GHG emissions for all Arab countries. Agriculture was the second largest emitters for almost all countries. In some countries, such as Djibouti removals by Land Use Change and Forestry (LUCF) offset GHG emissions.

The level of emissions varied widely among reporting Arab countries reflecting, as stated earlier, disparities in energy consumption and levels of development. In 1998, three countries (Saudi Arabia, Egypt, and

Algeria) have CO_2 emissions (excluding LUCF) higher than 100,000 Gg, the rest have lower CO_2 emission levels. On the other hand only Djibouti has a negative balance of -93.16 Gg CO_2 and this is making it one of the world's greenhouse gas sinks.

Using the same set of data to compare percapita CO_2 emissions among Arab countries, it is clear that GCC countries have the highest levels with Qatar in top. This is due to the high levels of percapita income, accelerated rate of industrialization and energy use. Eight countries (Bahrain, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, and UAE) have percapita CO_2 emissions greater than the world's average in 1998, which was 4.1Gg per person.

TABLE (6). EMISSIONS OF GHG IN THE ARAB COUNTRIES (1000 GG)

Countries	CO_2	CH_4	N_2O	CO2	Per capita CO_2 (Gg)
Algeria				106.613	3.6
Bahrain				18.687	31.4
Comoros	0.836	0.074	0.406		
Djibouti	2.038	0.307	0.007		
Egypt	84.5	1.029	0.034	105.753	1.6
Jordan	13.39	0.404	0.0004	13.920	2.2
Iraq				82.378	3.8
Kuwait				49.103	27.1
Lebanon				16.345	5.1
Libya				36.448	6.8
Mauritania					
Morocco	31.908	0.349	0.028	32.035	1.2
Palestine					
Oman				20.270	8.5
Qatar				46.772	80.8
Saudi Arabia				282.995	14
Syria				50.636	3.3
Sudan	20.077	1.985	0.033	3.597	0.1
Tunisia	20.827	0.861	0.169	22.364	2.4
UAE				88.198	37.5
Yemen				14.158	0.8

5. Sustainable development and the integration of climate change concerns into planning

Despite a significant increase in environmental commitment by Arab countries over the past three decades, the national and regional institutions established to manage the sustainable development process remain largely inadequate. While stronger environmental commitments have translated into the establishment of new environmental institutions, which in turn have considerably improved environmental governance in the Arab region, in most cases a significant gap remains with respect to the ability of newly established institutional frameworks to manage effectively the sustainable development process. This is fundamentally attributed to the current culture of environmental management and its associated institutional arrangements and instruments, which take a sector-based approach. The main challenge ahead for Arab countries lies in finding appropriate mechanisms that, while culturally and politically sensitive to the region, can move towards a governance system for sustainable development that is highly integrated, multi-sectoral, process-oriented and participatory.

However, a number of challenges and constraints remain in the Arab region, namely, the formulation of a common definition and understanding of sustainable development; the establishment of a clear and concise

political platform defining specific goals and priorities for action; and the adoption of an integrated approach to sustainable development, which can address economic and social issues alongside and in line with environmental priorities.

The Arab Initiative for Sustainable Development, advanced by the League of Arab States (LAS) in 2002, represents an important beginning in this conceptual process. At a regional level, new institutions have been established over the past three decades. The establishment of CAMRE in 1987 by the Arab League was a watershed for the Arab region in that CAMRE provided the first political forum to address environmental matters regionally. The subsequent establishment of CEDARE to focus on the linkages between the environment and development was an equally significant regional milestone. However, the success of these institutions in advancing sustainable development regionally remains limited due to the difficulty in coordinating sustainable development policies across sectors and ministries at a national level. Moreover, environmental institutions in Arab countries tend to be politically weak. This can be attributed to several factors, including: (a) comparatively recent establishment and restructuring; (b) power of politics; (c) limited institutional mandate; (d) comparatively smaller roles as advisors or coordinators; (e) limited budgets; (f) limited capacity to generate income; and (g) overlapping institutional jurisdictions (ESCWA, 2003).

At the national levels, with regard to managing climate change and meeting countries' commitments within the UNFCCC, all Arab countries have established a climate change national focal points, some of them such as Morocco and Egypt have established a climate change unit (Morocco, 2001), few countries have established a national interagency committee on climate change such as that of Egypt where the committee members represent a wide range of governmental and non-governmental stakeholders, including private sector, scientific community and international organizations. This Committee aims at:

- Coordinating on a national level, regarding the participation of Egypt in the UNFCCC process.
- Developing an integrated Egyptian policies and strategies to deal with the climate change;
- Reviewing and updating the National Action Plan for Climate Change; and
- Following up the implementation of the UNFCCC (Egypt, 1999).

In addition, several organizations are extensively involved at the national levels in climate change related activities. These include academic and research institutions, other relevant government agencies such as those in the energy, water, agriculture, and health sectors, Non government organizations and the private sector. However, these multi-layer climate change institutional arrangements remain to be waited in many Arab countries in order to play a leading role in integrating climate change issues in the national agendas.

6. Measures contributing to addressing climate change

Initial national communications are meant to be the major source of information on the steps taken to mitigate climate change. However, so far, they rarely include detailed assessments of past and/or ongoing mitigation projects or activities; they focus instead on projects, activities or programmes and measures that are envisaged for the future. The information provided in the 12 national communications indicates that GHG mitigation studies had been undertaken in almost all the reporting countries. GEF enabling activity projects (Annex 1) or other multilateral or bilateral programmes included mitigation as part of their activities as well. Emissions projections were provided for some countries where energy models such as ENPEP was used to develop baseline and mitigation scenarios in Jordan and Egypt. This section summarizes different mitigation measures taken or planned by Arab countries to address climate change in the main sectors.

A. Energy

In the energy sector, measures to mitigate GHG emissions cover the supply and demand sides. Measures on the supply side included, among others, energy efficiency in power generation, cogeneration, increasing transformation efficiency, modernization of electric utilities, fuel switching to less carbon fuels, electricity imports, reduction of losses in transmission and distribution, development of plans to promote rural electrification and use of renewable energy sources. A good example of the promotion of renewable energy sources is the Syrian Renewable Master Plan. The plan is calling for the investment of US$ 1.48 billion to

produce power from renewable sources to increase the contribution from renewable energy sources in the national energy balance. This will foster environmentally sound, sustainable energy development and reduce the current near-total dependence on conventional energy sources in Syria. The plan focuses on wind power, bio-energy, and solar hot water systems as well as photovoltaic. By the end of the planning period in 2011, renewable energy sources could satisfy 4.31 per cent of the country's energy needs, leading to a significant reduction in greenhouse gas emissions (UNDESA, 2004). Another good example is the development and commercialization of grid connected wind power in the Red Sea area of Egypt with cooperation with some industrialized countries such as Denmark, Germany and Japan. These projects would generate Certified Emission Reductions (CERs) that will be traded under the Clean Development Mechanism (CDM) of the Kyoto Protocol.

On the demand side, reported countries identified mitigation options in the industrial, residential, and commercial and transport sectors. Regarding the industrial, residential, and commercial sectors, the main reported measures related to enhancement of energy efficiency in lighting, cooling, cooking and air conditioning; implementation of demand-side management programmes; promotion of fuel switching; and use of renewable energy.

Energy efficiency measures included improvements to building designs and the enforcement of building regulations such as in Egypt and Lebanon, and energy efficiency policies in the industrial and residential sectors. Other measures included energy audits, and the use of energy efficiency labeling for appliances such as in Egypt.

In the power generation and residential sector, the switch from more carbon intensive fuels to natural gas was the most commonly reported activity. For example, the use of natural gas was increased considerably in a number of countries. In one country (Tunisia), most of thermally generated energy supply comes from natural gas. In Egypt, more than 90% of the thermal electricity generated is based on natural gas.

In the transport sector, measures envisioned by Arab countries covered development of road transportation master plans; introduction of electric or compressed natural gas vehicles, encouragement of early adoption of hybrid vehicles, discouragement of the use of private vehicles, improvement of the public transport systems, introduction of vehicle emission standards, improvement of road infrastructure, and switching from diesel to electric traction on railways.

B. Agriculture

Measures reported under agriculture included: introduction of new varieties of rice and management of paddies to reduce CH_4 emissions, rational use of fertilizers to reduce N_2O emissions, increase of soil water absorption, and reduction of agricultural residue burning. Measures in the livestock-related operations included improvement of cattle feed, reduction of CH_4 emissions from enteric fermentation, manure management and management of livestock population. To a lesser extent, a switch to environmentally friendly agricultural practices and the development of markets for environmentally sensitive agricultural products also reported as means to mitigate climate change impacts in the agriculture sector.

C. Waste Management

Reported measures in this sector represented different aspects of sound solid and liquid waste management practices. These included reduction of disposal of organic materials in landfills, recovery of methane to generate electricity, solid waste and/or sewage management, composting, and incineration. In addition, revision and strengthening of legislation and promotion of education, training and public awareness on waste issues are also among the planned activities. However, these activities are almost on their early stages of development in many countries.

D. Land use change and forestry

There is a widespread recognition of the potential of forests and, to a lesser extent, land-use changes for enhancing removals of GHGs. Measures proposed included the enhancement of GHG sinks by preserving and increasing the density of existing forest cover, and by planting high productivity forests. They also included: establishing a legal framework for long-term management of forests, establishing forest inventories, setting up a national forest management plan, legislating on types of activities to be authorized within forests, investing in alternative sustainable economic activities for rural populations, and promoting programmes of conservation, regeneration, reforestation, and afforestation.

E. Projects

Many countries included in their national communications a list of proposed projects aimed at reducing GHG emissions and enhancing removal by sinks. A list of projects by country is extracted from the UNFCCC website and shown in Annex I (UNFCCC, 2001).

In the energy sector, the mitigation projects identified in the energy sector related primarily to more efficient production and a wider adoption of renewable sources. Some of the projects proposed were to evaluate the potential of solar, photovoltaic and wind technology, to identify and overcome barriers to widespread adoption of renewable energy, to decentralize electrification by photovoltaic systems, and to adopt a combined cycle expansion of thermal electrical plants which uses natural gas. In the demand side, projects included efficient lighting systems, certification and labeling of appliances and building and dissemination of improved stoves for cooking in rural areas.

Within the industrial sector, projects concerned with improving energy efficiency, cogeneration, fuel switching to natural gas, substitution of materials and process change to improve energy efficiency are listed.

Projects in the transport sector included introduction of zero or reduced emission fuel cell bus operation in Cairo, switching to natural gas in the transport sector, Vehicle emission testing programs, promotion of use of public transport, and rehabilitation of road systems.

In the agriculture sector, only Mauritania reported projects concerning improved water and fertilizer management, and improved efficiency of use of nitrogen fertilizers.

In the waste sector, projects included improvement of an integrated waste management system designed to mitigate GHG emissions, collection and transportation of solid waste in the capital cities, waste to energy technology and reprocessing of landfill gas.

In the LUCF sector, the projects are related to reforestation, wood conservation, and improvement of timber harvesting techniques, conservation and restoration of forests and, rehabilitation and sustainable management practices for degraded rangelands. They also included projects related to forest management and agro-forestry, in addition to reforestation of mountain regions.

7. Research and systematic observations

The experience of the past decades has shown the necessity of systematic observations of the earth's atmosphere, the oceans and the land surface for weather forecasting. In more recent decades it has been demonstrated that further improvements in atmospheric, oceanographic and terrestrial observations will be required to predict and model climate change and variability, and to assess the extent and pattern of trends. It has been identified that improved observations is a crucial foundation for appropriate policy-making on climate change issues. The Conference of countries (COP) of the UNFCCC has highlighted the necessity for improvements in the geographical coverage, quantity, and quality of climate observations and has urged individual countries to address deficiencies in national climate-observing networks. Improvements in both ground-based and space-based observations are needed, and further integration of the two types, to produce consistent and coherent data sets, is imperative. The Global Climate Observing System (GCOS) was established in 1992 to facilitate the required improvements (CSD, 2001).

Research and observations are comparatively weak in the Arab countries as is the case in many developing countries. The constraints relating to research and systematic observation were broadly identified by many reporting Arab countries as lack of financial resources and technical support, and lack of human capacities. Many countries provided information on planned research programmes that will be undertaken depending on the availability of financial and technical resources. Needs and priorities for systematic observation included training and capacity building in the sciences of meteorology and climatology, database development and management, and the upgrading, rehabilitation and strengthening of existing observation systems. Many countries also indicated that large gaps exist in observations and therefore require new monitoring stations, improvement of technical capacities and capabilities, upgrading and maintenance of equipment, and coordination and strengthening of the institutions responsible for education, training and research. Comoros is a good example of those countries that need to develop its capabilities to monitor climate change. Comoros need to strengthen the capacity of its Meteorological Service Agency as it is barely functioning now because of the lack of proper facilities.

A. Research

Most of the research activities identified or planned by the reporting Arab countries were those included in climate change vulnerability and adaptation assessments and identification of adaptation and mitigation options. Agriculture, water resources, coastal zones and forestry sectors were the most common sectors in which limited research and systematic observation were undertaken or planned.

Most reporting countries such as Morocco, Egypt, Sudan and Tunisia provided information on their ongoing or planned research programmes and activities, which focused on a better understanding of the impacts of climate change and variability on environment, biodiversity, forests, agriculture, livestock, water resources, coastal zones, fisheries, human health and socio-economic sectors. For instant, Djibouti reported the need for research on how to manage its waste sector and on the technical and economic feasibility of desalination of sea water and use of its aquifers for the assessment of its water resources. Egypt identified climate research needs to address three main issues: the science of climate; the likely impacts of climate changes; and the policy mitigation and adaptation measures to be implemented. As an example, the Egyptian Meteorological Authority identified the following areas of research as its priorities: global Climate Observing System; global Terrestrial observing System; and global Oceanographic Observing System. Moreover, it needs capacity building that involves staff training on the use of satellites monitoring equipment, and networking with national and international universities, and the World Meteorological Organization (Egypt, 1999).

Research programmes on the impacts of climate change included activities relating to the maintenance of the sustainability of agriculture and forests through various means, such as: development and adoption of new and appropriate technologies to reduce impacts of climate change, investigation of the quantity and quality of surface and ground water resources, improvement of soil management and a better understanding of fishery activities, coral bleaching and marine ecosystems.

B. Systematic observation

When reporting on systematic observation, most Arab countries included information on their observation records and the types and number of observation networks and stations that are in use. In most cases these systems consist of a network of observation and monitoring stations which collect meteorological, oceanographic and hydrological data. Mauritania identified 12 meteorological stations; while Morocco has over 1,000 climatological stations, in addition to a network of regional drought observation units.

Some Countries mentioned their participation in various global observing systems, such as the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS), and others such as Tunisia that acknowledged their cooperation and collaboration with international organizations.

Many countries saw the need to establish strong and effective institutions to manage national observation systems, rehabilitate, modernize and extend the coverage of observation networks, and develop, use and access databases. Problems, difficulties and constraints relating to systematic observation include lack of basic infrastructure for systematic observation, lack of financial and human resources to maintain and/or

upgrade the existing observation systems and inadequate geographical coverage of the climatological and hydrological stations. To enable improved reporting of systematic observation, some countries such as Egypt identified its need for meteorological observations to assess agricultural crop production, upper air quality, hydrological and environmental monitoring, and solar radiation.

8. Climate change impacts, vulnerability, adaptation and response strategies.

There is currently much debate about the extent to which recently observed changes in climate can be attributed to human activities. This is complicated by the fact that climate varies naturally from year to year and decade to decade; thus long-term human-induced warming has to be distinguished from this natural background, wherein lies the challenge of extracting the consequences of human-induced climate change at regional and local levels from those due to natural climate variability. It has been argued that climate change could lead to significant changes in the frequency and intensity of extreme weather and climate events which could lead to disasters. It is not easy, however, to attribute cause or a particular role to climate change in any single extreme event once it has occurred.

A. Methods and sectoral vulnerability assessments

The Arab countries are likely to be affected by climate change. The Arabian Peninsula, Egypt and a number of islands (such as Bahrain and Comoros) will probably be prone to sea level rise. Temperature variations and changes in rainfall patterns will affect water resources and food production capacity in Egypt, Sudan, Morocco and others. Climate change impacts are considered a high priority in some countries such as Morocco, Tunisia, Sudan, Mauritania and Comoros.

In assessing the vulnerability to climate change, many countries used different methods; and many other countries indicated the use of various global circulation models (GCM) to generate climate change scenarios. A wide range of sea-level rise scenarios for different time horizons up to the year 2100 were indicated by countries that reported on sea-level rise such as Egypt, Djibouti, Mauritania, Tunisia, and Morocco.

Most of the reporting countries assessed the vulnerability of agriculture and indicated that it will be affected by increased climate variability and extreme events such as droughts, a loss of soil fertility and erosion, leaching of mineral fertilizers, heat stress on animals and the indirect effects of sea-level rise. Djibouti and Mauritania reported possible losses of agricultural land as a consequence of sea-level rise through inundation and salination. Various crops, including wheat, maize, rice, and cotton, were assessed under a variety of climate change scenarios. The results are not comparable across countries because of the diversity of assessment methods and approaches used. Egypt reported both positive and negative changes in crop yields and Djibouti presented the results of impact assessments for livestock productivity. Egypt stressed its reliance on imported food products to ensure its food security, which it predicts would be aggravated by climate change.

Many reporting Countries assessed the vulnerability of coastal zones with some countries (Egypt, Djibouti, Mauritania, Tunisia, Morocco, Comoros) conducting the assessment under different sea-level rise scenarios. The main impacts identified were erosion and setback of coastlines, increase of salinity in estuaries and wetlands with the death of mangroves, salt water intrusion into aquifers, beach degradation and losses, decrease in productivity of coastal fisheries and devastating effects on species of coral. Almost all coastal countries, including the small island developing state (Comoros) reported that climate change and its consequent sea-level rise will have devastating effects on coastal communities and infrastructure. In the human settlements sector, Egypt mentioned the necessity to develop a strategy for the migration of at least 2 million people from the delta areas, due to the expected inundation and loss of fertile land.

Many reporting countries provided information on the assessment of climate change impacts on water resources. Some of the countries (Egypt, Djibouti, Sudan, Morocco, Tunisia, and Jordan) reported a potential decrease in water resources (UNFCCC, 2002). The negative impacts of salt water intrusion on water quality, sedimentation and evapotranspiration were indicated by most of the reporting countries, which also stated that they already faced problems of water shortage.

Djibouti presented information on the impact of climate change on terrestrial ecosystems, including forests, mangroves and rangelands. Impacts on forests and rangelands include changes in biomass or the suitability of the land for various uses under projected climate change, a general shift in species composition, with possible extinctions, and changes in vegetation types in warmer climates. Impacts were negative in all cases, with some effects on the society and economy.

Some countries (Djibouti, Egypt) examined impacts on fisheries as a part of their impact assessments relating to climate change and sea-level rise. Possible adverse effects on fisheries due to changes in temperature and loss of productive habitats for many species have been identified. Djibouti indicated changing fishing activities and lower incomes for fishermen. Egypt reported negative effects of climate change on aquaculture. Impacts were expected to stem from destruction of nursery areas and breeding grounds, such as mangroves and coral reefs, availability of nutrients and increased water temperatures.

Many countries such as Sudan, Mauritania and Egypt reported information with varying levels of detail on the assessment of climate change impacts on human health. Most of the reporting countries indicated that the incidence of water- and vector-borne diseases will certainly increase, as well as those related to water contamination. A number of diseases have been identified, the most common being malaria, dengue and diarrhoea, which are likely to increase in incidence under future climate change. Many countries also mentioned the additional stress higher temperatures will have on the population, which is likely to make them more prone to sicknesses. Some countries indicated a likely increase in the incidence of endemic diseases as a consequence of climate change, due to population growth and poorer sanitary conditions.

Some reporting countries such as Egypt and Tunisia provided information on the vulnerability of other sectors or resources, such as human settlements, tourism and biodiversity. Comoros and Egypt reported potential adverse effects of climate change on coral reefs and their consequences on the tourism industry.

B. Adaptation measures and response strategies

All reporting Arab countries stated the need to implement adaptation measures to minimize the effects of climate change on the most important socioeconomic sectors. Most countries described adaptation activities in terms of future programmes and ongoing research, listing possible adaptation options and needs to combat adverse effects of climate change. None of the reporting countries provided information on the implementation of adaptation measures.

Most countries provided information on adaptation options, measures and/or strategies related to climate change impacts for a wide range of sectors such as water resources. They indicated various water policy reforms to be introduced such as those focusing on water conservation, desalination, flood management and construction of dams. Some countries reported on adaptation options and/or strategies in agriculture, which varied from development of drought-tolerant crops to improving early warning systems, enhancing erosion control, and training and assisting farmers. Other countries reported on adaptation measures which could be undertaken in coastal zones, namely integrated coastal zone management, and yet others reported on human health, forests, tourism, fisheries, human settlements, biodiversity and wildlife. Reported measures included improvement of the health care system, enhancement of forest management, protection of tourism infrastructure, strengthening of environmental legislation and promotion of nature conservation.

One of the most important constraints on the assessment of vulnerability and adaptation was the lack of capacities to conduct the type of vulnerability and adaptation assessments that would generate reliable results for incorporation into national development planning processes. The lack of data arises because of inadequacies in data collection and monitoring, and access to existing databases, and the lack of capacity to analyze, manipulate and improve quality assurance in some data sets.

C. Economic impacts of "response measures"

It should be noted here that none of the Arab oil producing and exporting countries, have reported any assessments of their vulnerability to the possible impacts on their economies of the implementation of

policies and measures by Annex B countries in meeting their emissions reduction targets under the Kyoto Protocol. The following are areas of concerns that need to be addressed in future work:

- Assessing further modeling work to determine, with less uncertainty, the magnitude of the impact of response measures and to assess the impacts of response measures on individual Arab countries.
- Modeling and assessing the effects of policies, such as market approaches (taxes, subsidies, cap-and-trade) on the economies of Arab countries, especially those of the oil exporting countries.
- Addressing the inability to fully disaggregate the impacts of a suite of climate change measures and mechanisms given the intricate linkages between national and international economies, and the complexities among different sectors.
- Promoting international cooperation in fostering research on improving model quality by building upon the work already compiled by the IPCC in the Third Assessment Report. The Arab countries should also increase their participation in the preparation of future IPCC assessments on modeling activities.

9. Education, training, and public awareness

The level of awareness on climate change issues is generally low in developing countries; the Arab countries are no exception. The Arab reporting countries reported on the development and implementation of educational, training and public awareness programmes on climate change and its effects. Some of them such as Comoros expressed their need for financial and technical support to address their concerns on education, training and public awareness. Other countries (Egypt and Morocco) provided information on the extent of participation in international and/or regional educational programmes and workshops relating to climate change. However most of them shared their concerns about the inadequacy of national programmes on education, training and public awareness relating to climate change for academic and research institutions, policy makers, practitioners in the media and industry, students and teachers in formal and non-formal education, non-governmental and community-based organizations, and the public at large.

A. Education

Some countries (Morocco, Egypt, Tunisia, Mauritania, and Yemen) provided general information on existing initiatives and/or future plans to incorporate the issue of climate change into primary, secondary and tertiary educational programmes. Some of these countries such as Egypt, and GCC countries had already started teaching climate change, mainly at the university level.

B. Training

Reporting countries provided information regarding training on issues related to climate change. Some of them indicated target groups for climate change training activities. Others highlighted the importance of the various training activities they had been involved in during the preparation of the initial national communications. They indicated the valuable input they had received from various multilateral and bilateral training programmes on the different components of the national communications. Some of them (e.g. Morocco) provided information on their participation in, and/or organization of, regional and international training programmes and workshops, while others expressed the need to have training on specific technical and policy issues relating to climate change and sustainable development.

Many reporting countries such as Tunisia, and Comoros identified their training needs on climate change related issues, while others such as Djibouti expressed the need to build capacity for the formulation of climate change project proposals in the required format and/or to access bilateral and multilateral funds for project development and implementation.

It is worth to mention that training of national experts on climate change issues such as national GHG inventories, vulnerability and adaptation assessments, and GHG mitigation analysis should be carried out continuously. The scope of training should be widened, to include data and uncertainty analysis and vulnerability and adaptation assessments. Training is required in a number of key areas in vulnerability and

adaptation assessment: use of climate models and preparation of scenarios for vulnerability and adaptation assessment, use of impact models, establishment and management of databases, identification and collection of information on vulnerability and adaptation and interpretation of results (CGE, 2002).

C. Public awareness

Reporting Arab countries stressed the importance of public awareness in the area of climate change. All of them stated that public awareness on the issue of climate change is still in its early stage of development, and most of them highlighted the challenges they faced in improving it. They reported on the ways and means used for existing and planned public awareness activities. These means included, inter alia, workshops, radio and television programmes, newspapers, films, pamphlets and web sites. They also reported on planned, ongoing and/or implemented special awareness campaigns for specific groups such as decision makers, journalists, artists, NGOs, academia, coastal communities, and the private sector. Public participation was another effective means for raising public awareness in Djibouti where introduction of new technology such as composting was used in this regard. The collaboration of NGOs in public awareness campaigns was also mentioned by Egypt, Tunisia, Morocco, and Mauritania.

10. Financial and technological needs and constraints

As stated earlier, all reporting Arab countries acknowledged having received financial and technical assistance from the GEF and its implementing agencies, and/or from other multilateral or bilateral programmes, for the preparation of their initial national communications, and indicated the need for further assistance. Reported needs related to lack of capacity for the preparation of GHG inventories, assessments of impacts and vulnerability to climate change, facilitation of adaptation to the adverse effects of climate change, and the identification and implementation of measures for addressing climate change. Djibouti indicated that it requires extensive assistance in all areas of the national communication process. Most countries reported on their needs relating to climate change research and systematic observation, in particular, their need to develop, extend and/or modernize national climate observation system to provide essential input to national efforts on vulnerability and adaptation assessments, and to develop models and tools for climate change research and analysis. Countries indicated the need to enhance research through improved collection and management of data. Mauritania, Egypt, and Tunisia highlighted the importance of creating and/or strengthening research institutions that deal with climate change.

A. National greenhouse gas inventories

Most countries reported on constraints and/or needs with regard to preparing their national GHG inventories, in particular, to the availability, accessibility, management and/or quality of activity data. Almost all of them indicated that they had concerns relating to the appropriateness of default emission factors. Most countries (Morocco, Djibouti, and Sudan) referred to the need to strengthen the capacity of institutions involved in the preparation of the GHG inventory, including the training of personnel. Reported problems also included lack of data management capabilities, lack of models for specific sectors, insufficient training on available models, lack of appropriate technologies and difficulties with technology transfer.

B. Measures for addressing climate change

Although developing countries including Arab countries do not have commitments for limiting GHG emissions, all of the 12 reporting countries provided information on mitigations options in their national communications (Annex I).

Some technical difficulties were encountered in the estimation of the emissions reduction associated with the implementation of identified measures. Also, the technical potential for emission reduction in some of the sectors and the cost associated with the implementation of measures were difficult to assess. Other problems identified included limited access to appropriate technologies for the development of integrated mitigation strategies and policies.

With regard to assistance to build capacity to formulate mitigation projects for funding, Djibouti, for example, identified insufficient human and institutional capacity and finance to prepare projects; Mauritania mentioned the priority for formulation and analysis of projects; and proposed mitigation projects for funding in accordance with Article 12, paragraph 4, of the UNFCCC.

C. Assessment of vulnerability to climate change

All countries reported on constraints relating to the assessment of vulnerability to climate change. The most frequently reported constraint was the lack of in-depth studies in various sectors including agriculture, biodiversity, forestry, health and tourism. Several countries have encountered various problems and constraints affecting the completion of vulnerability assessments in preparing their initial national communications. The assessments were not very exhaustive and did not cover all sectors, mainly because of a lack of capacity, of good quality data, and of financial resources. Most assessments were qualitative, and used expert judgment instead of quantitative studies. Djibouti lacks data for studies on water resources, coastal zone and ecosystems (UNFCCC, 2003) while Mauritania lacks reliable climatic data and needs to enhance research activities for better vulnerability assessments.

Some countries stressed that funding available to conduct impact and vulnerability analyses in many sectors that are of vital importance to the national economy was inadequate. Many countries indicated that in order to address climate change issues in a multidisciplinary and an efficient way, they would require additional financial and technical resources to develop and train a critical mass of human resources.

D. Measures to facilitate adaptation

Some countries such as Djibouti, Sudan, Comoros and Mauritania reported on constraints with regard to identifying, evaluating or implementing measures to adapt to the adverse impacts of climate change. The most frequently reported constraints being the lack of institutional capacity, including sufficiently trained personnel and financial resources. Some countries such as Egypt, Djibouti and Mauritania included a list of adaptation projects for funding. Djibouti reported that finance is the major constraint for implementation of the proposed programme to facilitate adaptation; Mauritania reported that institutions responsible for implementing strategies and adaptation measures need to have sufficient human resources, materials, logistics and finance.

11. Capacity Building

Arab reporting countries have identified the extent of involvement of academics and experts in the preparation of the IPCC reports and similar assessments. They identified technical and financial assistance and means to strengthen capacity building to fulfill the obligations and commitments towards UNFCCC, and means to enhance scientific and technological capabilities for the exchange of scientific data and information. Most of them indicated their needs for capacity building in the collection, archiving and management of data needed for the preparation of national communications. Some of them provided information on their needs for building national capacity for climate change project development and management, the need for building capacities to generally address climate change, the need to promote information sharing and networking at the national, sub regional/regional, and international levels, and the needs in relation to the integration of climate change into national planning and policy-making towards sustainable development. Further common reported capacity building needs were better institutional arrangements to enable data collection and analysis, improved coordination and cooperation between relevant institutions and agencies as key factors in facilitating the integration of climate change concerns into policy-making processes, and improving the capabilities of national climate change related institutions. In addition, a reported need was enhancing existing methodologies and capacities to undertake integrated assessment of climate change impacts in different sectors (such as water resources, agriculture and human health or coastal zones, human settlements and biodiversity, etc.).

The Global Environment Facility (GEF) has largely contributed through its enabling activities in building the capacity of the Arab countries for meeting their obligations under the UNFCCC. Annex II displays the enabling activities funded by GEF in the Arab countries.

12. Technology Transfer

GEF and other bilateral and multilateral donor organizations have been playing a crucial role in facilitating the transfer of climate friendly technologies to some Arab countries. Examples are many and include the electrical and hybrid vehicles demonstration project in Cairo, the Reduction of Methane Emissions and Utilization of Municipal Waste for Energy in Amman, the Decentralized Electrification in the Northern Coastline of Mauritania through Hybrid (Wind/Diesel) Systems, and the Solar Based Thermal Power Plant in Morocco (GEF). However, many reporting Arab countries showed their needs for technology transfer in different areas of climate change mitigation and adaptation. This is due to the lack of appropriate technologies, lack of research and development (R&D) capabilities and difficulties with technology transfer from developed countries. Assistance related to the enhancement and/or creation of an enabling environment is regularly incorporated in the implementation of different climate change projects funded by GEF and its implementing agencies. Such assistance include the study of, or enhancements to, the implementation of climate change-related policies, the removal of technical, legal, social and administrative barriers, and regulatory frameworks related to the transfer and development of climate friendly technologies.

13. A framework for actions

In view of the findings of some Arab countries in preparing their initial national communications, there is evidence of substantial vulnerabilities to the projected climatic changes, particularly for poor populations and populations in coastal areas. Thus, there is a need to draw attention to adaptive capacity and vulnerabilities of populations, natural systems and socio economic development. Based on this experience, a number of lessons could be drawn. These include: the importance of involvement of key stakeholders, the need to promote effective information exchange and networking at the national, regional and international levels, the urgent needs of formalizing the national climate change committees and building the institutional capacities, the needs to promote synergies with other environmental policies and programmes, and the importance of promoting regional cooperation on relevant issues such as developing emission factors, activity data for improving the GHG inventories, climate observations and early warning systems. In addition, Arab countries should be made aware of and provide more inputs to the IPCC deliberations, and the IPCC should give more attention to guidelines on vulnerability and adaptation issues.

International community should support Arab countries in building the needed institutional structures for better coherence of climate change policies with national policies and strategies. It should also provide enhanced assistance to national education systems to consider climate change at the primary, secondary and tertiary levels. Educational systems should encourage wider understanding and study of society/environment interactions, because there is a need for a better informed public on the consequences and impacts of climate variability and change. Financial assistance is urgently needed to some Arab countries, especially LDCs to plan, and implement response measures to adapt to the potential impacts of climate change. Developed countries are required to assist Arab countries on issues of technology transfer, and the selection of appropriate technologies.

Capacity building efforts should include national and/or regional expertise to collect, process and analyze data for enhancing the preparation of national communications and planning for sustainable development. It should include strengthening of national UNFCCC focal points and strengthening of relevant and key academic and research institutions and nongovernmental organizations. Training activities are highly needed in areas such as vulnerability and adaptation assessments, climate modeling and observations, and data management. There is also an urgent need to build capacity to deal with the issues of land use, land use change and forestry.

Political support at the country level is essential, and Arab countries are encouraged to participate in the global activities related to disaster reduction and initiatives on global change research and systematic observations. In addition, oil exporting countries should cooperate in assessing further modeling work to determine, with less uncertainty, the magnitude of the impact of response measures of developed countries on individual Arab economies.

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ANNEX I - LIST OF PROJECTS REPORTED BY SOME ARAB COUNTRIES

Sector	Country	Project title
Agriculture	Mauritania	Improve water and fertilizer management
		Improve efficiency of use of nitrogen fertilizer
Energy	Algeria	Reduction of flaring gas by 50 per cent
		Reduction of fugitive emissions by renovating oil and gas installations (refineries, pipelines)
	Jordan	Alkylation unit
		Co-boiler for the fluid catalytic cracking unit
		Continuous catalytic reformer
		Crude oil distillation unit
		Expansion of distillation capacity
		Gasification
		Heat recovery from sulphuric acid plant/Jordan Phosphate Mining Company
		Hydro desulphurization for diesel
		Hydrocracking
		Isomerization unit
		Modern fluid catalytic cracker
		Merox upgrade
		Sulphur recovery plant
		Exploration regarding geothermal energy in Jordan
		Power supply by PV systems to remote villages
		Reverse osmosis water desalination (ROWD) with renewable energy hybrid system in remote areas
		SALT-gradient solar pond pilot plant
		Solar and wind energy resources assessment and mapping
	Egypt	Energy efficiency improvement and GHG reduction
		Integrated solar thermal/natural gas power plant
		Heat supply from solar energy
	Morocco	Development of renewable energy
		Promoting sustainable biomass energy use in rural areas to reduce CO_2 emissions
		Increasing the number of hydropower units
		Encouraging the use of solar water heaters
		Electricity generation using wind energy
		Development of cogeneration
		Desalination of water using wind energy in Tan-Tan
		Drying sugar beet by using superheated steam in the Doukkala sugar refineries
		Partial substitution of clinker by fly ash from thermal plants
		Use of humid phosphate instead of dry phosphate in the Jorf Lasfer plant
		Financing the decentralization of rural electrification
		Rational use of energy in government buildings
		Promote the use of improved boilers in business establishments (hammams, ovens)

Sector	Country	Project title
(Energy)	Sudan	Install mini- and micro-hydropower generation for electricity in high-potential areas of Sudan 2003
		Energy auditing in the industrial sector
		Replacing biomass fuel with higher energy density fuels in sectors of household, bakeries and brick-making industry
		Introduction of solar cookers in household and services sectors
		Introduction of new building techniques to improve natural ventilation and air conditioning in household and commercial buildings
	Lebanon	Removing barriers for implementing renewable energy
		Industrial sector: efficiency improvements to boilers and furnaces via replacement and fuel switching options
		Efficiency improvements to boilers and furnaces via replacement and fuel switching options
		Motor-driven system improvement and replacement
		Energy efficiency: building sector
		Enhancing thermal performance of building envelopes: capacity-building project
		Enhancing thermal performance of building envelopes: market-based programme
	Tunisia	Enhancement of the market for solar water heaters
		Setting rules for thermic building efficiency
		Certification of refrigerators
	Djibouti	Promote use of solar energy in rural areas through education and public awareness, capacity-building and technology transfer
	Mauritania	Promoting the use of PV equipment
		Installation of wind generators in Nouadhibou
		Promoting the use of improved stoves
		Promoting the use of kerosene as cooking fuel
		Use of peat as cooking fuel
		Connection of Nouakchott to the OMVS (Organisation pour mise en valeur du fleuve Sénégal) grid
		Electrification of the Vallée village
		Energy saving in government buildings
	Comoros	Improve the conservation and management of forest resources
LUCF	Sudan	Afforestation and reforestation programs for waste degraded rangelands
		Improvement of timber harvesting techniques
		Rehabilitation and sustainable management practices for degraded rangelands
	Mauritania	Management of natural resources in wet zones
		Reforestation programmes in Assaba, Gorgol, Brakna, Trarza, Guidimakha, Hodh el Gharbi, Hodh Chargui and Tagant
	Djibouti	Reforestation and management of forests through EPA, capacity-building and data basing/studies
		Reforestation and management of plains and small catchment areas
		Reforestation of mountain regions
	Morocco	Supporting the reforestation master plan
		The development of agroforestry

Sector	Country	Project title
Industry	Morocco	Use of humid phosphate instead of dry phosphate in the Jorf Lasfer plant
		Partial substitution of black phosphate by white phosphate in Youssoufia
		Heat recovery in the Safi and Jorf Lasfer chemical plants
		Increased use of natural gas in the industrial sector
		Rational use of energy in the industrial sector
		Rehabilitation of mining sites in Khouribga
		Replacement of boilers in the industrial and tertiary sectors
	Comoros	Promotion of the substitution of wood with non-metallic mineral material for construction usage
	Djibouti	Valorization of waste as energy source
	Lebanon	Cement industry: conservation and preheating in pyroprocessing and improvements in the grinding process
Solid waste management	Egypt	Climate change early action technology measures: methane recovery from landfill
		Reduction of methane emissions to the atmosphere through commercial utilization of landfill methane
	Lebanon	Composting and landfilling with gas recovery and flaring
		Composting and landfilling with gas recovery and utilization
		Landfilling with gas recovery and flaring
		Landfilling with gas utilization
	Morocco	Recovery of biogas from solid waste disposal sites in Mediouna and Marrakesh
		Recovery of biogas from waste water treatment plants in Benslimane and Grand Agadir
	Mauritania	Waste management in Nouakchott village
		Composting
	Djibouti	Waste treatment and use of waste for energy production
Transport	Egypt	Integrated system for zero or reduced emission fuel cell bus operation in Cairo
		Climate change early action technology measures: retrofitting 2-stroke engines
	Morocco	Diagnostic centers for vehicle engines
	Mauritania	Limit import of used vehicles, reinforce technical inspections, encourage use of public transport
	Sudan	Energy conservation in the transport sector (redesign the construction of roads and rehabilitation of existing roads)

ANNEX II - GEF FUNDED ENABLING ACTIVITIES IN THE ARAB COUNTRIES

Country	Title	Status
Egypt	Building Capacity for GHG Inventory and Action Plans in response to UNFCCC Communication Obligations.	Completed
Jordan	Capacity Building to enable Response to the UNFCCC	Competed
Lebanon	Enabling Activity (Building Capacity for GHG Inventory and Action Plans in Response to UNFCCC Communications Obligations	Completed
Morocco	Enabling Morocco to Prepare its First National Communications in response to commitments to the UNFCCC	Competed
Oman	National Capacity Building to Enable the Sultanate of Oman to Prepare its National Action Plan and First National Communication	Under implementation
Saudi Arabia	Enabling Saudi Arabia to Prepare its First National Communications in response to commitments to the UNFCCC.	Under implementation
Sudan	Capacity Building to Enable the Sudan's Response and Communications to the UN Framework Convention on Climate Change	Completed
Tunisia	GHG Inventory: National Strategy and Action Plans for Emission Reduction and Communications under the UNFCCC	Completed
Yemen	Enabling Yemen to Prepare its First National Communications in response to commitments to the UNFCCC	Completed
Yemen	National Adaptation Programmes of Action (NAPAs)	Under implementation
Sudan	National Adaptation Programmes of Action (NAPAs)	Under implementation
Egypt	National Capacity Self-Assessment (NCSA)	Under implementation
Jordan	National Capacity Self-Assessment (NCSA)	Under implementation
Lebanon	National Capacity Self-Assessment (NCSA)	
Libya	National Capacity Self-Assessment (NCSA)	Under implementation
Morocco	National Capacity Self-Assessment (NCSA)	Under implementation
Sudan	National Capacity Self-Assessment (NCSA)	Under implementation
Syria	National Capacity Self-Assessment (NCSA)	Under implementation
Tunisia	National Capacity Self-Assessment (NCSA)	Under implementation
Yemen	National Capacity Self-Assessment (NCSA)	Under implementation
Algeria	Elaboration of a National Climate Change Strategy and Action Plan	Under implementation
Egypt	Building Capacity for GHG Inventory and Action Plans in response to UNFCCC Communication Obligations	Under implementation
Jordan	Capacity Building to enable Response to the UNFCCC	Under implementation
Lebanon	Enabling Activity (Building Capacity for GHG inventory and Action Plans in Response to UNFCCC Communications Obligations	Under implementation
Morocco	Enabling Morocco to Prepare its First National communications in response to commitments to the UNFCCC	Under implementation
Oman	National Capacity Building to Enable the Sultanate of Oman to Prepare its National Action Plan and First National Communication	Under implementation
Saudi Arabia	Enabling Saudi Arabia to Prepare its First National Communications in response to commitments to the UNFCCC	Under implementation
Sudan	Capacity Building to Enable the Sudan's Response and Communications to the UN Framework Convention on Climate Change	Under implementation
Tunisia	GHG Inventory: National Strategy and Action Plans for Emission Reduction and Communications under the UNFCCC	Under implementation
Yemen	Enabling Yemen to Prepare its First National communications in response to commitments to the UNFCCC	Under implementation

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