

The World Bank
Middle East and North Africa Region (MENA)
Sustainable Development Sector Department (MNSSD)
Regional Business Strategy to Address Climate Change

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Note

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I BACKGROUND

I.1 Regional Impacts of Climate Change

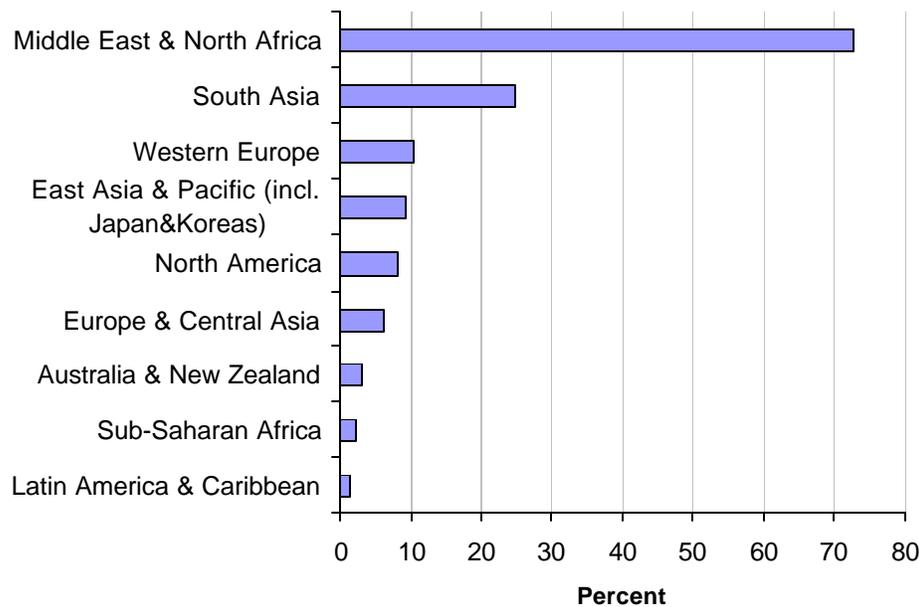
The Middle East and North Africa (MENA) is one of the regions most vulnerable to climate change, on account of water scarcity (the highest in the world), a significant dependence on climate-sensitive agriculture, the concentration of population and economic activity in flood-prone urban coastal zones, and the presence of conflict-ridden areas in which climate-induced resource scarcity could escalate violence and political turmoil even beyond the region's boundaries.

The latest scientific assessments of the distribution of climatic changes across the world are unequivocal on the magnitude of the changes to be expected for MENA: due to lower precipitation, water run-off is projected to drop by 20 to 30% in most of MENA by 2050 (Milly et al, 2005)¹; the IPCC 4th assessment report estimates an increase in temperature in MENA of up to 2 degrees in the next 15-20 years, and over 4 degrees for the end of the century (the increase is higher for faster emission scenarios).

The combined effect of higher temperature and reduced precipitation (especially at critical stages of plants' growing cycles), will increase the occurrence of droughts: an effect which is already materializing in the Maghreb, with an increasing of drought frequency from one event every 10 years in the beginning of the 20th century, to five or six events every 10 years currently (Agoumi, 2003). Climate change will require a more severe adjustment of water resource management in MENA than any other region (Figure 1): over three-quarters of MENA's water resources are already being withdrawn for human use. Any given percentage reduction in precipitation in MENA will therefore translate into a four times higher percentage decrease in water available for additional withdrawal. The next highest level of water use is in South Asia, where only one quarter of water resources is currently being withdrawn.

¹ Some models reviewed by the IPCC predict a trend of precipitation *increase* in some of the regions' desert areas (particularly in the Arabian peninsula – including Yemen and Saudi Arabia), and in Iran. Given the extremely low level of baseline precipitation, it is unlikely that these increases could have significant impacts on overall water availability. On the other hand, to the extent that the higher rainfall concentrates in short, intense precipitation events, this might actually lead to an increase in the risk of flash floods, and might have negative consequences on aquifer recharge under certain geological conditions. The net result might be quite negative for countries already experiencing severe water crisis like Yemen

Figure 1 Percentage of Total Renewable Water Resources Withdrawn by Region



Source: Compiled from FAO AQUASTAT data for 1998–2002.

Note: The figure shows the sum of withdrawals across all countries in a region, divided by the sum of all the renewable water available in each country.

Global models predict sea levels rising from about 0.1 to 0.3 m by 2050, and from about 0.1 to 0.9 m by 2100. While impacts on MENA’s land areas are lower than the average of developing countries (0.25% vs. 0.31% with a 1m Sea Level Rise, SLR), when measured in social, economic and ecological terms, impacts on MENA are estimated to be relatively higher: a 1m SLR would affect 3.2% of MENA’s population (vs. 1.28% worldwide), 1.49% of its GDP (vs. 1.30% worldwide), 1.94% of its urban population (vs. 1.02% worldwide), and 3.32% of its wetlands (vs. 1.86% worldwide) (Dasgupta et al, 2007). Low-lying coastal areas in Tunisia, Qatar, Libya, UAE, Kuwait, and particularly Egypt, are at special risk: in the Nile Delta, a 1m SLR would affect 10% of the population and 13% of the country’s total agricultural area.

Unless adequate and rapid action is taken to reduce MENA’s vulnerability to climate change, the region will be exposed to large economic and social impacts,

- Some additional 80-100 million people will be exposed, by 2025, to water stress (i.e. access to less than 1,000 m³/ capita/ year), compared to the 1995 baseline (Warren et al, 2006); this will exacerbate competition for water across sectors and geographic locations, and will put further pressure on groundwater, which is currently being extracted in most areas beyond the aquifers’ recharge potential;
- Agriculture yields, especially in rain-fed areas, are expected to fluctuate more widely over time, and to converge to a significantly lower longer-term average: a recent study estimates that for the region as a whole, agricultural output will decrease (in value terms) 21% by 2080, with peaks of almost 40% decrease in countries like Morocco and Algeria (Cline, 2007);

- In urban areas in North Africa, between 6 and 25 million people are estimated to be exposed to coastal flooding under a temperature increase of between 1 -3 degrees. In addition, heat waves, increased “heat island effect”, water scarcity, decreasing water quality, worsening air quality, and ground ozone formation are likely to lead to an overall worsening of public health, and more generally, to a deterioration of living conditions.

I.2 Regional Contribution to GHG emissions

MENA emissions of Greenhouse Gases (GHG) are small in absolute terms (in 2000 they were about 4.5% of the world’s total), and in per capita terms.

But the growth of MENA CO₂ emissions from fuel combustion has been the third largest in the world in 1990-2004 (+88%), at roughly the same level of India, and well above LAC (+43%) or AFR (+39%). MENA emissions grew in 1990-2004 more than 3 times faster than the world’s average. In terms of CO₂ intensity, MENA’s energy-based, non-forest-and-landuse CO₂ emissions per unit of GDP per capita are second only to those of ECA, and unlike ECA, the trends do not suggest decreases in intensity.

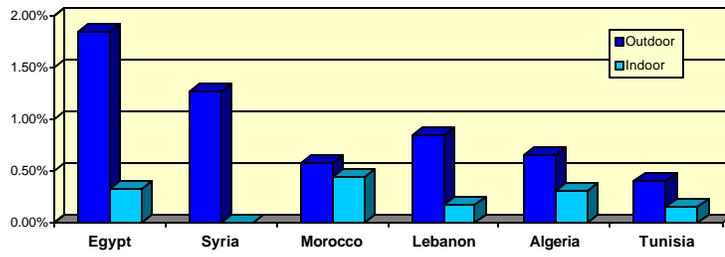
The bulk of MENA emissions is concentrated in the regions’ oil producing countries (Iran, Saudi Arabia, Egypt, United Arab Emirates, Algeria and Iraq), which account for 74% percent of the region’s total.

MENA is an exceptionally high producer of CO₂ emissions due to fuel combustion. In 2004 MENA emitted 1,503 Mtons CO₂, much more than Africa (497Mtons CO₂), Latin America (1,281Mtons CO₂), or India (1,102 Mtons CO₂). The emissions due to energy transformation and use account for 83.9% of all MENA emissions. Within this category “electricity and heat” are the greatest source of emissions, followed by “manufacturing and construction” and “transportation” on more-or-less even keel. It is noteworthy that “fugitive emissions” constitute 12.4% of all emissions, a proportion higher than that found in any other region.

Actions to reduce MENA GHG emissions would also have important ancillary domestic benefits. In particular:

- Some of the key GHG emitting sectors (energy, industry, transport) are also responsible for the release of local air pollutants (PM, Sox, NOx) which in several countries of the region have large health costs (Figure 2);
- Energy subsidies are large in many countries of the region; in addition to creating incentives for wasteful resource use (which increases GHG emissions), energy subsidies cost around 5% of the region’s GDP and are usually regressive. Improving energy efficiency would therefore contribute to the longer-terms competitiveness of MENA’s economies.

Figure 2 Annual damage costs from air pollution as %GDP



II REGIONAL STRATEGY ON CLIMATE CHANGE

On account of the magnitude of the expected impacts of climate change on the region, and of the link between GHG emissions and one of the region's main sectors (energy), climate change lies at the core of MENA's development agenda (see also Box 1). Far from considering climate change a sector-specific concern (to be addressed with stand-alone interventions), the strategy outlined in this document proposes to put climate change squarely at the center of the dialogue that the World Bank holds on the overall development agenda with its partners in the region (client governments, civil society, donor community).

Box 1. Climate change and MENA development agenda

In the face of a recent impressive economic performance (6.1% annual GDP growth in the last three years), largely driven by the oil boom, the region faces a number of persistent challenges to its longer term development prospects, in terms of high unemployment (especially among the numerous young), limited access to export markets, social exclusion, and weak public governance.

While several of MENA countries have embarked (often with assistance from the Bank) in ambitious reform processes to tackle such challenges, much of the progresses made (and of those yet to come) could be jeopardized by climate change. Income and employment could be lost to more frequent droughts in rural areas, and to floods and sea surges in urban and coastal areas. Changes in temperature and precipitation patterns could damage strategic sectors such as tourism, or others with growth potential such as high value added agriculture. Climate-induced out-migration could strain relations with the EU and hinder economic integration across the Mediterranean.

The combination of these impacts could slow down the reform process in governance and public sector management, discourage trade and foreign investments, and ultimately offset the growth benefits generated by high oil prices.

The strategy's overall objective is therefore to support MENA countries in their adaptation and mitigation efforts, by fully integrating the objectives of reducing climate change vulnerability and GHG emissions into the Bank's development assistance to the region. While a sector-specific declination of the strategy will be presented in the following sections II.1 to II.3), the rest of this section outlines in more general terms, *what*, *how* and *where* the Bank will act to achieve the strategy's objective.

What will the Bank do: the Bank will both scale-up to the climate challenge its existing sector strategies, and will undertake innovative actions:

- *Build on the existent:* in several areas, the Bank has already developed a strategic approach promoting reforms in policies and investments that indirectly reduce vulnerability to climate change (e.g. improved water demand management, agriculture diversification through cereal reform and supply chain development); or that promote reduction of GHG emissions (e.g. enhancing energy efficiency and power sector reform). The Bank has been engaging several of its client in a policy dialogue to implement such reforms. Climate change offers an important opportunity to strengthen the case for the benefits and urgency of reform;
- *Undertake innovative action:* climate change poses new challenges that require adequate responses. In some cases the Bank will develop new types of analytical services (to assist clients in better evaluate magnitude and distribution of climate

impacts), will engage in lending in support of new technologies for both mitigation and adaptation, and will support innovative mechanisms to spread climate risks (e.g. insurance, contingent financing, etc).

The Bank will adopt suitable tools to ensure that all of its project are “climate-proofed”, i.e. are not designed, sited or implemented in ways that makes them vulnerable to climate change impacts.

How will the Bank operate: climate change is too big a challenge for any one actor to operate in isolation, or to address all of its dimensions. The Bank will therefore actively seek partnerships with its clients and with the rest of the development community; and will be selective in the choice of its interventions:

- *Build partnerships:* the Bank will undertake high-level consultations with its clients to rapidly agree on priorities for action on climate change, and will seek collaborations with the rest of the donor community, so as to offer to MENA countries adequate combinations of technical value-added, and attractive financial terms;
- *Be selective:* the Bank will concentrate efforts on interventions with large expected pay-offs (e.g., whenever possible policy lending to achieve rapid institutional reform aimed at increasing the climate resilience of vulnerable sectors), and on pilot projects with the potential of broad transferability or quick scale-up (e.g. new technologies for water savings, crop resistance, renewable energy or energy efficiency)

Where will the Bank work: the geographical focus of Bank’s action will depend on client demand, on quality of the policy dialogue, and on expected likelihood of success.

In IBRD countries entertaining an active policy dialogue with the Bank on climate-sensitive sectors there are solid conditions for a fruitful engagement; for instance, Morocco (adaptation in water and urban development, mitigation in energy and transport), Tunisia (adaptation in agriculture and mitigation in urban transport), and Egypt (adaptation in rural development and in cities).

Particular attention will be given to the region’s two IDA countries, which are particularly vulnerable to climate change impacts, i.e. Djibouti (floods, sea level rise), and Yemen (rain-fed agriculture, fisheries, ground-water management).

In countries affected by conflict (Iraq, West Bank and Gaza, Lebanon), climate change could appear as a longer-term concern when compared to the need of taming internal violence or ending hostilities with neighboring countries. In fact climate change is already affecting the livelihood of many of those countries’ communities, hence the need to better integrate it into the design of development assistance provided by the Bank.

Opportunities to provide support to adaptation and mitigation in Gulf countries will be pursued mainly through technical assistance.

II.1 Adaptation

II.1.1 Agriculture and rural development

The ARD sector in MENA is characterized by large rates of rural employment, a relatively stagnant economic performance, a significant degree of government intervention through input subsidies, physical investment, and trade protection; and a limited ability to penetrate export markets.

Climate change poses the risk of further depressing the sector's economic performance through accelerated desertification², yield reductions and increased volatility (especially in cereals), of threatening rural jobs, increasing the fiscal burden of government intervention in support of the sector, and thwarting efforts to improve access to foreign markets for high value crops.

The MENA region has been accustomed for millennia to deal with a warm and arid climate, but the predicted pattern of higher temperature and reduced precipitation will be beyond the coping range of many individual farmers and communities; suitable selection of adaptation strategies will thus be indispensable. While in some cases adequate changes in the selection of input, outputs and technologies will be able to minimize climate change impacts, in some others the sector's vulnerability may just be too high to warrant large public or private investments in adaptation, and the challenge will be to devise a strategy of gradual productive diversification and sector transformation.

The proposed World Bank strategy in the ARD sector would therefore focus on interventions to:

- Improve the countries' understanding of the likely magnitude, timing and location of climate change impacts on agriculture and fisheries;
- Maintain the long-term productive potential of the natural resource base, with particular attention to rangelands, through:
 - support to adoption of climate-resilient production solutions (e.g., change in crop/livestock production systems etc), drought and flood resistant crop varieties, modification in planting times,
 - preservation or recovery of traditional knowledge, particularly in the "Fertile Crescent"³;

² Desertification is a serious regional issue. In addition to the harsh arid climate and the fragile soils, the problem is exacerbated by anthropogenic perturbations caused by deforestation, excessive grazing in rangelands, and extractive farming practices which cause fertility decline and the depletion of soil organic carbon pool. Accelerated erosion and other resource degradation processes enhance emission of CO₂ and other greenhouse gases (e.g., CH₄ and N₂O), reduce agronomic productivity, contaminate water resources and reduce biodiversity. Desertification control and restoration of degraded ecosystems can be achieved through conversion to a restorative land use, afforestation with appropriate species and adoption of recommended management practices.

³ The "Fertile Crescent" encompassed within the modern territories of the Near East (including Jordan, Lebanon, the Palestinian Authority, Syria, southeast Turkey and southern Iran) is an area of megadiversity of important food crop and pasture species, where numerous species (notably wheat, barley, lentil, pea and vetch) of temperate-zone agriculture, including their wild relatives and landraces, which originated 10,000 years ago are still found there. These drylands are most outstanding for their within-species genetic diversity, and the indigenous crops and food plants are known for their resistance to disease and abiotic

- Increasing farmers' capacity to deal with plant and animal pests and diseases, which are likely to become more pervasive due to climate change;
- Promote the integration of measures capable of reducing climate change impacts in existing or planned programs of support to poorer farmers (e.g. micro-credit programs);
- Provide cost-effective ways of protecting farmers from increased vulnerability due to high climate volatility through weather-based insurance and other schemes, such as targeted social protection programs
- Promote the diversification of productive activities in rural areas away from vulnerable crops or livestock activities, and facilitate the transition and transformation of the most climate-vulnerable rural areas (encouraging the development of alternative income and employment options, such as eco-tourism)
- Support farmers or herders to exit out of areas which will have become too dry for any farming or herding activity, through professional/vocational training programs

II.1.2 Water resource management

In a region characterized by aridity and variability of rainfall, climate change is likely to have a major impact on water resource management, in terms of i) decreased average annual precipitation, ii) increased variability in the frequency and intensity of precipitation events, and iii) increased average temperatures and resulting higher evaporation from dams and reservoirs. Trends of reduced surface water availability, reduced groundwater reserves, and increased occurrence of drought and flood events have been observed in several countries (e.g. in Morocco over the last 30 years). Since urban consumption is predicted to increase, and water use by natural processes to remain constant, it is expected that irrigated agriculture will experience the brunt of the impact of reduced overall precipitation.

With few exceptions, MENA countries already sustain water demands that are substantially in excess of renewable resources, as a result of demographic and economic growth, as well as the accelerated development of irrigated agriculture. Although conditions and achievements vary substantially among MENA countries, public-sector led supply-driven policies have tended to be predominant, leading to major investments in water storage and distribution infrastructure but limited public involvement in water policy and service delivery and have often led to water not being allocated to the highest value uses. .

As informed in a 2007 flagship report⁴ on water and development in MENA , even in the absence of climate change, re-aligning water demand with available supply will require substantial institutional reforms addressing both the water sector proper, as well as other areas influencing water usage (agriculture, trade, energy, employment, land markets, etc). The predicted impacts of climate change further strengthen the case for sector- and

stresses, making them a valuable source of genetic material for germplasm and climate resilience and have the potential to contribute to enhanced food security both within the national and global context.

⁴ The World Bank, 2007, *Making the Most of Scarcity*

economy-wide reforms that would make water resource management more environmentally, socially and financially sustainable.

Against this backdrop, the proposed Bank strategy to support adaptation in water management would include:

- Support broad policy and institutional reform for improved (and “climate-proof”) water management, through a combination of analytical activities and policy lending; this comprehensive approach has already been successfully tested in Morocco where the Bank has undertaken a multi-year program of studies and technical assistance, and policy lending in support of sector reform;
- Strengthened hydrological monitoring capacities and updated resource assessments,
- Aggressive scarcity management strategies focused on:
 - Demand management for efficient allocation and use of water;
 - Protection and conservation of surface water and groundwater resources;
 - Development of alternative water resources (including through desalination, water reuse, storage, etc.);
 - Flood risk mitigation strategies combining watershed management and land planning.
 - Improved governance of water planning, allocation and service delivery

II.1.3 Urban development

Of the 298 million inhabitants (2004) of the countries of the MNA region, about 56%, or 167 million, live in cities, and 63 million in cities of one million and more. The cities of the region are the heart of all social, cultural and political life, and are the hub of all economic activities. The development potential of MENA cities is currently limited by a number of constraints, such as the growing urbanization of poverty, the proliferation of slums and informal settlements, and the lack of secure property rights which hinders the development of real estate markets. MENA cities —due to their vulnerability to climate change, including flash floods, rising sea level in 43 port cities (24 in the Middle East and 19 in North Africa), as well as in other coastal cities;⁵ heat waves; water scarcity and decreasing quality; worsening air quality; and potential in-migration due to one or more of the above direct impacts – need to be prepared to become climate-change-resilient cities.

World Bank’s action in the sector would therefore aim at promoting adaptation to climate change into the overall urban development strategy of MENA cities. This would be done by a combination of advisory services, lending and technical assistance, which would:

- better assess the degree of vulnerability of urban areas to the various effects of climate change;
- help develop adaptation strategies and promote their inclusion into ordinary urban management instruments (zoning, building regulations, master plans, etc);

⁵ For example, sea-level rises are expected to heavily impact the city of Alexandria (Egypt). A 0.5m rise would leave more than 2 million people displaced, with \$35 billion in losses in land, property, and infrastructure, as well as incalculable losses of historic and cultural assets.

- Increase and improve disaster and hazard preparedness of urban areas;
- Increase the capacity of city governments to design and build “climate-proofed” urban infrastructure, i.e. suited for the likely climatic conditions prevailing at mid-century;
- Identify the most vulnerable urban settlements (often informal housing of the poor, which is typically built on slopes, ravines, and low-lying flood-planes) and undertake action to either protect, or relocate them;
- Support the construction of sea-surge protective barriers, flood barriers and dikes in urban areas where the cost of relocation is likely to exceed the cost of protection; and
- Promote the exchange of climate change knowledge and adaptation experiences between the “early adopters/adapters” and other cities in the region

II.1.4 Transport

In general transport systems in the MENA region are well developed. Most countries have extensive road networks and important facilities for air, sea, and rail transport. In urban as well as rural areas, this infrastructure would be severely affected by changes in climate. Indeed these would affect the integrity of structures, increase road pavement deterioration, and submit facilities to extreme events and water levels for which they have not been conceived. The most vulnerable transportation systems include coastal infrastructure and bridges over torrents and rivers in case of floods. Accordingly, the Bank strategy to support adaptation of transport infrastructure would encompass:

- Support awareness raising of potential impacts of climate change on the integrity of transport systems in vulnerable areas
- Promote diagnosis of the risk levels of transport infrastructure and improvements in information systems
- Take into account structural improvements to limit and prevent damage on vulnerable infrastructure or alternative options in project design.
- Help prepare and disseminate improved design criteria.

II.1.5 Cross cutting issues

In addition to actions easily linked to individual sectors, supporting adaptation will require a number of interventions of a more horizontal nature.

Meteorology

The National Meteorological and Hydrological Services (NMHS) are critical public service providers – especially in terms of delivering weather and hydrological forecasts and warning for the public and economy. The importance of having a reliable and modernized NMHS system is growing due to: (i) the rise in economic losses from adverse weather events, and (ii) the climate-change driven increase frequency of those events. Bank action would focus on the following interventions:

- Support to upgrading and modernizing NHMS through investment in physical and human capital, and institutional reform aimed at consolidating and integrating different meteorological networks;
- Strengthening the capacity of climate monitoring, modeling, and prediction;
- Promoting the transfer of technical knowledge through partnership with centers of excellence in the region, in the rest of the Mediterranean, and in continental Europe.

Management of fragile ecosystems

Climate change is likely to have impacts at the ecosystem level, which often transcend administrative and sectoral boundaries. Ecosystems inland or in coastal areas play an important support function to local livelihoods, and are often a key actual or potential source of tourism revenue.

Coastal areas and fisheries. Coastal tourism is an important income and hard-currency earner in Tunisia, Morocco, Lebanon, and Syria; Egypt and Jordan also benefit from reef ecotourism; Yemen has a potential for tourism development in coastal areas which remains significantly untapped. Sea level rise, increases in temperature and decreased water availability could dramatically affect the attractiveness and livability of these ecosystems. Fisheries, which are important income earners in parts of the region (in Yemen accounts for 15% of GDP), are also at risk from climate change.

Land-based biodiversity. Similarly, countries like Jordan, Tunisia or Morocco boast inland natural areas of regional or global biodiversity significance⁷, and of importance for their tourism sector. Several of these ecosystems are being threatened by climate change, which will cause modifications⁸ in the spatial distribution of ecological and agro-ecological zones, habitats, spatial patterns of plant diseases and pests.

⁶ While in general coral reef ecosystems are considered to be quite vulnerable to climate change impacts, it is noteworthy that the northern coral reef ecosystems of the Red Sea, which are naturally subjected to large variations in salinity and temperature, were little affected by the mass bleaching events (of 1998) that affected most of the reefs worldwide. Valuable knowledge from this ecosystem could be of great global importance in adapting to the impacts of climate change for other reef systems in the region and worldwide. In this context, coral reefs of the MNA region provide a unique opportunity, and a natural laboratory, to understand reef resilience to sea surface anomalies and bleaching events (attributed to climate change), which could inform the global community of reef ecosystems.

⁷ A particular ecosystem, limited to the Maghreb countries of MNA and which is very much at risk is the cork oak forest landscapes. These forests which are unique high conservation value forest, and support one of the highest levels of biodiversity also provide one of the best examples of interaction between people and nature in the region. Cork oak forests, which are particularly well adapted to the Mediterranean climate and soil conditions, and play a vital role in the prevention of soil erosion and desertification, are at risk from climate stresses

⁸ In Jordan, the predicted temperature increase of 1-2 degrees centigrade by 2030-2050 is expected to cause shrinkage of grasslands (which currently extend over 10% of Jordan) and a transformation of semi-arid rangeland (which extend over 80% of Jordan) to become arid desert.

To help address these concerns, the Bank could:

- Improve, through TA or analytical work, the understanding of climate change impacts on coastal zones and other natural and agro-ecosystems and the related consequences on local livelihoods and tourism potential;
- Support the design and implementation of adaptation strategies in coastal areas, including protective infrastructure investments, and identification of coastal insurance policies;
- Support, in partnership with GEF and other financiers, the consolidation or expansion of protected areas, to ensure adequate protection of biological and genetic diversity, even under conditions of changed climate.

Social issues: migration, conflicts and gender

The MENA region faces a number of important social challenges: with an employment rate of only 47% (among the lowest in the world), and unemployment at 11%, MENA at present largely under-utilizes its human capital. In addition, given the current demographic structure in which the younger age groups predominate (in 2005, more than half of the population was younger than 25), it is estimated that an additional 80-100 million jobs will need to be created over the next two decades to absorb the new entrants in the labor market.

Poverty is also an important concern (Table 1). Using a poverty line of \$2 per capita per day - a fitting threshold for a largely middle-income region- the share of poor is about 20 percent of the total population, equal to 59 million people. While poverty is more a more markedly rural phenomenon, (rural poverty percentage head counts are up to 3 times larger than urban ones in Morocco), there are significant pockets of poverty in urban areas: over 10% in Algeria, Egypt and Iran, which, considering high urban concentrations, make for a sizeable absolute number of poor people in urban areas.

Table 1: Poverty incidence in selected MENA countries, 1988-2006

	Urban	Rural	All
Country (and year of assessment)	Headcount Index (%)	Headcount Index (%)	Headcount Index (%)
Algeria (2000)	10.3	14.7	12.1
Egypt (2004/05)	10.1	26.8	19.6
Jordan (2000)	12.9	18.7	14.2
Iran (1998)	14.2	31.7	20.9
Morocco (2003/04)	7.9	22	14.2
Tunisia (2000)	1.63	8.3	4.1
Yemen (2005/06)	20.7	40.1	34.8

Notes:1/ The headcount index measures the proportion of the population below the poverty line.

2/ Urban headcount index for Tunisia refers to combined index for Metropolitan and Other Urban areas poverty headcounts, weighted by relevant population shares.

Sources: Sustaining Gains in Poverty Reduction and Human Development in MENA, 2006. World Bank Poverty Assessments for Egypt (2005) and Yemen (2005/06).

Climate change is expected to add new challenges to the social agenda, spanning across class boundaries and administrative jurisdictions; and affecting rural and urban spaces alike. First, worsening of living conditions in rural areas is believed to affect internal and international migratory flows. Second, the impoverishment of the natural resource base (water, soil) might lead to renewed social tensions and conflict; finally, climate change could affect disproportionately selected segment of urban and rural population, particularly women.

The Bank's strategy to tackle these issues would include:

- Promoting, through targeted analysis, a better understanding of the impacts of climate change on:
 - migration patterns, including both infra-state migration (rural-urban migration at national level), and intra state migration (from, to and within the region);
 - the occurrence and intensity of conflicts (among communities, social groups, sectors or countries) for the access and management of water and other natural resources;
 - the gender effects of climate change (e.g. the impacts on women subsistence, farming, health, etc)
- Promoting the inclusion of social issues in local and national adaptation strategies. These would be done by reviewing and disseminating knowledge on coping mechanisms that have been used (especially by women) in the region or elsewhere to

manage water scarcity; or on conflict mitigation mechanisms that could help alleviate social tensions resulting from reduced water availability;

- Designing pilot projects or project components aimed at strengthening the adaptation capacity of women and other vulnerable groups, including reinforcement of water user organizations, adoption of participatory approaches in water resources planning, management and utilization, simplification of the procedures for dealing with water conflicts and disputes through the judicial system
- Supporting programmatic approaches for community based adaptation at national level, through capacity building at central and local government level.

II.2 Mitigation

II.2.1 Energy

Given that 85% of GHG emissions in the region come from energy production, transformation and use, the energy sector, from well to burner-tip, has a crucial role to play in mitigation. The sector is characterized by the predominance of oil in the fuel mix, a limited development of renewables (despite the potential of wind and solar energy), and a largely inefficient pattern of energy use. In tackling these challenges, the World Bank overall energy strategy already supports actions with positive implications for GHG emission reduction. In particular, the Bank is already supporting:

- Promotion of the efficient and sustainable use of energy resources, among other things through the introduction of price incentives for the efficient use of energy;
- Improvement in energy efficiency and reduction in energy intensity, through implementation of measures, besides pricing policies, which:
 - Facilitate the penetration of energy efficient equipment and appliances
 - Establish energy services companies
 - Develop appropriate financing mechanisms
 - Introduce tighter building codes
 - Better manage electricity loads
 - Reduce gas flaring
- Development of renewable energy resources, and promoting, through DPL lending, policy reforms aimed at increasing efficiency and raising the share of renewables in the energy mix. A successful experience of this approach is the recently approved \$100 million energy sector DPL in Morocco;

Promoting transition to a low-carbon development in MENA calls for expanding and scaling up actions in those directions, by renewing efforts on promoting reform (especially in pricing policies), and supporting low-carbon energy investments through suitable combinations of IBRD lending, concessional funds and carbon finance. In particular, to add new momentum to its action, the Bank will:

- Promote through advocacy firmly grounded in analytical work, the dialogue on energy pricing: given the high rates of energy subsidization in MENA, promoting pricing reform is an essential precondition of any further action towards low carbon

sector developments, including improved choice of fuel, equipment and production technology. Particular attention will be given to the analysis of reform options capable of minimizing social impacts, especially on the poor;

- Scaling-up investments in low-carbon energy generation, including fuel switching to promote use of natural gas and renewables; reduction of gas flaring, leakage and fugitive emissions; and in support of energy efficiency investments in priority sectors (e.g. industry, building and transport);
- Supporting actions to raise awareness (through information and education campaigns) in all sectors and among the public in general.

II.2.2 Urban Development

In the developing world, on average 80 percent of GHG emissions originate from cities, and half of that figure is related to energy consumption in the residential and commercial sector and in the functioning of public facilities and utilities. Our working hypothesis is that the cities of the MENA region would reflect such averages. For instance, the region's high level of urbanization (over 55%) and its continuing pace contribute to the current levels and on-going increase in the production of municipal waste, which already accounts for some 4% of total emissions.

Yet, there appear to be ample opportunities to improve the energy performance (and by consequence, emission levels) of the built environment and of the municipal systems, on account of the following:

- The expected average temperature increase of 2C in the next 15 to 20 years in the region due to global warming will decrease the energy demand for residential heating purposes but will greatly increase the energy demand for cooling of buildings, with a significant net increase that can be only contained if greater thermal insulation is incorporated in the design of new buildings or retrofitted into existing ones, and if more energy-efficient air conditioning systems are introduced.
- Improving the efficiency of energy use in urban areas could generate significant savings for municipal budgets, for households, and for the thriving urban service sector; this would require introducing innovations in street and residential lighting, domestic appliances, more efficient pumping stations, solar water heating systems, and other climate-friendly technologies in the commercial and manufacturing sectors. Such economies would be even higher, provided that reforms of current energy subsidies, which currently distort energy pricing, will be introduced.
- The savings resulting from an increasingly energy-efficient built environment and operation of municipal facilities and utilities are of particular interest for the oil-importing countries of the region, where the increasing oil bill is having a sizeable impact on public finances and private consumption patterns.
- Reducing GHG emissions from solid waste through capture and re-use of landfill gas (LFG) could both improve the environmental performance of MENA cities, and generate, via carbon finance and energy sales, a sizeable stream of revenues benefiting municipal finances.

There is therefore a strategic link between the development and mitigation agenda in MENA's urban sector. The pursuit of co-benefits should form the cornerstone of the Bank's strategy to reduce emissions in urban areas, through analytical work and investment financed by IBRD lending in combination with concessional and carbon finance. The Bank has already started working on this approach, in particular in the solid waste sub-sector, in which there is a sizeable pipeline of projects already approved or in preparation (in Tunisia, Jordan, Morocco, Egypt, Syria, Iran), which will contribute significantly to reduce GHG emissions from municipal solid waste.

In sum, to make further progress on the proposed strategy, the Bank will assist in the design and financing of "soft" and "hard" solutions for low-carbon urban management. These could include:

- Improving the efficiency of energy use in urban areas, including municipal buildings and facilities, industry, and households;
- Better integrating objectives of sustainable mobility in the planning of use of urban and peri-urban areas development;
- Reducing GHG emissions from solid waste, via recovery and or/use of LFG.

Given the diffused and delayed nature of some of the related domestic benefits, the Bank will actively pursue, especially through programmatic approaches, opportunities for funding their implementation through carbon finance.

II.2.3 Transport

GHG emissions from the transport sector account for 15% of total MENA emissions. As in most of the developing world, transport GHG emissions are also growing fast in the MNA region because of the relatively high elasticity of transport demand to GDP, the overwhelming preference given to road-based transport modes, and numerous problems that reduce the efficiency of energy use in the sector. The growth of motorization, as much a social as an economic phenomenon, and the poor performance of public transport modes, are particularly serious issues.

The sector also generates major externalities that constrain growth and threaten the quality of life. These include urban air pollution (among the worst in the world in Cairo and Tehran), traffic congestion, which damages economic and social activity in key metropolitan areas such as Cairo, Amman, Casablanca and Tehran; and road safety, for which some MNA countries are among the world's worst performers. Much as in the case of the urban sector, there are therefore opportunities to pursue the "co-benefits" of GHG abatement while tackling the other externalities of urban transport via investments that seek primarily to extend access to public transport and reduce congestion.

In addition, there is a key strategic link between improving transportation and improving urban planning and management. In large municipal areas (Cairo, Amman, Beirut, Algiers), there should be less focus on building new roads and more emphasis on improving land-use planning and developing efficient public transport systems. Providing reliable and affordable public transport services within an environment of accessible neighborhood public and retail services would significantly improve the competitiveness of metropolitan areas, as well as urban livability.

The above would be the basis for regional work on GHG emission reduction. The strategy would primarily include:

- Scale-up analytical work, technical assistance and policy dialogue, and undertake advocacy activities, to (i) assess priority actions to reduce GHG emissions in the sector and formulate national strategies and (ii) demonstrate the linkages between improving the energy and emission performance of the transport sector, and the generation of national benefits (in terms of air quality, congestion, road safety, and competitiveness of MENA's urban areas on Mediterranean and global markets);
- Assist in the design and financing of low-carbon transport investments. These could consist of interventions aimed at:
 - Promoting public transport solutions, including high-capacity transit systems, in particular, Bus Rapid Transport (BRT) systems with dedicated lanes, in which MENA could build on a number of successful experiences in the world (for example in the LAC region);
 - Encouraging, including through use of economic incentives⁹, modal shifts in passenger and freight transport away from GHG-emitting modes;
 - Improving fuel efficiency of vehicles (better vehicle inspection and maintenance, better standards, scrapping programs for older vehicles, etc);
 - Introducing or enhancing traffic demand management systems; and
 - Promoting fuel switching investments (CNG vehicles, hybrid buses, etc)

II.2.4 Cross cutting issues

In addition to sector specific interventions, it is proposed that the strategy includes the development of Technological Watch capabilities, both at the level of the Bank and in counterpart countries, in order to lower barriers for the adoption of more efficient technologies. This could be done by:

- establishing a database of energy efficient technologies in various sectors
- conducting AAA work on the financial and technical viability of new technologies including an assessment of the social acceptability and overall externalities
- disseminating the information to industry/institutions through training/seminars/workshops
- supporting the establishment Technology Watch Centers in some of the MENA countries

II.3 How to make it happen: institutions, outreach and regional cooperation

Supporting MENA in adapting to climate change and in reducing GHG emissions does not take only sound analytical work, targeted technical assistance and investment financing. In addition to the ordinary constraints limiting MENA development process in general (limited institutional capacity, weak accountability etc), addressing climate change poses new challenges, related to the cross-sectoral nature of the effects, the need to balance urgency against uncertainty, and the sheer magnitude of the financing needs.

⁹ Although at times politically unappealing, measures to discourage car use (increased vehicle registration fees and fuel prices congestion pricing) could be considered. Proceeds from these actions could be utilized to offset capital expenditures of public transport projects and/or to incentivize use of public transport.

Success of the Bank's strategy will thus depend significantly on the ability to promote consensus on the need to act (which is needed to mobilize human and financial resources), and to support the growth in institutional and technical capacity required to define how to act. To achieve these objectives, the Bank will:

At the national level:

- Document the economy-wide impacts of climate change and provide estimates of their cost. This type of studies would build on sector-specific assessments mentioned throughout section II.1. The findings of this work would be used to reach out to senior decision makers and strengthen the case for responding to climate change;
- Support outreach and communication campaigns (either as component of other projects, or as stand-alone initiatives) targeted at different stakeholder groups (e.g. policy makers, civil servants, community leaders, private sector, etc), and aimed at raising awareness on adaptation needs (for instance by disseminating the results of vulnerability assessments); or on cost-effective opportunities to reduce GHG emissions;
- Ensure that Bank operations give adequate emphasis to building capacity in climate change-specific technical issues (e.g. evaluation of future climate impacts and implication for investment planning). Particular attention will be given to strengthening the capacity to access carbon markets: a key precondition for ensuring success of mitigation actions.

At the regional level:

- Organize high-level consultations with senior policy makers and recognized experts in the region (possibly organizing a high-level advisory group) to seek feedback on the proposed climate change strategy, and advice on its implementation;
- Establish, in partnership with the rest of the donor community, a regional program of cooperation and technical assistance on adaptation to, and mitigation of, climate change. Such a program would build on the experience of METAP, which has achieved remarkable results in advancing the environmental agenda in the region. The objectives of new program would be:
 - Facilitate the exchange of knowledge and experiences on adaptation and mitigation options;
 - Promote or strengthen regional centers of excellence which could achieve economies of scale in the provision of technical services to the climate change agenda (e.g. meteorological services, conservation of genetic diversity for agriculture resilience, assistance in preparing CDM projects, etc.);
 - Promote, through advocacy and emulation, national level response to the climate change challenge.

III ON-GOING WORLD BANK ACTIVITIES TO ADDRESS CLIMATE CHANGE

While the present document purports to provide a systematic framework for addressing climate change in MENA for the future, there is a number of ways in which the World Bank is already supporting activities that help countries in the region to both enhance resilience to climate change, and to reduce their contribution to carbon emissions.

Over the last 5 fiscal years, the World Bank has been financing (through its IBRD and IDA lending) investment in the region for US\$ 4.4 billion in sectors such as water, urban development, agriculture, energy and transport (Table 2). In the absence of internationally agreed upon methodologies, it is difficult to define the extent to which these activities have contributed to enhance the climate resilience of the borrower's capital stock. Preliminary estimations suggest that a share of 20-30% of Bank's recent lending has been supporting activities consistent with objectives of reducing vulnerability to climate change impacts. For example, in the water sector the Bank supports improved efficiency in irrigation, enhanced storage infrastructure, and institutional reform for better demand management at the basin level.

Table 2: IBRD and IDA lending to MENA region, Sustainable Development Network (FY03-07, US\$ Million)

Sector Board	Total
Water	1,115.13
Urban Development	1,064.20
Agriculture and Rural Development	690.61
Energy and Mining	684.05
Transport	650.86
Social Development	135.00
Environment	84.46
Global Information/Communications Technology	13.13
Grand Total	4,437.44

Similarly, on the mitigation front, World Bank activities have been increasingly focusing on projects and analytical work that can help reduce the Carbon intensity of MENA's development. For example, in the *energy* sector (Table 3), the Bank has been adding to more conventional areas such as reinforcing power generation, transmission and distribution networks, a focus on low-carbon activities such as facilitating gas-fueled power generation and renewable energy (wind and concentrated solar thermal power). Activities also mobilized resources for energy efficiency. AAA activities have helped identify ways to mitigate emissions through improved energy efficiency and institutional development to accelerate renewable energy project implementation.

Table 3: World Bank Group Energy Lending in MENA Region, FY03-07 (US\$ million)

Energy Sector	FY03	FY04	FY05	FY06	FY07	Total FY03-07	Percent for FY07
Low Carbon		1	9		121	130	31%
Access				46		46	
Blended low-carbon & access			1	11		12	
Transmission and distribution					50	50	13%
Oil, gas and coal	50	20	51	70	74	265	19%
Thermal generation				260	107	366	27%
Other energy					43	43	11%
Grand Total	50	21	61	386	395	913	100%

In the *transport* sector, the Bank has assisted its MENA clients in recent years take actions which contributed to GHG emissions reduction. Bank assistance (Table 4) has been provided through loans for improving urban public transport and traffic efficiency, and through AAA for advancing better sub-sector policies.

Table 4: On-going transport activities with relevance for mitigation

Country	Project / AAA Name	Description
Lebanon	Urban Transport Development Project	Improvement in traffic management, reduction of congestion at key intersections, and implementation of traffic restraints through a better parking policy, all in the Greater Beirut area.
Tunisia	Transport Sector Investment Project	Improvement in public transport efficiency and in the capability for urban transport management in Tunis, aimed in particular at ensuring that the modal share of public transport is maintained over time.
Egypt	Cairo Urban Transport Strategy	Comprehensive assessment of urban transport issues in the Greater Cairo area and preparation of key recommendations for improving the efficiency of its urban transport system.
Morocco	Urban Transport Sub-sector Strategy Note	Comprehensive assessment of urban transport issues in the main Moroccan urban areas and preparation of key recommendations for improving the efficiency of their urban transport systems.

Finally, the Bank has contributed to the development of carbon markets in the MENA region, by providing technical assistance and institutional strengthening through the CF-Assist program; and by developing a pipeline of carbon finance transactions focusing on the solid waste sector, with two projects under way in Tunisia and Egypt, and several others in preparation in Algeria, Jordan, Syria, Morocco, Yemen, for a total estimate of 14 million tons of carbon emission reductions.

IV REGIONAL BUSINESS PLAN (FY08-FY11)

IV.1 Resource requirements

There are currently no universally accepted estimates of the resources that developing countries, in MENA or elsewhere, will need in the future years and decades to adapt to climate change and to reduce their contributions to GHG emissions. Some attempts however have been made to provide broad orders of magnitude for programmatic purposes.

Concerning mitigation, the first version of the World Bank's Clean Energy Investment Framework (World Bank, 2006), estimated that total costs of shifting the world economy to a low carbon development trajectory (with stabilization of CO₂ concentration at 550 ppm) would be in the order of \$60 billion per year. Assuming that these costs would be distributed in proportion to relative contributions to global emissions, this would translate into some \$2.7 billion per year for MENA. Excluding emissions from the region's higher-income, oil-producing countries (which receive technical assistance from the Bank but are not borrowers), mitigation costs for the rest MENA would amount to \$1.4 billion per year.

In terms of adaptation, the Stern Report (Stern, 2006) suggests that adapting to climate change may require increasing gross fixed capital formation (GFCF) by 1% to 10% annually. Using a mid-point estimate of 5% of GFCF increase required for adaptation, and assuming a constant share of GFCF of 25% of GDP (the 2000-2005 average), and an annual GDP growth rate of 5% (World Bank 2007a), the additional adaptation investment for current World Bank borrower countries would be in the range of \$7 billion per annum.

The sum of the estimated additional investment for adaptation and mitigation (\$8.4 billion per year), is one and half times the average ODA funds allocated to MENA (for infrastructure and productive investment) for the period 2000-2005 (\$5.5 billion per year). This confirms the sheer magnitude of the challenge, and suggests that to address it a combination of efforts will be required, from international donors, government finances and the private sector.

IV.2 Scope for World Bank support

In terms of the role that the World Bank can play, assisting MENA countries in their efforts to reduce emissions and enhance climate resilience will entail integrating specific adaptation and mitigation activities into projects *already under implementation or design*.

But it will also require scaling up the volume of financial assistance provided, as a way to help fill the large financing gap that has been described in section IV.1 above. The proposed business plan of lending activities is organized around two dimensions:

- a) the World Bank projects (IBRD and IDA) that will serve as "vehicle" to deliver the mitigation or adaptation assistance; these include:
 - projects already under implementation (portfolio),
 - projects under design (pipeline: FY08 to FY10), and

- projects that could be included in the pipeline in the future (business development: FY09-FY11);
- b) The additional activities that would help MENA countries reduce GHG emissions or enhance their resilience to climate change.
- “Fast track” project components: these are activities that could be integrated into projects that are already included in the Bank’s pipeline or portfolio, with IBRD or IDA loan amounts already agreed upon or discussed in principle with client countries. In these operations additional adaptation or mitigation activities could be rapidly integrated into project design or implementation;
 - “Consolidation” project components: this group includes ideas that, based on country dialogue, expert assessment of sector needs, and existing sector work, could be included in the Bank’s existing or future pipeline in a subsequent stage of strategy implementation. For these projects, indicative amounts of IBRD and IDA lending have been tentatively identified as a basis for further consultation with the clients.
 - Other projects: This category includes projects in the portfolio or in the pipeline for which no specific opportunities of integrating adaptation or mitigation activities have been identified.

In terms of geographical focus (Table 5), the business plan proposes to concentrate fast track activities into a small number of countries (Egypt, Morocco, Tunisia, Yemen and Djibouti) where transformational impacts would be achieved by applying a *country-wide, multi-sector approach*. In the consolidation phase, it is proposed to broaden the scope of engagement to other countries, such as Iran, Lebanon, Syria and West Bank and Gaza.

Table 5. Proposed business plan: country breakdown (US\$ million)

Country	1. Fast Track	2. Consolidation	3. Other Projects	Total
Egypt, Arab Republic of	1,195	50	198	1,442
Morocco	730		294	1,024
Yemen, Republic of	244		279	523
Tunisia	320		9	329
Djibouti	3	3	17	22
Iran, Islamic Republic of		18	420	438
Iraq			361	361
Jordan			162	162
Lebanon		48	305	353
Syrian Arab Republic		50		50
West Bank and Gaza		30	34	64
Total	2,491	199	2,078	4,768

In terms of client demand/ absorptive capacity, while several of the activities included in the business plan reflect several years of policy and project dialogue with client MENA countries –and have therefore in the opinion of Bank staff a good chance of being

integrated into projects under preparation- finalization of the business plan would require more targeted, country-level consultations. These might result in adjustments/modifications of the plan, including the possibility of shifting some activity from the fast track to the consolidation phase, to afford countries more time, if needed, to firm up internal consensus on adaptation and mitigation priorities, and scale up their institutional and technical capacity to execute the activities proposed.

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