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Briefing Paper:
Vulnerability & Adaptation to Climate Change in Turkey

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List of Acronyms

CDM	Clean Development Mechanism
CO2	carbon dioxide
COP	Conference of the Parties
DMİ	Turkish State Meteorological Service
DSI	General Directorate of State Hydraulic Works
EU	European Union
FAR	Fourth Assessment Report
GDP	Gross Domestic Product
GHG	Greenhouse gas
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
KP	Kyoto Protocol
MARA	Ministry of Agriculture and Rural Affairs
MoEF	Ministry of Environment and Forestry
OECD	Organisation for Economic Co-operation and Development
UNFCCC	United Nations Framework Convention on Climate Change

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Introduction

Around the world, climate change is exacting increasingly visible and heavy tolls. Even though Turkey has been adapting for millennia to climatic variability and extremes, it is nevertheless a country that is struggling to cope with vulnerability of its water resources, coastal zones, and agricultural activities to *current* climatic conditions, not to mention the longer term impacts associated with climate change. Longer term impacts will depend on the location with some areas experiencing more extreme heat, while others may experience flooding, drought, and intense summer heat.

Much of Turkey's population, infrastructure and economic activity are located in coastal zones vulnerable to sea level rise, salt-water intrusion, and more frequent extreme weather events. For inland areas, Turkey displays great diversity regarding demography, socioeconomic trends, natural resources, and infrastructure. Hence, Turkey's vulnerability to climate change is a complicated issue requiring deliberative policy-relevant processes to better understand the potential options and strategies for climate change adaptation.

This Briefing Paper aims to provide workshop participants with an overview of climate change-related activities in Turkey and an outline of the context for adapting to climate change. The Paper should also serve as a useful background reference for use during the training workshop on climate change negotiations issues. After an overview of Turkey's status and obligations under the UNFCCC, the Paper describes the best available knowledge of how climate is projected to change in the country over the next 50 to 100 years. These projections are the basis for the discussion that follows regarding the vulnerability of key sectors, communities, and regions. The Briefing Paper concludes with an overview about possible strategies for adaptation.

Turkey's Status, Obligations and Perspectives under the UNFCCC

At the UNFCCC'S 2001 Conference of the Parties (COP-7) in Marrakech, Turkey was removed from the list of Annex II countries. This event marked the beginning of the process for Turkey to become an Annex 1 country. It also was accompanied by Turkey's strategic invitation to the Parties of the UNFCCC to be recognized as having unique and special circumstances as an Annex 1 country (i.e., an OECD member yet with per capita emissions well below the OECD average).[1]

On May 24, 2004, the UNFCCC came into force for Turkey as the 189th Party to the Convention, thus obligating Turkey to address its international commitments under the Convention. Turkey ratified the Kyoto Protocol (KP) on 17 February 2009 but because it remains a non-Annex B country, has no binding greenhouse gas emission reduction targets for the initial period though 2012. As of this writing, Turkey's status under the climate convention and perspectives regarding future economic development can be summarized by the key points noted in Box 1.

Box 1: Basis for Turkey's climate change negotiating position

- ✓ Member of OECD;
- ✓ Annex I country with unique status;
- ✓ Party to the KP, but without binding GHG reduction targets;
- ✓ Candidate for membership in the European Union;
- ✓ Ineligible to participate in JI, CDM, and carbon trading mechanisms;
- ✓ High levels of annual GHG emissions; low GHG emissions/cap;
- ✓ Rapid industrial growth up to 2020 and beyond,
- ✓ Low GDP per capita

[1] Decision 26/CP.7 on "deleting the name of Turkey from Annex II and recognizing the special circumstances of Turkey, accepting that Turkey is in a situation different from that of other Parties included in Annex I" adopted in the 7th Conference of Parties (COP.7) of the United Nations Framework Convention on Climate Change (UNFCCC) which was held in 2001 in Marrakesh.

Regarding the post-2012 climate regime to be negotiated during COP-15 in Copenhagen later this year, the following points represent a point of departure for plausible post-2012 strategic action by Turkey for greenhouse gas emissions.

- ✓ Given Turkey's recent ratification of the KP, its membership in the OECD, and its candidacy for EU accession, Turkey should join other industrialized nations and adopt appropriate GHG emission reduction commitments;
- ✓ The GHG emission reduction targets should be established in a way that accounts for Turkey's low per capita GDP, fast-growing population, and need for sustained economic growth and to raise living standards;
- ✓ Turkey should not withdraw from Annex I to become a non-Annex I Party, as this would be a regressive option and inconsistent with current and expected international and EU climate change policy; and
- ✓ Turkey should define its obligations under the UNFCCC in a manner that allows for flexibility, its significant differentiation from other EU countries (see Table 1), and accounts for its economic development aspirations.

Table 1: CO_2 emission indicators (source: Turkey INC)

Country/Region	CO_2/capita (tonne/cap)
EU-15	9.0
EU-25	9.0
OECD	11.1
Annex 1 countries	12.2
Turkey	3.3

Regarding climate change adaptation, it is a priority issue for Turkey given the recent observable changes that have already taken place in regional climates and its relatively low levels of institutional adaptive capacity. Turkey's perspective on funding adaptation activities is summarized below and has been shared with the international community:[2]

> *"… Turkey is of the view that the funds for adaptation should be provided to Parties on the basis of certain criteria including vulnerability to the adverse effects of climate change, level of associated risks and the technical and financial capacity of the Parties to adapt to climate change. Generation of new, adequate, predictable and sustainable financial resources should be based on the principles of "equity" and "common but differentiated responsibilities" and respective capabilities. Turkey is of the opinion that there is a need for an international, multi-optional insurance mechanism in compensating losses and damages that arise from climate induced extreme events such as droughts, desertification, floods, frost and landslides, as indicated in the Bali Action Plan... "*

Projected Changes in Temperature and Precipitation

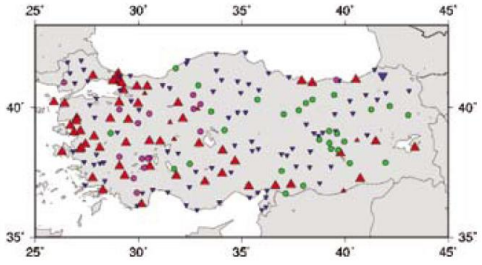
In recent years, statistical records in Turkey show that climate has been clearly changing throughout the country (source: Turkish State Meteorological Service/DMİ). Synthesizing these observed changes yields the following conclusions regarding Turkey's current climate:

- ✓ A general upward trend in average air temperature especially in southern regions;
- ✓ Most distinct and widely distributed warming trends seen in minimal air temperatures in spring and summer;

[2] *"Turkey's Views on the Fulfillment of the Bali Action Plan and the Components of the Agreed Outcome",* 24 April 2009.

- ✓ Rapid urbanization in Turkey has a large effect on these warming effects at minimal temperatures;
- ✓ General trend in maximal temperatures are in an upward trend in the summer season (see Figure 1);
- ✓ Important precipitation decrease trends are seen in winter season;
- ✓ Important precipitation decrease periods of NAO (North Atlantic Oscillation) are corresponding to strong positive anomaly periods.

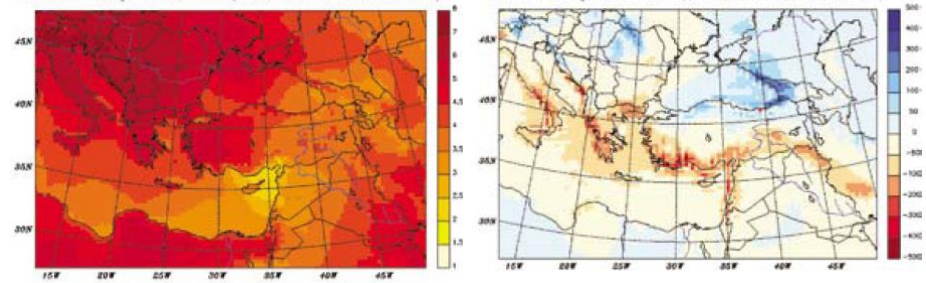
Figure 1: Turkey summer temperature trends, 1951-2004 (source: Turkey INC)



In terms of future climate change, there have been several scientific studies published on climate change, especially the Fourth Assessment Report of the Intergovernmental Panel on Climate Change – IPCC. These studies indicate that the Mediterranean Region will be one of the world's most adversely affected areas from climate change, with Turkey likely to become will be warmer and more arid, with uncertain precipitation conditions (see Figure 2). Synthesizing the results of a range of modeling studies in Turkey yields the following conclusions regarding Turkey's climate in the post-2035 period (source: DMİ - SRES A2 Emission Scenario)

Figure 2: Climate change projections, 2071:2100 – 1961:1990 (source: IPCC's FAR)

(a) Summer temperature difference (°C) (b) Winter precipitation difference (mm)



- ✓ *Annual temperature:* Average annual temperature in Turkey is projected to increase by around 2-3 °C relative to historical levels;
- ✓ *Average summer temperatures:* Average summer temperatures in the west of country are projected to be around 3 – 4 °C higher than east of the country.
- ✓ *Average precipitation:* Average annual precipitation levels are projected to *decrease* along the Aegean and Mediterranean coasts; average annual precipitation levels are projected to *increase* along the Black Sea coast;
- ✓ *Water resources:* Turkey's water resource availability, particularly during the winter season, are projected to decrease in upstream areas of the Fırat and Dicle River Basins;
- ✓ *Snow accumulation:* Snow thickness in the Fırat and Dicle River Basins is projected to decrease by around 24% as more precipitation occurs in the form of rain instead of snow.

Key Climatic Hazards

While Turkey is faced with many types of environmental hazards, there are three major climate hazards affecting the country namely, drought, floods, and wildfires. Droughts in the Mediterranean Basin are an enduring challenge for Turkey as it produces adverse effects on the whole of Turkey and creates the need to include droughts among the list of disasters, and the need to integrate drought risks into agricultural insurance and other development policies that can increase technical and institutional capacity (source: General Directorate of Disaster Affairs). Drought hazards adversely impact water resources in Turkey. Turkey is not a rich country in terms of its water resources due to its current climate and especially its hydrologic conditions. Droughts and water shortage in Turkey are related not only to agricultural and energy production but are also to irrigation, drinking water, other hydrological systems and their efficiencies.

Floods are evident in low-lying coastal areas (source: Turkish Parliament/ *Climate Change and Water Management Research Report, April 2008*). Turkey is a country with many low-lying coastal areas which makes the cities, communities, and industries located in these areas vulnerable to coastal erosion form increased storm surges associated with sea level rise and a greater frequency of extreme storm events. To a lesser extent, floods represent a significant climatic hazard within river basins throughout the country due to Turkey's mountainous structure, irregular river regimes, steep gradients, and land use practices.

Finally, Turkey is a country characterized by ample arid and semi-arid areas, having mostly a dry and semi-dry climate. About 25% of Turkey's surface area is forested and around half of this area is extremely fire sensitive due to the degraded forest areas and climatic characteristics (source : REC Turkey/*Head End Guide to Climate Change from A to Z, 2008*). With the increased temperatures projected for summer months particularly in the western part of the country, the risk of wildfires in these areas is projected to increase significantly.

Key Vulnerabilities

With climate change, the above hazards are projected to produce adverse impacts on key sectors, businesses, and communities. Turkey's characteristically arid soil, erosion, and runoff patterns are conducive to natural disasters related to flooding and extreme precipitation; this has important implications for adaptation and disaster risk management. A country's vulnerability and adaptive capacity, with respect to climate change, varies according to its demographic and socioeconomic trends, resources, institutional capacity, and infrastructure and other characteristics. Given the diversity within the country, understanding Turkey's vulnerability is particularly important before identifying potential strategies for climate change adaptation. Table 2 provides a sampling of major impacts and vulnerable sectors/areas and an assessment of their severity relative to the climatic hazards of droughts, floods, and wildfires.

Key Challenges for Developing a National Adaptation Strategy

Climate change hazards and impacts represent a serious threat to Turkey. This is particularly true for sectors that are dependent on natural resources, especially water. Work has recently commenced to address climate change impacts in economic growth strategies and national development policies. Notably, the current Ninth Development Plan (2007- 2013) and the various Annual Programmes drawn up under this Plan contain principles and targets

related to reduce agricultural vulnerability to climate change adaptation, some of which are accompanied by legislative and institutional initiatives to promote integrated water resource management, alternative crop production systems, and sustainable forest management (additional adaptation activities are summarized in Box 2).

Table 2: Climate change impacts and vulnerable sectors/areas in Turkey (source: Turkey INC and MARA)

Impacts	Severity	Vulnerable Areas	Vulnerable Sectors/Themes
Decreased crop productivity	Medium	Mediterranean and Aegean Coasts	Agriculture (employment)
Decreased hydro power potential	Low	Mediterranean Region	Energy, industry
Soil degradation & Desertification	Medium	South -Western Part of Anatolia	Agriculture, farmer livelihoods, shallow lakes and wetlands
Increased potable water scarcity	High	İstanbul, Ankara, Aydın, Nevşehir, Bursa	Urban areas
	Medium	Afyon, İzmir, Kayseri, Muğla, Manisa	
Decreased surface water flow	Medium	Western part of Anatolia	Agriculture, industry, energy
Flooding	Medium	Black Sea Region and South - East Anatolia	Agriculture, water distribution infrastructure
Altered river basin regimes	Low	All	Agriculture, farmer livelihoods
Species habitat migration	Low	Mediterranean Region	Ecosystem services & biodiversity
Coastal erosion	Low	Black Sea Region	Fisheries, ports, infrastructure
Land loss/salinity	Low	Mediterranean, Black Sea, Aegean Region	Tourism, agriculture
Decreased fishery production	Low	Mediterranean Region	Fishery unemployment
Marine ecosystem degradation	Low	Mediterranean, Aegean, Black Sea	Tourism, ecosystem services, biodiversity, fisheries
Forest Fires	Medium	Western part of Anatolia	Forestry, agriculture, tourism

While a national climate change adaptation policy has not yet been developed in Turkey, issues relevant to climate change adaptation measures are being addressed in strategic goal setting. In particular, many of the vulnerable sectors identified in Table 2 (e.g., agriculture, forestry, energy, industry, tourism) are also the focus of exploratory adaptation strategies. However, these issues have not yet been linked directly to climate change adaptation though inter-sectoral effects are not sufficiently recognized. For example, in the existing national policy documents on desertification and food security, the joint and holistic perspectives needed for climate adaptation are inadequate. Looked at from this angle, in preparing an adaptation strategy for Turkey, there is still a need for an approach which will consolidate the strategies/policies of the sectors concerned.

Box 2: Priority adaptation activities for Turkey

- ✓ Enhancing institutional, technical, knowledge capacity as well as public awareness;
- ✓ Strengthening inter-sectoral coordination of adaptation strategies/policies;
- ✓ Development of appropriate methods and tools to assess/reduce vulnerability (e.g., agriculture, public health and climate risks);
- ✓ Promotion of clean production methods in industrial sector;
- ✓ Encouraging use of innovative technologies (water and energy efficiency technologies);
- ✓ Commissioning studies on costs of climate change adaptation and cost/benefits of policy instruments (e.g., taxes, penalties and incentives, insurance); and
- ✓ Promote adaptive management as a guiding principle for national adaptation policy-making.

However, both the implementation of adaptation strategies and monitoring the performance of those strategies remains weak in Turkey. This is due to three major reasons. First, there are a number of practices/policies that have yet to be understood as maladaptive and hence serve to increase vulnerability. Examples include ineffective water management policies, ineffectual agricultural practices in the face of a changing climate, and permission for mining activities to take place in vulnerable water basins, ecological areas and forests. Second, there tends to be poor coordination across ministries. Examples include conflicts of authority in land use planning, amendment of legislative provisions that are not well founded, conflicts between legislation and ecosystem sustainability, and insurance regimes that are not well aligned with climate change risks. Finally, there is low institutional and technical capacity to sustain the initiatives required. This is evidenced by weakness in identifying and prioritizing potential adaptation projects, and by extension the lack of sufficient capacity to access available adaptation funding.

A high-level coordination board (the Climate Change Coordination Board) which brings together the ministries related to climate change, has been working actively and giving direction to climate change policies since 2004. The emphasis so far, however has been on mitigation rather than adaptation. As a result, the development of suitable policy instruments is at a nascent stage. Cost-benefit calculations for adaptation are not being made either at the national level or on a regional or sector-specific basis. In addition, data and information is lacking, and is not brought together, while academic research is insufficient. All this suggests that Turkey needs a strategy for address climate change adaptation priorities. To first order, these include increased institutional capacity, strengthening of cross-ministry coordination activities, raising awareness of decision-makers for well understanding of vulnerability & adaptation to climate change, vulnerability research and assessments, climate adaptation modeling, and the integration of adaptation concerns into GHG mitigation strategies.

It is important to note that Turkey has significant institutional infrastructure for climate adaptation efforts. The policies relevant to climate adaptation of critical institutions like the Ministry of Agriculture and Rural Affairs (MARA), the Ministry of Environment and Forestry (MoEF) and the General Directorate of State Hydraulic Works (DSI) and Turkish State Meteorological Service (DMI), which fall under MoEF, are continually being strengthened and their projects and activities in this field are increasing. Partly due to the influence of the EU accession process, there have also been important developments supporting adaptation work in legal and institutional structures. Some bodies are developing joint initiatives to combat the combined effects of climate change, and are cooperating on the basis of mutual protocols (For example, the Protocol between the DMI and the Ministry of Agriculture and Rural Affairs). Moreover, many public institutions and universities have research institutes capable of undertaking research in the areas of climate change adaptation.

Parting Thoughts

In the face of the looming threats from climate change, analysts in Turkey have begun to ask how to best adapt to climate change. However, the development of effective adaptation strategies is complicated by the fact that Turkey is grappling with a host of immediate national development challenges such as rapid population growth, increasing urbanization, and intensifying economic activity. Nevertheless, as noted above, there are notable

examples of adaptation efforts within the framework of sustainable development policies already underway against the background of such challenges.

At the broadest level, anticipatory, planned adaptation is essential for Turkey. Currently, the rising risks of climate variability and their implications for development are not explicitly accounted for in most investment decisions by government or the private sector. Given a changing and uncertain climate, the assessment of climatic risks of investment decisions needs to become a conventional activity in feasibility studies. In contrast to Turkey's current development planning experience, addressing climate risks from the outset is likely to result in investment decisions that increase diversification and reduce vulnerability, though at the cost of potential short-term benefits.

At a more specific level, recommendations for future adaptation activities focus on a potential range of activities. These include efforts to increase public awareness about increasing climatic variability; support of research synthesis activities and networks in the country and surrounding region; implementing a series of adaptation demonstration projects in high priority vulnerable areas; and promoting integrated water resource management overarching framework for managing water resources in vulnerable water basins. Finally, the implementation of such adaptation activities will need to be part of a comprehensive process. This is a best seen as a process entailing more than merely the implementation of a policy or the application of a particular technology. It is a multi-stage and iterative process, involving information development and awareness raising; planning and design of activities; implementation; and monitoring and evaluation.