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Climate Change, Its Effects, and the Political Economy of Adaptation and Mitigation

Turkey and the Eastern Mediterranean Region

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INTRODUCTION

Climate change, summed up by the popular catchphrase "global warming," has become an increasingly urgent global concern. As the Intergovernmental Panel on Climate Change (IPCC 2007: 30) details, the planet warmed by 0.74°C between 1906 and 2005, with decadal rises in the last half of the twentieth century nearly double that of the full one-hundred years, and 1995–2006 contained eleven of the twelve hottest years since 1850; the ocean absorbed four-fifths of this added heat, causing its mean temperatures to increase as far down as three kilometers below sea level, which has risen 1.8 mm per year over the 1961–2003 period; and precipitation has "declined in the Sahel, the Mediterranean, southern Africa and parts of southern Asia." The frequency and intensity of "extreme weather events," like heat waves, "heavy precipitation events" (more rain from heavy falls), and "extreme high sea level," have been rising (IPCC 2007: 30).

This chapter focuses on the Mediterranean region, specifically Turkey. Ten of the Mediterranean's twelve driest winters since 1902 occurred in the last two decades, pointing to a "hotspot" trend of declining winter rainfall and rising summer temperatures due primarily to anthropogenic greenhouse gas (GHG) emissions and aerosol forcing (IBRD 2012: 15, 16). Climate change will accentuate this region's future climate variability. Annual European temperature increases will likely exceed the global mean, with southern Europe experiencing drops in overall rainfall and number of precipitation days, along with increased risk of summer drought and the highest summer warming (Christensen et al. 2007: 850, 872). There, climate change will "reduce water availability, hydropower potential, summer tourism, and . . . crop productivity" (IPCC 2007: 50). Global mean temperature may increase by 2.8°C (in the likely range of 1.7–4.4°C) from 1980–1999 to 2090–2099 according to the Special Report on Emissions Scenarios (SRES) marker scenario A1B (IPCC 2007: 45), but Southern Europe and the Mediterranean (SEM) could see a median annual increase of 3.5°C (2.2–5.1°C), with a higher summer (June–August) rise of 4.1°C (2.7–6.5°C), as well as a 12 percent (4 to 27 percent) drop in median annual rainfall, including a summer decrease of 24 percent (3 to 53 percent) (Christensen et al. 2007: 854, 873–874). The Potsdam Institute starkly warns that "the warmest July in the Mediterranean region could be 9°C warmer than today's warmest July" (IBRD 2012: xv).

Various Mediterranean countries have sunk into economic and political crises that make them even more vulnerable to the effects of climate change. Syria, for one, experienced a severe drought in 2008 that affected two-fifths of its cultivated land; as a result, 1.3 million people suffered losses and tens of thousands were uprooted (IBRD 2012: 16). The violent civil strife that broke out there in 2011 sent huge flows of refugees to neighboring countries, including Turkey, a comparative beacon of stability and growth. However, climate change could also imperil Turkey's own population and economy. Pressured to meet European Union (EU) conditions in order to become a member despite strong countervailing developmental aspirations, Turkey finally acceded to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) in 2004 and the 1997 Kyoto Protocol in 2009, and has since advanced plans (without targets) to mitigate its GHG emissions as well as adapt to climate change.

This chapter surveys the sources of Turkey's GHG emissions, climate-change trends in the country, and the latter's impact on the country's human security values. The fourth section looks at how official and unofficial stakeholders have approached the issue of "proofing" Turkey's economy against the effects of climate change via mitigation and adaptation measures. The fifth part looks at Turkey's stance towards international agreements on climate change. The last part concludes by examining what Turkey can and should do now.

SOURCES OF TURKEY'S GREENHOUSE GAS EMISSIONS

Economic and Population Growth

Turkey's economy has undergone rapid growth since the end of the Cold War. The July 2011 National Climate Change Action Plan (NCCAP) of the Ministry of Environment and Urbanization (MEU 2011a: 5–6) shows how much the economy, energy use, and GHG emissions have grown. GDP increased 170 percent to reach USD 832 billion in real terms by 2008, raising per capita income to USD 11693, an increase of 114 percent. Population grew at a much lower rate, from 56.20 million in 1990 to 71.08 million in 2008. According to the Turkish Statistical Institute (Turkstat 2012), the country gained 2.64 million more people by 2010, with more than one-third of the total population concentrated in five (out of eighty-one) provinces, and, while mean population density crept up in this two-year interval from ninety-three persons per square kilometer (km^2) to $96/km^2$, it exceeded 2500 people/km^2 in Istanbul, which straddles a 452 km stretch of Turkey's 8300 km coastline. Coastal areas, with over 30 million people, have an average density twice the national average (MEF 2007: 166–167).

This expansion meant more construction, raising direct residential pressure on energy supply and GHG emissions. The number of buildings increased from 4.3 million in 1984 to 8.4 million (on an area of 1.5 billion square meters) in 2009, when total dwellings reached 16.2 million (MEU 2011a: 20). More people have also moved into energy-hungry luxury high-rise apartment complexes or gated community subdivisions. Residential energy use went up 88 percent between 1990 and 2010, increasing from 15 million tonnes (metric tons) of oil equivalent (toe) to 29 million toe; however, as total final energy consumption (TFEC) doubled, residential share (51 percent in 1970) dropped from 37 percent to 35 percent, slipping below industry's share in 1996 (MENR 2012a; MENR 2012b). In 2010, coal, electricity, and gas met 28 percent, one-quarter, and 22 percent, respectively, of residential TFEC, while the latter used 56 percent of coal, half of electricity, and 46 percent of natural gas TFEC (MENR 2012b).

Residential GHG emissions also grew over the two decades ending in 2010. According to Turkstat (2012), they rose to 50 million tonnes of CO_2 equivalent (tCO_2e), more than doubling, with almost all of this sector's GHG emissions consisting of carbon dioxide (18 percent of energy-related CO_2 emissions and 15 percent of all CO_2 emissions) in 2010. Moreover, by 2010, this sector emitted 56 percent of all methane (CH_4) emissions from energy use, albeit only six percent of total CH_4, and one-quarter of nitrous oxide (N_2O) emissions from energy use, but only 3 percent of all N_2O, with all four of these shares down from their 1990 levels.

Energy Use

Turkey's economic growth and rising energy demands exhibit a tight interdependence. According to International Energy Agency (IEA) data compiled in the NCCAP (MEU 2011a: 6), Turkey's total primary energy supply (TPES—roughly equivalent to primary energy demand (PED)) reached 99 million toe in 2008, an increase of 86 percent since 1990, while electricity output rose from 58 billion kilowatt hours (kwh), or 58 terawatt hours (twh), to 198 twh, a growth of 245 percent. In per capita terms, TPES rose by 48 percent to 1.39 (below respective world and OECD averages of 1.83 and 4.56) toe, electricity use increased to 2400 (still below respective world and OECD averages of 2782 and 8486) kwh, and electricity output rose to 2791 kwh. Conversely, per USD energy intensity fell from 0.17 to 0.12 toe and per USD carbon intensity fell from 0.61 to 0.44 tCO_2e.

Turkey's energy uses have propelled the bulk of GHG emissions growth. As the same report (MEU 2011a: 6) details, between 1990 and 2008, total GHG emissions rose by 96 percent, from 187 to 367 million tCO_2e, but carbon dioxide increased by 114 percent, from 127 to 271 million tonnes, and GHG emissions linked to electricity generation ascended by 234 percent, from 30 to 102 million tCO_2e, expanding from 16 to 27 percent of total GHG emissions. Per capita GHG emissions increased by 55 percent, from 3.33 to 5.16 tCO_2e. The carbon intensity of Turkey's energy supply went from 2.39 to 2.75 (above respective OECD and world averages of 2.33 and 2.40) tCO_2e/toe. Given the impact of the global financial crisis in 2008–2009, the NCCAP data understate Turkey's overall trend (MEU 2011a: 7).

Thus, resumption of economic growth put energy use back on its upward trajectory. Turkey's PED climbed to 109 million toe (per capita demand rose to 1.48 toe), an increase that encompassed all key fuels (except nuclear, of which Turkey has none), including hydrocarbons. Coal use nearly doubled, oil demand rose by more than one-third, and gas use saw a tenfold increase (BP 2012). Coal's share of PED fell about two percent (to 28–29 percent) and oil's share plummeted by nearly one-fifth (to 27–28 percent), but natural gas soared from 6 percent to just under one-third (MENR 2012b, 2012c). However, after deducting the 24 percent of PED diverted to power plants, coking plants, oil refining, and losses, the 84 million toe of 2010 TFEC consisted of equal shares (17 percent) of coal and gas and 32 percent for oil (MENR 2012b).

Electricity generation and use also increased. By 2010, 42 percent of coal (including three-fifths of all lignite) and 56 percent of gas were firing power plants (MENR 2012b). Installed capacity trebled to 49.52 gigawatts (GW), from which Turkey generated 211.21 twh of electricity, nearly 2865 kwh per person (TETC 2011). In 1990, two-fifths of electricity came from dams, 35 percent from solid fuels (mainly hard coal and lignite), 18 percent from gas, seven percent from fuel oil, and a minuscule share from geothermal-plus-wind (TETC 2011). Two decades later, hydropower, solid fuels, and fuel oil were supplying smaller fractions of total electricity (one-quarter, 26 percent, and 1 percent, respectively), while biomass-plus-waste, geothermal-plus-wind and gas were generating 0.2, 2, and 47 percent, respectively (TETC 2012: 13). Turkey's First National Communication on Climate Change (MEF 2007: 14) forecasts a decline in the shares of electricity produced by fuel oil, diesel, and natural gas by 2020 (when output may reach 544 twh), but a rise in coal's share.

Expanding energy uses continued to pull up GHG emissions. Turkstat (2012) records that total GHG emissions reached 402 million tCO_2e in 2010, increasing 115 percent since 1990, with per capita GHG emissions edging up to 5.45 tCO_2e. GHG emissions from energy use increased from 132 to 285 million tCO_2e (71 percent of the total), while GHG emissions from electricity generation rose 250 percent to reach 107 million tCO_2e. By 2010, total carbon dioxide reached 326 million tonnes (81 percent of total GHG), with per capita CO_2 emissions rising from 2.26 toe to 4.42 toe. Energy-linked carbon alone reached 277 million tonnes, slipping only slightly from 90 to 85 percent of total CO_2 emissions, and the carbon content of energy supply came to 2.54 tCO_2/toe, a 6 percent intensification, albeit smaller than that of the 1990–2008 period.

Industrialization

Industry still plays a significant role in Turkey's development. Accounting for 20–25 percent of GDP, it includes food, textiles, petroleum products, iron and steel, automobiles, and chemicals, which make up 18.8 percent, 16.3 percent, 8.8 percent, 6.2 percent, 5.8 percent, and 5 percent, respectively, of industrial output (MEU 2011a: 23). It also consumes a lot of energy. Between 1990 and 2010, industrial energy uses doubled from 15 to 31 million toe (edging up from 27 to 28 percent of PED and from 35 to 37 percent of TFEC), accounting for one-fifth of total coal demand (behind power plants and residencies), one-fifth of all natural gas demand (second only to power plants), and 13 percent of total oil demand, behind transportation and agriculture (MENR 2012a; MENR 2012b). In 2010, hydrocarbons continued to dominate industrial fuel supply, with gas, coal, and oil supplying 23 percent, 21 percent, and 13 percent, respectively, of industry's PED, while iron and steel (15 percent based on coal and one tenth on natural gas) made up 22 percent of industrial energy use, and cement (54 percent based on coal), which has a small share of GDP but a large share of industrial carbon emissions, comprised 15 percent of industrial energy use, nearly two-fifths of industrial coal use, and 57 percent of industry's use of hard coal (MENR 2012b).

Manufacturing represents a significant secondary factor in Turkey's GHG emissions. Turkstat (2012) enumerates GHG emissions from "industrial processes" and differentiates them from the emissions due to energy use of "manufacturing industries and construction." GHG emissions from "industrial processes" grew from 15.44 to 29.26 million tCO_2e between 1990 and 2008 (MEU 2011a: 7), but by 2010, they had reached 54 million tCO_2e (a 249 percent increase since 1990)—amounting to 13 percent of Turkey's 2010 GHG emissions and 18 percent of the total 1990–2010 GHG increase. Nine tenths of industrial processes' 2010 GHG emissions consisted of carbon dioxide and these CO_2 emissions expanded from one tenth in 1990 to 15 percent of total CO_2 emissions in 2010. Industry in total spewed an even larger volume of carbon dioxide. While CO_2 emissions from "industrial processes" reached 49 million tonnes in 2010 (more than trebling the 1990 volume), nearly three-fifths of it from cement making, energy-related CO_2 emitted by "manufacturing industries and construction" increased to 57 million tonnes (Turkstat 2012). Thus, all industrial CO_2 reached 106 million tonnes in 2010, just under one-third of total carbon emissions and close to GHG emissions from electricity.

Urbanization

Turkey's industrialization has propelled its urbanization. Most of the world now lives in cities and the urban developing world will drive most of the world's population growth until 2030 (Dupont and Thirlwell 2009: 80), but most people in Turkey have lived in urban areas since the early 1980s (Ozdemir et al. 2012: 80). In 2010, three-quarter of Turkey's population lived in "province and district centers," with only eight out of its eighty-one provinces having more residents of "towns and villages," and other figures show that 85 percent of the total population lives in 2950 municipalities, including the sixteen metropolitan areas (Turkstat 2012). Thus, rising urban residential energy uses, mostly centered in multistory buildings, transportation fuel uses, and municipal waste have increased ambient air pollution as well as GHG emissions.

Transportation

Transportation's energy uses and GHG emissions have grown relatively slowly, with the fastest expansion in motor vehicle (and petroleum) uses. Motor vehicles on Turkey's roads (which actually decreased in number by eliminating most unpaved village roads) quadrupled from 3.75 million (about 15 people per vehicle) to just over 15 million (just under 5 per vehicle) between 1990 and 2010, when privately owned vehicles made up 90 percent (and personal cars comprised 49 percent) of the total (Turkstat 2012). This sector's energy use rose by three-quarters, reaching 15 million toe in 2010, but shrank from 16 to 14 percent of total PED and 21 to 18 percent of TFEC (MENR 2012a; MENR 2012b). Nonetheless, by 2010, transportation consumed half of Turkey's oil demand and oil supplied nearly all transportation energy (MENR 2012b).

GHG emissions from ships, planes, trains, and motor vehicles increased between 1990 and 2010, but mostly diminished as shares of the total. According to Turkstat (2012), this sector's collective emissions of carbon dioxide (nearly all of this sector's GHG), methane, and nitrous oxide increased by 72 percent, from 26 to 45 million tCO_2e, but fell from one-fifth to 16 percent of GHG emissions from energy use and from 14 to 11 percent of total GHG emissions. Transportation's methane emissions increased by four-fifths, but only the growth rate (117 percent) of this sector's nitrous oxide emissions exceeded that of overall GHG emissions. Roads (including motorways) make up most of this sector's GHG emissions, but even this sub-sector, which gained slightly in terms of methane, saw its 93 percent shares of transportation's GHG and CO_2 emissions in 1990 drop four percent by 2010, mostly to air travel and maritime shipping, where CO_2 emissions grew even more rapidly. Per vehicle carbon emissions fell nine percent between 1990 and 2004 via better engine technologies, greater alternative fuel use, and removal of 320,000 old vehicles (MEU 2011a: 30).

Waste

Turkey's municipalities disgorge ever more voluminous amounts of refuse. In 2008, municipal waste collection exceeded 24 million tonnes (MEU 2011a: 34). According to Turkstat (2012), in 2010, the total topped 25 million tonnes, equaling 1.14 kilograms (kg) per capita per day or 416 kg per annum and covering 83 percent of the total population and 99 percent of the total municipal population. However, only 54 percent of this waste went to controlled landfill sites, although this rate averaged 83 percent in the five provinces with the largest total and municipal populations, which collectively make up over two-fifths of the country's municipal population and 44 percent of its combined waste (Turkstat 2012).

Waste emits the most $CH_{4,}$ which also makes up most of its GHG emissions. Turkstat (2012) indicates that GHG emissions from solid waste disposal and wastewater handling increased by 270 percent, from 9.68 million tCO2e (5 percent of total GHG emissions) in 1990 to 35.83 million tCO2e (9 percent) in 2010. Waste's methane (which expanded from 86 to 95 percent of the GHG it emits, at the expense of nitrous oxide) rose even more rapidly than its entire GHG emissions and grew from one-quarter to nearly three-fifths of Turkey's CH_4 output. Even if controlled waste disposal has improved, its share of methane emissions has risen: While unmanaged waste sites made up three-quarters of the waste sector's CH_4 in 1990, these comprised less than one-third in 2010.

Agriculture and Forestry

Agriculture employs about one-quarter of Turkey's workforce (and a larger fraction of its female workforce), but has less importance in the larger economy and in GHG emissions. Agriculture's share of GDP fell from one-third in 1968 to less than ten percent in 2010 and even its overall land use shrank (Turkstat 2012). That is, "utilized agricultural land" (the sum of "arable land," "land under permanent crops," and "land under permanent meadows and pastures") fell seven percent between 1990 and 2010 to 39 million hectares (half of Turkey's landmass), including a 12 percent drop in arable land to 21 million hectares.

Concomitantly, this sector's non-energy related GHG emissions also fell. Turkstat (2012) reveals a nine percent decrease between 1990 and 2010, from 30 to 27 million tCO_2e, with agriculture's nonenergy share of total GHG emissions falling from 16 to 9 percent and its portion of methane dropping from three-fifths to under one-third. In this period, cattle in Turkey stayed around 12–13 million head per year, but the sheep and goat population fell by over two-fifths and the combined total of five other farm animals fell by three-quarters. However, number of tractors (85 percent of which have thirty-five-plus horsepower engines) rose by 58 percent. Thus, agriculture's total GHG emissions actually increased from 35.6 to 40.3 million tCO_2e, one-third of the latter volume consisting of carbon dioxide from fuel consumption.

In Turkey, forests constitute more of a "carbon sink" than a GHG source. Between 1990 and 2010, forest area grew from 20.2 to 21.5 million hectares (Turkstat 2012). Between 1972 and 2004, tree stock increased by 35 percent (standing at 1368 million m^3 in 2008) and by 29 percent in terms of "current annual volume increment rate" (MEU 2011a: 49). Turkstat (2012) data on forested area, assembled by Turkey's Ministry of Land, Agriculture, and Forestry, includes both "normal" and "spoiled" area, and exceeds that of Faostat (2012a) by a factor of two. But half of Turkey's forest area (10.58 million hectares) is "unproductive," and "one-third of productive forests have a low density" (MEF 2007: 72). Nonetheless, net stock increment rose from 12.02 million tonnes per year (44.08 million tCO_2e of carbon stock) in 1990 to 15.64 million tonnes per year (57.36 million tCO_2e of carbon stock) in 2008 (MEU 2011a: 51).

CLIMATE CHANGE IN TURKEY

While its contiguous southern and southwestern coastlines locate Turkey in the Mediterranean basin, its oft-cited quality as a "bridge" between continents and cultures is climatic as well. The country's 783,000 km^2 territorial land mass, coterminous with latitudes 36–42N and longitudes 26–42E, straddles southeastern Europe and southwestern Asia and forms part of the Alpine-Himalayan ridge. Its Mediterranean macroclimate lies "between the temperate and sub-tropical zones at western parts of the [aforementioned] continents" (MEF 2007: 3, 35). But Turkey consists of distinct regional and subregional microclimates (MEF 2007: 37–38). The southern coastline has classic Mediterranean features—snow-free and frost-free winters and hot and dry summers, with the humid Mediterranean coastline getting about 1000 mm/year in rainfall and the semi-humid Aegean receiving about 600–800 mm/year. The semi-humid Marmara region, north of the Dardanelles Straits and south of the Bosporus Straits that cut through Istanbul, has colder winters and gets 500–700 mm/year. Further in towards the more arid "steppes," Central Anatolia has cold winters and gets most of its 350–500 mm of annual rainfall in the spring, and Southeastern Anatolia receives 350–800 mm of rainfall per year, but experiences hotter, drier, and longer summers. Eastern Anatolia, with the country's coldest winters, gets over 500 mm/year, while the Black Sea region, demarcating the country's northern border, is Turkey's rainiest. As such, climate change will not have a uniform impact on the country's landmass.

Increasing Temperatures

Turkey's climate in general has been getting hotter and drier, a trend that is set to continue. Data from 1940–2008 show Turkey's mean annual temperature, estimated at 13.6°C over the last three decades of the twentieth Century, increasing at a rate of 0.64°C per century (Mengu et al. 2011: 824). Over the course of the century ahead, according to regional climate model simulations based on the A2 emission scenario, average annual temperature will rise 2–3°C for Turkey as a whole, with winter increases higher in the east and summer increases up to 6°C in the west (MEF 2007: 165). This trend may become especially pronounced in the larger municipalities. By expanding the area of impermeable surfaces (viz, asphalt, cement, concrete, etc.) that absorb solar energy during the day and emit it at night, greater concentrations of residents and economic activity in Turkey's municipalities have created an "urban heat island" (UHI) effect, characterized by higher urban temperatures and wider temperature spreads between rural and urban areas, as shown in studies of minimum-degree data over the 1965–2006 period (Ozdemir et al. 2012). Warmer evenings will boost energy use for urban air conditioning (MEF 2009a: 8).

Decreasing Precipitation

Turkey has also been experiencing adverse trends in precipitation. Total rainfall, which averaged 635 mm/year between 1971 and 2000, has been decreasing by 29 mm/century, with Mediterranean precipitation falling one-fifth since the mid-1980s (Mengu et al. 2011: 824). Turkey is projected to encounter regionally divergent, but generally adverse, precipitation outcomes by 2071–2100. Winter and spring rainfall will decrease along the Mediterranean coastline (with the largest drops in the southwest), increase along the Black Sea coastline, and remain relatively constant in Central Anatolia; seasonally, however, while the country as a whole will experience little change in summer precipitation volumes, it may get more in the fall, especially in the Euphrates-Tigris river basin (MEF 2007: 164). "Snow water equivalent" is projected to fall by 200 mm over the Eastern Anatolia steppes and the eastern Black Sea mountain range (MEF 2007: 165).

Rising Sea Levels

Given the length of Turkey's coastline and the large numbers of people living there, the country and its economic values will have no immunity from rising sea levels. Turkey's coasts, along which sea levels have already risen 12 cm or so over the past century, are forecast to face erosion, flooding, inundation, and saltwater intrusion, a problem already exacerbated by population (permanent and seasonal tourist) pressure on groundwater sources and one that could, if Accelerated Sea Level Rise (ASLR) occurs, threaten Istanbul's Buyukcekmece and Kucukcekmece lagoons and the Halic estuary (the so-called "Golden Horn") as well as the city's drinking-water supply (MEF 2007: 167).

IMPACT OF CLIMATE CHANGE ON HUMAN SECURITY IN TURKEY

Population and Health

Greater magnitudes and frequencies of high temperatures will have multiple negative impacts on the health of Turkey's people. Over half of the population lies in the 15–49 age-range (Turkstat 2012), a factor that could lessen the full health-related impact of climate change. Yet, an increase in the number of consecutive extremely hot days (i.e., "heat waves") will increase the incidences of heart attack, diseases of a cardiovascular, metabolic, renal, or respiratory nature, and colorectal as well as gastric cancers (MEU 2011b: 104). Rising temperatures will also exacerbate vector-borne contagions in Turkey, including cutaneous leishmaniasis, malaria, leptospirosis, rat-borne tularemia, West Nile fever, tuberculosis, trachoma, and tick virus-transmitted Crimean Congo Hemorrhagic Fever or CCHF (MEU 2011b: 106). A 1998 prevention program sponsored by the World Health Organization (WHO) and United Nations Development Program (UNDP) curtailed malaria, which peaked at nearly 120,000 cases in 1977 (around Adana in the south) but reached a secondary maximum of over 90,000 cases in 1994 (near Urfa and Mardin in the southeast), with both respective epicenters experienced unusually warm temperatures in those years (MEF 2007: 176–177). In 2002–2004, rural animal husbandry workers in the central provinces of Tokat, Sivas, and Yozgat bore the worst brunt to date of CCHF, which may be correlated with above average April temperatures (MEF 2007: 177–178). Seasonal migrations of agricultural workers, like those from further east who set up tent cities near irrigation canals in the Seyhan River Basin or the energy hub of Yumurtalik (MEU 2011b: 106), could raise the risk of future outbreaks.

Water

Adverse changes in temperature and precipitation have blunt impacts on water supplies. Turkey already faces a deteriorating water-supply situation based on rising population. The FAO's (2012) Aquastat database cites a 2011 figure of 2783 cubic meters (m^3) of actual "total renewable water resources per capita" (based on an overall estimated volume of 212 billion cubic meters (bcm)), but it also cites total "exploitable" water sources of 112 bcm (87.5 percent surface water, 12.5 percent groundwater), thus concurring with Turkish agencies (Williams 2012: 20). This amounts to per capita available volume of 1519 m^3 in 2010, when actual consumption totaled 44 bcm—with irrigation, households, and industry consuming 72 percent, 16 percent, and 12 percent, respectively (DSI 2011: 25), and thus amounted to annual per capita consumption of nearly 600 cubic meters.

Official sources project that available per capita water supply will decline. A population of 100 million would lower per capita "exploitable" quantity to 1,120 m^3, thus drawing the country below what official accounts refer to as "water scarcity" (less than 2,000 m^3 per annum) and just above "water poverty" (DSI 2011: 25). However, even this dire projection may not factor in independent climate change-related constraints on the water budget. Notably, the Aegean region's Gediz and Greater Menderes river basins could lose one-fifth of their surface waters by 2030, 35 percent by 2050, and one half by 2100, while facing larger irrigation water demands due to "increasing potential crop evapotranspiration (up to 10 percent and 54 percent for the years 2030 and 2100, respectively)" (MEF 2007: 19, 170). Urban areas of Ankara, Aydin, Bursa, Istanbul, and Nevsehir face elevated risks of water scarcity (MEU 2011a: 59). Thus, plans to raise irrigation, household, and industrial water uses to 72, 18, and 22 bcm, respectively, by 2023 (Williams 2012: 22–23) could come up short if the water supply were to fall below 112 bcm in line with the projected trends for the analyzed Aegean basins.

Hydropower and Other Renewable Energy Sources

Hydroelectric power (HEP) provides a significant source of electricity for residents of Turkey and non-HEP renewables are also rapidly increasing as sources of power and heat. BP (2012) shows that Turkey's HEP increased by 124 percent between 1990 and 2010 (hovering around 11 percent of Turkey's total energy consumption), while non-HEP renewables, providing about 0.2 percent of Turkey's total energy use in 2010, saw a steeper rise over the same two decades. The government has set ambitious targets for HEP expansion, with official sources citing technically feasible potential of 216 twh, four times more than current average production from 267 HEP plants in operation (DSI 2011: 16).

However, HEP and wind depend on weather-linked cycles that climate change may upset. HEP output growth has not actually kept up with overall electricity generation and even its longer-term overall growth masks salient multiyear drought-induced decreases. Between 1998 and 2001, annual HEP fell from 42.23 to 24.01 twh (with its share of Turkey's total electricity output shrinking from 38 percent to one-fifth), and fell again between 2004 and 2006 from 44.24 to 33.27 twh, whereas wind power rose from 0.08 twh to 3.58 twh per annum between 1990 and 2010 and increased every year between 2003 and 2011 (TETC 2011). But Turkey's burgeoning wind-energy sector could also be vulnerable to the "more likely than not" outcome of "reduced windiness activity" in Mediterranean Europe caused by a northward shift in cyclonic activity (Christensen et al. 2007: 864,878). As one government assessment has put it, "Droughts, extraordinary natural events, and climate system instability may cause expensive malfunctions in Turkey's energy infrastructure" (MEF 2009a: 29).

Agriculture, Food and Forests

Climate change could inflict the most severe and pervasive effects on Turkey's agriculture and thus its food security. For Turkey, "86.5 percent of its total land area and 73 percent of its arable land" are vulnerable to erosion, land degradation and desertification, and the Aegean region's increasing aridity between the 1960s and 1990s (MEF 2007: 178) augurs poorly for ameliorating this factor. Shifts in temperature and rainfall patterns will diminish the quantity and quality of water available for food production, further degrade pasture land, and increase the range and species count of agricultural pests (MEU 2011a: 58), thus leading to "a possible decline of 2–13 percent in [agricultural] productivity throughout Turkey" (MEF 2007: 170). Temperature increases and rainfall decreases, by shortening fruition periods (i.e., vegetative duration and the grain-filling process) and speeding plant water loss, may cut Turkey's winter wheat yields by up to one-fifth (Ozdogan 2011), and severe drought (as in 2007) will exact a toll on the yield of Turkey's olive trees, which produce up to five percent of the world's olive oil (Tunalioglu and Durdu 2012). Turkey's forests also face greater vulnerability to fire. About 12 million hectares (58 percent) of Turkey's forests are located in the fire-prone Aegean and Mediterranean regions, 46 percent consist of calabrian and black pine, and one-fifth have flammable accumulations of brush (MEU 2011b: 94).

Ecosystems and Biodiversity

Turkey's forests serve as hosts to its larger biodiversity heritage. While "forests and natural land," the latter consisting of "macquis, scrubs, weeds, and open ranges," represent 53 percent of Turkey's land mass, wetlands and marshes constitute three percent (MEU 2011a: 49). After Turkey had largely ceased marsh drainage (100,000 hectares between 1955 and 1970), it joined the Ramsar Convention in late 1994, and this accord's criteria apply to 200 of Turkey's wetlands, twelve of them consisting of 200,000 hectares and three of them on the coasts (MEF 2007: 175–176). Turkey's wetlands constitute rich troves of biodiversity. Turkey has "at least 8,650 vascular plant species, 30.9 percent of which are indigenous to Turkey" (MEF 2007: 36), 120 species of mammal, 130 of reptile, and 400 each of birds and fish (with over 1700 inhabiting the surrounding seas), with 3–4 percent of the total being indigenous and six percent of them threatened; thus, 0.7 percent of Turkey's land falls under categories I–V of IUCN protection and the country has been a party to the UN Biodiversity Convention since 1996 (MEF 2007: 174).

Global warming could severely diminish Turkey's biodiversity. Studies suggest that a 3.6°C increase in temperature may halve the count of plant species in the northern Mediterranean and the Mediterranean mountainous region (MEF 2007: 174). Under rising temperature and falling streamflow pressures, the Greater Menderes River Basin, for example, which contains Lake Bafa, an important wetland in the Aegean region, could lose scores of macro-invertebrate taxa that need "low temperature, high dissolved oxygen, [and] high current velocity" (MEF 2007: 174). Similar climate trends will make many of Turkey's 200 lakes, covering over 9000 km^2, richer in nitrogen and phosphorous nutrients, thus fostering algal blooms and lowering diversity of aquatic plants and predator fish and birds via eutrophication (MEF 2007: 175).

Socioeconomic Impacts

Socioeconomic ramifications of climate change in Turkey will be multifaceted but unevenly distributed in terms of geography, sector, and gender. Turkey achieved a Human Development Index (HDI) score of 0.679 in 2010 (below the OECD and even "high human development" group averages), but it registered the second largest negative differential (-26) between GNI per capita rank and HDI rank of the latter group, lowering its "inequality-adjusted" HDI score to 0.518 (UNDP 2010: 143–146,149,153). In Turkey, 47 percent of males aged 25 or older had secondary schooling in 2010 and 70 percent belonged to the workforce in 2009, but females lagged behind at 27 and 24 percent, respectively, dragging it below the "low human development" average for females on both indices and yielding a 2011 Gender Inequality Index (GII) score of 0.443, better than in 2008, but still below the "high human development" average GII score (UNDP 2011: 140–142).

Turkey's population and economy face potential threats from sea-level rise. Over two-thirds (70 percent) of Turkey's industries are found along its coasts (MEF 2007: 57). Nearly three-fifths of Turkey's GNP has come from the heavily industrialized Tekirdag-to-Kocaeli corridor on the Marmara Sea's northern coast, with its epicenter in Istanbul, which displays "high-risk values" in this regard. A "preliminary assessment of vulnerability analysis" suggests that Turkey could suffer capital losses of 6 percent of GNP as well as protection and/or adaptation costs equivalent to 10 percent of GNP—mainly for dike and levy installations (MEF 2007: 167).

Tourism, a major revenue source both for countless businesses and for the government, remains largely seasonal in nature and thus sensitive to climate change. As Turkey's National Climate Change Adaptation Strategy and Action Plan or NCCASAP (MEU 2011b: 12) notes, "It is inevitable that the tourism sector will also be negatively affected from decreasing snow cover in mountainous areas and increasing temperatures in the Mediterranean Region." Some potential loss of touristic value from the economy has already been attributed to climate change, especially via rising sea levels, and this is projected to increase. For example, increased wave and sand-dune activity, in addition to ASLR, could damage or destroy landmark cultural sites like Phaselis and Patara on Turkey's southwestern coastline (MEF 2007: 19). "Flagship" historical sites on Istanbul's shoreline, such as the Dolmabahce Palace and Mosque, the Ortakoy Mosque, the Beylerbeyi Palace and the Kucuksu Kiosk, face similar threats (MEF 2007: 167).

Extremely sensitive to heat and rainfall patterns, agriculture will bear the worst brunt of climate change. As the NCCAP (MEU 2011a: 58) contends, agriculture constitutes a "priority sector for socioeconomic reasons" and a key source of food supply. Soil erosion and drought will require considerable expenditure to fix while lowering farm incomes and exacerbating rural-to-urban migration (MEF 2009a: 10). Stark gender inequalities will further aggravate climate change's socioeconomic effect on agriculture (MEU 2011b: 76). While "unpaid family workers" in 2010 made up one-fifth of the total workforce of 22.59 million and 47 percent of 5.68 million agricultural laborers, they made up three-quarter of females working in agriculture and four-fifths of rural females in that sector (Turkstat 2012).

GOVERNMENT POLICIES AND STAKEHOLDER ACTIONS

On the issue of addressing climate change, Turkish authorities contend that the country faces a more difficult predicament than developed countries and even non-Annex I developing countries (see below). While Turkey had developed a National Environmental Action Plan to integrate environmental issues into the 1996–2000 seventh Five-Year Development Plan (MEF 2007: 6), the EU's 1999 Helsinki decision to nominate Turkey as a candidate member and its 2005 decision to open accession talks bolstered Turkey's environmental efforts. In 2006, Turkey renewed its 1983 Environment Law and passed the EU Integrated Environmental Approximation Strategy, both emphasizing sustainable development (Izci 2012: 191). The ninth Development Plan (2007–2013), National Climate Change Strategy (2010–2020), and in 2011, the NCCAP and NCCASAP, focused more directly on climate change. Although the European Commission (EC 2012: 83) has faulted the NCCAP for lacking targets, the 2011 plans enumerated core sectors (one set for mitigation and another for adaptation) as well as key purposes and objectives for each sector, and involved "consultation" with nongovernmental stakeholders in their drafting and formulation.

Mitigation

Mitigation seeks to cut or limit the sources of GHG emissions. Turkey's NCCAP identifies seven main sectors—energy, buildings, industry, transportation, waste, agriculture, and land use and forestry, as well as "cross-cutting issues in GHG control," such as institutions, technology transfer, financial assistance, data and information collection, capacity building, and mechanisms to monitor and evaluate the plan itself (MEU 2011a: 2–3). Every mitigation sector has delineated key "purposes," each with specified "objectives" and "actions," the latter containing timetables, co-benefits, performance indicators and tasked organizations (MEU 2011a: 66–132).

As discussed above, Turkey's energy sector accounts for 71 percent of its total GHG emissions and 85 percent of carbon dioxide. This area's mitigation foci aim to reduce 2008 energy intensity 10 percent by 2015 (via enhanced energy efficiency); increase the share of "clean" energy sources; limit GHG emissions from coal-fired electricity generation via "clean coal technologies" and higher coal-fired power-plant "cycle efficiencies"; and reduce "losses and illicit use in electricity distribution" to 8 percent by 2023 (MEU 2011a: 66). Annual electricity losses, which exceeded 17 percent of "total network supply" during 1996–2003, rose from 12 to 15 percent of network supply between 1990 and 2010, when they reached 30.22 twh, four-fifths of this from "distribution" (TETC 2011). The EU 2008 progress report on Turkey observed that electricity theft and loss "remains almost twice the EU average" (CEC 2008: 57).

Hydropower, biomass (e.g., firewood and dung), and solar hot water constitute established energy sources in Turkey, but wind, geothermal and advanced solar power have gained greater policy emphasis and legal impetus. The 2001 Electricity Market Law allows renewable power facilities to pay no annual licensing fee in their first eight years in operation, obligates priority grid access to renewable energy, and (its 2008 amendment) waives the production-license requirement for renewable power plants up to 0.5 MW (Tukenmez and Demireli 2012: 7–8). The 2005 Renewable Energy Law requires that 8 percent of retail power licensees' purchases consist of renewable energy source (RES)-certified electricity; guarantees prices for renewables; and authorizes the Council of Ministers to raise those prices by 20 percent annually (Tukenmez and Demireli 2012: 8). By 2010, 853 plants (including 736 HEP, ninety-one wind, eleven geothermal, four waste gas, and seven each of biomass and biogas) had been licensed within this law's scope (MEU 2011a: 19). A 2011 amendment to this law differentiates feed-in tariffs (i.e., USD 0.073 per kwh of hydropower and wind energy, 0.105 for geothermal and 0.133 for biomass and solar power) and incentivizes domestic manufacturing content (Tukenmez and Demireli 2012: 6,8), although the EU has questioned the latter's conformity with WTO rules (EC 2011: 74).

Energy-related GHG mitigation extends to buildings, industry, and transportation as well. Each of these sectors aims to increase energy efficiency, while the residential sector also strives for more use of renewable energy and transportation for greater use of biofuel. A 2009 study by the General Directorate of Electrical Power Resources Survey and Development Administration, tasked with implementing the 2007 Energy Efficiency Law, concluded that Turkey could cut industrial and transportation energy uses each by 15 percent and residential uses by 35 percent, thus surpassing maximum 2020 electrical output from "domestic and clean resources" (MEU 2011a: 17). Turkey has "a lot of unlicensed buildings that are poorly-insulated" (MEF 2009a: 27). Use by 10 million more residences of better insulation materials, including double-paned windows, could save 2.4 twh and 2.3 million toe by 2023; thus, buildings constructed after June 2000 require thermal insulation, and recent energy performance regulations mandate central heating of spaces over 2,000 m^2 and use of renewables and cogeneration for those over 20,000 m^2 (MEU 2011a: 21–22). In transportation, lower GHG-emitting railroad travel in Turkey, "the least railroad-intense country in Europe" (MEU 2011a: 29), has fallen far behind rising demand for greater personal mobility.

Curbing methane emissions requires better waste control. EU laws on waste disposal (especially the 1994 Packaging and Packaging Waste Directive, the 1999 Landfill Directive and the 2008 Waste Framework Directive) led Turkey to pass national legislation and propose, with EU financial help and technical assistance for Environmental Heavy Cost Investment Planning, an Integrated Solid Waste Management Plan that would close unmanaged waste sites (half by 2015 and all by 2023) and regulate recyclable packaging waste (MEU 2011a: 35–36). In terms of the European Union's 1999 Landfill Directive mandating member states to dispose of declining fractions of 1995 biodegradable waste in landfill sites in 2006, 2009, and 2016, Turkey uses 2006 as the baseline year and lags about nine years behind EU targets (MEU 2011a: 36). Turkey lacks sufficient revenue from the Environmental Cleaning Tax (ECT), paid as part of (often uncollectible) local water bills, and adequate data on unmanaged waste sites (MEU 2011a: 37–38). Conversely, seven municipal sites, including Ankara's mammoth Mamak landfill, now generate biogas power (MEU 2011a: 38). The European Commission has found Turkey to have made "good progress" in this sector (EC 2011: 100).

Turkey's GHG abatement also requires further agricultural reform. Unsustainable practices like over-fertilization, stubble incineration and excess tillage, inefficient irrigation methods, and scattered plot distribution consume 50 percent of agricultural energy (MEF 2007: 6). Improved land consolidation could save about one-quarter of agricultural fuel use and better cultivation techniques like "zero-tillage" could reduce energy use and enrich soil organic content (MEU 2011a: 44–46). Better management could enrich the carbon-sink capacity of Turkey's pastures, natural meadows, and "vegetation change areas" and boost Turkey's competitiveness in carbon trading (MEF 2007: 12; MEU 2011a: 42–43). Turkey's forests need resuscitation as well. The National Forestation Action Plan envisages rehabilitation of about 1.7 million hectares of "degraded" forest, thus increasing annual sink capacities from 41 to 222 million tonnes of carbon, although this remains a minority fraction of degraded forest and tourism and mining threaten forest biomass (MEU 2011a: 52–53).

Identifying tangible benefits play a crucial role in selling mitigation. As costs are loaded up front, GHG cuts require "framing through local issue bundling, or tying together the co-benefits of previously distinct public concerns" (Koehn 2008: 54). Turkey's 2011 NCCAP contains pervasive co-benefits on energy (energy security, lower energy costs, higher energy savings, and lower import dependency); EU alignment; capacity building; competitiveness; "green employment"; lower air pollution; and human health (MEU 2011a: 76–116). Agriculture and forestry focus on augmenting carbon sequestration, with cited co-benefits implicitly integrated with adaptation goals: improved natural resources management; sustainable use of soil and water resources; erosion control; healthy food production and food security; biodiversity conservation; and ecosystem services (MEU 2011a: 118–132).

Adaptation

While the NCCAP includes adaptation, the ensuing NCCASAP covers it more fully. Citing the long lag time for the elimination of existing atmospheric GHG concentrations, the latter plan states that, "adapting to the impacts of climate change is necessary regardless" of success in reducing global emissions (MEU 2011b: 12). The interconnected vulnerability areas consist of water resources management; agriculture sector and food security; ecosystem services, biodiversity, and forestry; natural disaster risk management; and public health; as well as "cross-cutting issues in adaptation" (MEU 2011a: 3; MEU 2011b: 15–16).

The first area emphasizes Integrated Water Resources Management (IWRM). This principle calls for holistic basin-centric water resources development capable of flexibly responding to shifting needs and covers effective agricultural water management, a key goal of the second vulnerability area (MEU 2011a: 71–72; MEU 2011b: 79–81). Turkey's early experiences in IWRM came via two World Bank-funded projects, one in 1993 to "restore sustainable range, forest, and farming activities" in the upper Euphrates catchment and the other in 2004 to improve "sustainable natural resource management" in 28 Black Sea-region micro-catchments (Dargouth et al. 2008: 112). Research continues into climatic effects on four crucial river basins—Gediz, Greater Menderes, Konya, and Seyhan (MEU 2011a: 60), the latter being the focus of a 2009–2010 systems approach-based program that utilized "stakeholder-livelihood-ecosystem" analysis and produced basin-level pilot eco-efficiency and "clean production" schemes (MEU 2011b: 43–36). IWRM also encompasses curbing illegal uses of underground water resources and urban water losses and theft (MEU 2011b: 66).

Basin water resource management has obvious ramifications for agriculture and food security, both of which intersect with ecosystems, biodiversity, and forestry as well as with natural disaster risk management and public health. While Turkey has been indirectly addressing adaptation needs, for example, by supplanting traditional flood techniques with sprinkler and drip mechanisms, its "[e]xisting strategies, policies, plans, and programs for the management of water resources . . . do not directly cover climate change adaptation targets" and it lags on modern water-use techniques, irrigation efficiency management, and developing low-water-use and drought-resistant crops (MEU 2011b: 25, 33). Poor cultivation practices (e.g., plowing and over-grazing pastures, marsh drainage, dam inundation of vulnerable habitats, over-use of aquifer water, and polluted runoff) have damaged natural areas and indigenous species varieties (MEU 2011b: 82). These areas thus face greater drought risk, elevating the urgency of developing climate-relevant "soil and land database and land information systems" and integrating agricultural drought into disaster planning and management activities (MEU 2011a: 71). Soil erosion jeopardizes cropped and forested land as well as biodiversity content and rural communities by aggravating the risk of natural disasters like fire, floods, and drought, which in turn can lead to desertification (MEF 2009a: 10). The NCCASAP thus aims to improve female farmer training, diversify forest villagers' livelihoods, and bolster insurance mechanisms (MEU 2011b: 126, 132, 135).

Stakeholder Actions

As elsewhere, Turkey's stakeholders in climate change encompass bureaucrats, corporations, unions, universities, community groups, and nongovernmental organizations (NGOs). NGOs, along with various international organizations (IOs) and international financial institutions (IFIs), have played key roles in placing environmental issues on Turkey's policy agenda, but governments, influenced by development imperatives, have had tenuous relationships with these NGOs, including, *inter alia*, Greenpeace Turkey, TEMA (a member of the European Environmental Bureau), and the "climate platform" (Izci 2012: 195). The Ministry of Environment and Forestry designated the Turkish branch of an IO known as the Regional Environmental Center (REC) as focal point for UNFCCC's Article 6 (Education, Training, and Public Awareness) during 2005–2008, but took over this duty in 2008 (MEU 2011b: 42).

Turkey's government has advanced mixed assessments of its own and NGO roles in increasing environmental consciousness. It has stressed the need for technocratic "soft adaptation measures," praising the establishment of the country's first certified education and training program on climate change and adaptation at Ankara's Middle East Technical University (MEU 2011b: 31, 43). But it has also critiqued the larger number of Turkish NGOs focused on mitigation instead of adaptation (MEU 2011b: 86, 114) and pointed to the "leading role" of the Education Ministry in raising "public awareness" on climate change. However, it concedes that, "Turkey still needs to strengthen participatory processes for adaptation to climate change" (MEU 2011a: 64), concurring with European Commission opinion that there exists at all levels "a significant need for awareness-raising on opportunities and challenges of climate change" (EC 2011: 101).

The government has engaged in public consultation, albeit generally on its own terms. The NCCASAP's own drafting and formulation involved only four months of "spirited stakeholder discussion," resulting in a "Participant Vulnerability Analysis" (a means of identifying local vulnerability areas "with the help of a participatory approach") that also highlighted a lack of urgency by province-level administrators, poor inter-agency coordination, bureaucratic obstacles to "implementation of effective action," and weak engagement by local universities and research institutes (MEU 2011b: 47). In a larger sense, though, civil society groups' access to information tends to be limited and their participation and consultation sought out merely to satisfy "procedural requirements" (Izci 2012: 196).

TURKEY'S STANCE ON CLIMATE-CHANGE TREATIES

Turkey has signed key climate change-related accords, although belatedly and only after securing specific exemptions from their most stringent obligations. Despite its "relatively well developed environmental policy and administration" and membership in numerous international environmental regimes since the 1970s, Turkey salient identity as a developing country has made it highly ambivalent about incurring the obligations of these regimes, including those on climate change (Izci 2012: 182–183).

Turkey initially balked at signing the 1992 UNFCCC. Fearful that its Cold War-influenced OECD membership would burden it with Annex-I GHG emissions-reduction pledges (applying to 15 Economies in Transition (EIT) and all OECD states except New Zealand) and Annex-II aid obligations (for all OECD states, including New Zealand), it did not join until 2004, over two years after the Seventh Conference of the Parties (COP7) in 2001 agreed to remove it from Annex II and recognize that

Turkey's "special circumstances" place it "in a situation different from that of other Parties included in Annex I to the Convention" (Erdogdu 2010: 1114). Conversely, as Turkish governments have also stressed, major non-Annex I (developing-country) parties lack emissions targets, but account for larger shares of 1850–2002 "cumulative CO_2 emissions" and emit higher per capita GHG volumes (MEF 2009a: 21–24, 32).

The European Union accession process has had a dualistic influence on Turkey, motivating its authorities both to approve the Kyoto Protocol and to delay that approval for as long as possible. Even after its parliament ratified it in February 2009, Turkey stayed out of Annex B and thus incurred no "quantified emissions reduction and limitation commitments" (MEF 2009a: 31–32) or QERLCs. While Turkish officials worried that the €60-billion costs of adopting the environmental chapter of the EU *acquis* (body of law) and accepting Annex-B targets would harm its competitiveness, improved prospects of eventual EU membership conveyed by the official launch of accession talks in 2005 and the opening of environmental chapter negotiations in December 2009 allayed these concerns somewhat (Izci 2012: 184–185, 190–191). Turkey also wanted to avoid losing a say in any post-2012 climate regime that would be influenced by the EU's 2006 "20–20–20 Plan" to cut 1990 GHG emissions by one-fifth and up to 30 percent, conditional on others' commitments, by 2020 (Erdogdu 2010: 1115, 1117). The EU also aims for 50 percent cuts by 2050 (MEF 2009b: 48).

Nonetheless, Turkish officials have invariably stressed the country's inability to take on obligations commensurate with Annex B or Kyoto's post-2012 successor. In 2009, after Turkey had joined the protocol and the Bonn-I Climate Change Talks had ended, the government issued an official opinion that "each country should decide on the suitable commitment for itself" after 2012 and that "there should not be any imposition upon the Parties" (MEF 2009b: 57). Prime Minister Erdogan, in a video statement to the September 2009 New York Summit on Climate Change, underscored Turkey's willingness to pursue "nationally appropriate mitigation actions" (NAMAs)—not QERLCs—according to the principle of "common but differentiated responsibilities" and its own "national circumstances" (MEF 2009b: 43). In the run-up to COP15 (Copenhagen), another government report bluntly stated that "every possible effort shall be made not to have Turkey's name under Annex B of the Protocol" (MEF 2009a: 35). COP16 in 2010 (Cancun) and COP 17 in 2011 (Durban) endorsed (Marrakech) COP7's original differentiation of Turkey from its Annex I partners (EC 2011: 101; EC 2012: 83). Yet, even if Turkey cannot be coerced by the post-2012 regime forged at Doha's COP18 to forgo adherence to NAMA-type flexibility, it knows that the European Union wants candidate members to adopt "ambitious binding" targets (MEF 2009b: 48).

CONCLUSION: PRESCRIPTIONS FOR TURKEY

Since 1983, when democratic government was restored to Turkey following the post-1980 junta rule and parliament passed the original Environment Law, affluence and effluents have grown apace, along with environmental concerns. Turkey's authorities, compelled to address the country's rising GHG contributions to climate change, which has exacerbated Turkey's Mediterranean-type weather and rainfall patterns and could threaten its rising standard of living, have elevated climate change and its impacts on human security higher on a policy agenda that classic security issues once monopolized and still dominate.

Turkish policy officials and civil society actors have grown more conscious of the ramifications of climate change, but the European Union has demanded even more of Turkey as a candidate member. The European Commission has decried Turkey's weak institutional capacity. Turkey has many laws that apply directly or indirectly to climate change as well as agency coordination mechanisms, like the Climate Change Coordination Board established in 2001 under the Ministry of Environment and Urbanization's aegis, but has no environmental protection agency with the central mandate to subject large infrastructure projects to impact assessments and public consultation (EC 2011: 101, 102). Given the place of wetlands and biodiversity in mitigation, the European Union has also expressed concerns, *inter alia*, over the law on the privatization of degraded forest land, the weakening of wetlands protection, and absences of such items as nature-protection framework legislation, delineation of agency responsibilities for nature protection, a national biodiversity strategy and action plan, and identification of Natura 2000 sites facing harm from planned HEP installations (EC 2012: 82).

Turkey has adamantly pushed for recognition of its "special circumstances." The European Commission, however, questions this stance, critiquing Turkey's failure to "put forward a greenhouse gas emissions reduction target for 2020" (EC 2012: 83). Without binding Kyoto targets or non-Annex I status, Turkish economic entities cannot avail themselves of Kyoto's flexibility mechanisms for trading in emissions credits or attracting Clean Development Mechanism investment monies. State planners have estimated that bringing Turkey's energy-efficiency, renewables, and solid waste projects into the EU's Emissions Trading System (ETS) could earn Turkey up to USD 166 billion by 2020, or 49 percent of project capital costs (Ulgen 2012: 23–24). Indeed, the EU has praised Turkey's "steps to enhance cooperation on emissions trading, including to raise awareness of the EU Emissions Trading System amongst the different stakeholders in the country" (EC 2011: 101). Whether this activity whets stakeholders' willingness to push for stricter GHG emissions-reduction commitments remains to be seen.

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