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Feeling the Heat

Adapting to Climate Change in the Middle East and Central Asia

Prepared by an IMF team led by Christoph Duenwald, Yasser Abdih, Kerstin Gerling, and Vahram Stepanyan, and including Lamiae Agoumi, Abdullah AlHassan, Gareth Anderson, Anja Baum, Mehdi Benatiya Andaloussi, Chen Chen, Sahra Sakha, Sergejs Saksonovs, Faten Saliba, and Jesus Sanchez

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Executive Summary

Climate change is among humanity's greatest challenges, and the Middle East and Central Asia (ME&CA) region is on the frontlines of its human, physical, and economic ramifications. Much of the region lies in already harsh climate zones, where global warming exacerbates desertification, water stress, and rising sea levels. This trend entails deep economic disruptions, endangers food security, and undermines public health—with ripple effects on poverty, inequality, displacement, and conflict. While recognition of these challenges is high in the ME&CA region, with nearly two-thirds of its population perceiving climate change as a global emergency (UNDP and others 2021), decisive and broad based action has yet to follow.

This paper is the first to highlight macro-critical climate adaptation challenges for the ME&CA region. Leveraging a newly assembled comprehensive data base on climate and macro-financial indicators, the paper derives novel climate risk profiles and empirical evidence to underpin its central message: adapting to climate change—by boosting resilience to innate climate stresses—is a critical priority for ME&CA economies. Concretely, the paper answers four questions: (1) What are the region's key climate challenges? (2) How does climate change affect the region's economies, development, and stability? (3) What public policies can boost climate resilience, including in the near term? (4) What are these policies' implied financing needs, and what sources exist to meet them? The paper's insights can help policymakers devise country-specific adaptation plans as part of wholistic climate strategies that also include mitigation and transition risk management.

Key Findings

ME&CA countries are already feeling the brunt of climate change. Analysis of data spanning the past century reveals that the region's three main climate stresses have further intensified since the 1990s: (1) temperatures have risen by 1.5° C, twice the global increase of 0.7° C; (2) precipitation, already sparse, has become more erratic than in any other region; and (3) climate disasters, such as droughts and floods, have occurred more often than in the past. Since 2000, climate disasters have resulted, on average per year, in \$2 billion in direct material damages, 7 million affected people, and 2,600 deaths. Analysis also suggests that continued climate change will exacerbate both current climate stresses and damages, particularly in countries with low resilience (above all, fragile and conflict-affected states). This mainly reflects their rain-dependent agriculture and structural vulnerabilities.

Climate change is a major threat to growth, prosperity, and macro-financial and socio-political stability. Econometric analysis finds that changing temperature and precipitation patterns have eroded per capita incomes and shifted the sectoral composition of output and employment over the past three decades. Middle East, North Africa, Afghanistan, and Pakistan (MENAP) countries have been harder hit than their Caucasus and Central Asia (CCA) peers, given their initially hotter and drier climates. Moreover, climate disasters have adversely affected growth, fiscal, and external sector dynamics, mainly within the two years following the events but also with permanent output and tax revenue losses in CCA countries. These economic effects of climate change have disproportionately affected vulnerable groups, aggravating poverty and inequality, and contributing to social tensions, migration, and conflict.

Therefore, climate adaptation is an urgent priority for the region. There is no one-size-fits-all panacea, given each country's specific set of climate stressors, capacity, and vulnerabilities. Nevertheless, some common principles apply to the region. First, adaptation needs full embedding in countries' medium-term inclusive growth agendas. This involves including climate risks and policies in all relevant policy frameworks and structural reform agendas. In parallel, "no-regret" measures can help boost much-needed climate resilience, notably social measures (mainly better social protection, health care, and education) and infrastructure

investments (such as in water and early warning systems). Policies also need to ensure that the private and financial sectors can play their role. If implemented in the near term, green policies can even help spur a resilient recovery from the COVID-19 crisis.

Adaptation will need significant additional spending and hence financing. Current estimates vary widely and cover public infrastructure investment needs in a moderate-emission scenario only. These alone, however, could still amount to up to 3.3 percent of GDP per year for individual ME&CA countries over the next ten years (IMF 2020c). At the same time, fiscal space is limited in many ME&CA countries, particularly in the aftermath of the COVID-19 pandemic, necessitating a mix of domestic policy reforms and greater international support. While some costs of adaptation could be met by reprioritizing public spending (for example, replacing general fuel subsidies with targeted ones), these countries are well advised to tap various multi-lateral and bilateral financing sources and to help catalyze private investment in adaptation to complement that of the public sector.

Acronyms and Abbreviations

°C	Degree Celsius
ADB	Asian Development Bank
AF	Adaptation Fund
AFD	Agence Française de Développement
AfDB	African Development Bank
AMER	Americas
APAC	Asia and Pacific
ARC	African Risk Capacity
BAU	Business as Usual
CCA	Caucasus and Central Asia
CCKP	Climate Change Knowledge Portal
CCUS	Carbon Capture, Utilization, and Storage
CH ₄	Methane
CIF	Climate Investment Funds
CO ₂	Carbon Dioxide
DFID	Department for International Development
EBRD	European Bank for Reconstruction and Development
EM	Emerging Market
EMDE	Emerging Market and Developing Economy
EU	European Union
EUR	Europe
EWS	Early Warning Systems
FAO	Food and Agricultural Organization
FCS	Fragile and Conflict-Affected States
F-gases	Fluorinated Gases
GCC	Gulf Cooperation Council
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse Gas Emissions
GIZ	German Agency for International Cooperation
IDB	Interamerican Development Bank
IFC	International Finance Cooperation

IFS	International Finance Statistics
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IRF	Impulse-Response Function
JICA	Japan International Cooperation Agency
KFW	Kreditanstalt für Wiederaufbau
LIC	Low-Income Country
MDB	Multilateral Development Bank
ME&CA	Middle East and Central Asia
MENA	Middle East and North Africa,
MENAP	Middle East, North Africa, Afghanistan, and Pakistan
N₂O	Nitrous Oxide
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
p.c.	Per Capita
pct.	Percent
PFM	Public Financial Management
PIM	Public Investment Management
PPP	Public Private Partnership
RCP	Representative Concentration Pathway
R&D	Research and Development
RoW	Rest of the World
SDG	Sustainable Development Goal
SSA	Sub-Saharan Africa
TCFD	Task Force on Climate-Related Financial Disclosures
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
WDI	World Development Indicators
WEO	World Economic Outlook
WFP	World Food Program

Glossary¹

Adaptation	Adjustment in natural or human systems in response to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities for human and societal welfares.
Adaptative capacity	The ability of systems, institutions, humans, and other social organisms (for example, families) to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.
Adaptation measures	<p>Actions that respond to the need for climate adaption in a specific way. They can be classified according to their assumed level of future climate risk and involved cost:</p> <ul style="list-style-type: none"> ▪ “No-regret” measures are justified under all plausible future scenarios, including the absence of man-made climate change. Examples include enhancing provision and dissemination of climate information, improving access to early warning systems by local communities living in flood and/or drought prone areas, or addressing so-called “adaptation deficits” (that is, longer-term under-investments in drylands and other marginalized areas that have resulted in low resilience to current climatic conditions of both natural resources and the livelihoods that depend on them). ▪ “Low-regret” measures yield large benefits under relatively low climate risks and with moderate levels of investment which increase the capacity to cope with future climate risks. Examples include promoting drought-resilient cultivars in areas where drought risk is projected to increase or over-specifying components in new builds or refurbishment projects, such as larger diameter drains where rainfall intensity is projected to increase. ▪ “High-regret” measures involve decisions on large-scale planning (for example, resettlement of a large population) and investments with high irreversibility (for example, large infrastructure projects such as sea level walls or large reservoirs).
Adverse effects of climate change	Changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience, or productivity of natural and managed ecosystems or on the operation of socioeconomic systems or on human health and welfare, which can cause negative impacts on humans and human societies.
Anomaly	The deviation of a variable from its value averaged over a reference period. A climate anomaly refers to the difference of a future climate condition compared to the present.
Biological hazard	A hazard caused by the exposure to live organisms and their toxic substances (for example, venom, mold) or vector-borne diseases that they may carry. Examples are epidemics or insect infestations.
Capacity building	In the context of climate change, the process of developing the technical skills and institutional capability in developing countries and economies in transition to enable them to effectively address the causes and results of climate change.
Climate change	A change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods of time.

¹ See UNFCCC (2021a, 2008b, 1992), IPCC (2021a), World Bank (2017a, 2010), Resin (2021), and Annex 4.

Climate disaster	A disaster (see definition below) of natural origin, caused by a biological, climatological, hydrological, or meteorological hazard.
Climatological hazard	A hazard caused by a long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability. Examples include drought and wildfires.
Climate stressor	Condition, event, or trend related to climate variability and change that can exacerbate hazards, such as changes in temperatures or rain patterns. In contrast, a non-climate stressor is a change or trend unrelated to climate that can exacerbate hazards, such as population growth, altering drainage patterns, or replacing open land with roads and buildings.
Disaster	Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.
Ensemble	A group of parallel model simulations characterizing historical climate conditions, climate predictions, or climate projections. Variation of the results across the ensemble members may give an estimate of modelling-based uncertainty.
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected.
Fossil fuels	An energy source with high carbon content, formed in the earth's crust from decayed organic material. The common fossil fuels are petroleum, coal, and natural gas. Carbon dioxide concentrations in the atmosphere have increased substantially since the industrial revolution, mainly due to the combustion of fossil fuels.
Global warming	The estimated increase in global mean surface temperature (GMST) averaged over a 30 year period, or the 30-year period centered on a particular year or decade, expressed relative to preindustrial levels unless otherwise specified. For 30-year periods that span past and future years, the current multi-decadal warming trend is assumed to continue.
Greenhouse gases (GHG)	The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO ₂), methane (CH ₄) and nitrous oxide (N ₂ O). Less prevalent—but very powerful—greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF ₆).
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
Hydrological hazard	A hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater. Examples include floods and landslides.
Hydromet services	They provide real-time weather, water, early warning, and climate information products to end users, based on weather, water and climate data.
Meteorological hazard	A hazard caused by a short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days. Examples include extreme temperature, landslides, fog, and storms.

Mitigation	A human intervention that prevents the planet from warming to more extreme temperatures, by reducing the emission of heat-trapping greenhouse gases into the atmosphere, or enhancing a reservoir (natural or human, in soil, ocean, and plants) where a greenhouse gas, an aerosol, or a precursor of a greenhouse gas is stored.
Multi-model ensemble	They include simulations by several models also include the impact of model difference, whereas ensembles made with the same model, but different initial conditions only characterize the uncertainty associated with internal climate variability.
Nationally Determined Contributions (NDCs)	According to Article 4 paragraph 2 of the Paris Agreement, each Party shall prepare, communicate, and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.
Natural disaster	A major adverse event resulting from natural processes of the Earth.
Permafrost	Ground (soil or rock and included ice and organic material) that remains at or below 0° C for at least two consecutive years.
Representative Concentration Pathways (RCP)	Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases and aerosols and chemically active gases, as well as land use/land cover. "Representative" signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. "Pathway" emphasizes the fact that not only the long-term concentration levels but also the trajectory taken over time to reach that outcome are of interest. IPCC's (2021) redefinition of climate scenarios does not imply substantial changes regarding key climate variables, which allows this paper to continue using standard Representative Concentration Pathway scenarios for climate impact projections.
Resilience	The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation in human and its society
Scenario	A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (for example, rate of technological change, prices) and relationships
Tipping point	For the climate system, it refers to a critical threshold when global or regional climate changes from one stable state to another stable state. It does not return to the initial state, even if the drivers of the change abate.
Transition risk	Encompass risks that arise because of the global governmental and economic shift toward a low-carbon future.
Vulnerability	The propensity or predisposition of the population or assets exposed to climate hazard to be adversely affected.