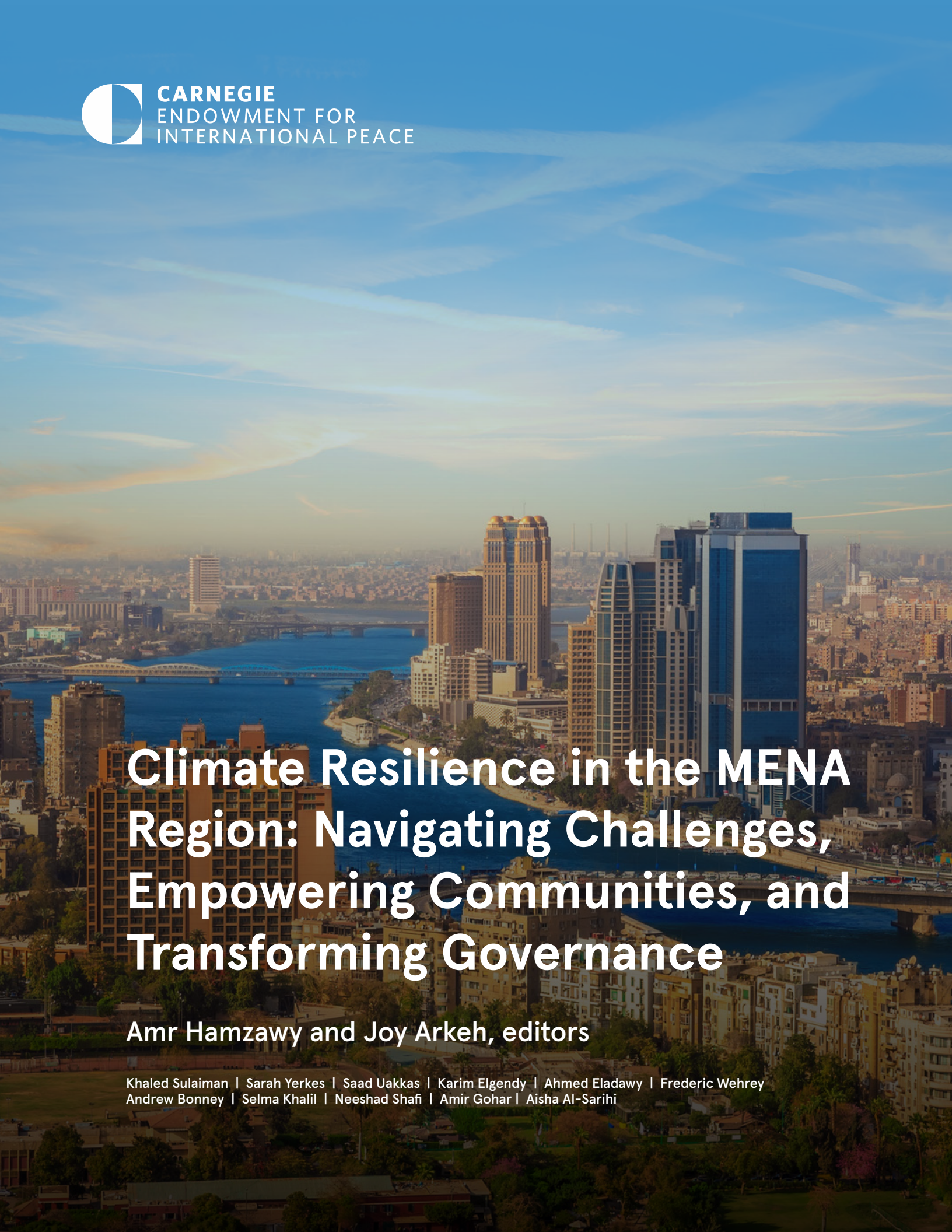

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Climate Resilience in the MENA Region: Navigating Challenges, Empowering Communities, and Transforming Governance

Amr Hamzawy and Joy Arkeh, editors

Khaled Sulaiman | Sarah Yerkes | Saad Uakkas | Karim Elgendy | Ahmed Eladawy | Frederic Wehrey
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Contents

Introduction

Joy Arkeh

The need for effective and inclusive government adaptation and mitigation plans is a political, socioeconomic, and security concern for the Middle East and North Africa (MENA) region. This was central to discussions at the 29th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29) that took place November 2024. In Sudan, for instance, flooding and heavy rain that year displaced around 23,000 households, also cutting off the entry of humanitarian aid due to inaccessible roads. In Palestine, the collapse of water supplies, sanitation infrastructure, and hygiene facilities brought about by its war with Israel, and already weakened by climate impacts, has left Palestine ill-equipped to manage water supply and quality issues. In the wake of surging regional instability, implementing reconstruction and adaptation schemes will rely on diverse capital and coordination across systems and sectors.

Regional collaborative governance toward investing in adaptive capacity is thus becoming increasingly challenging in a region where cascading political turmoil and the debilitating effects of climate change wait for no one. As the most water-scarce and one of the most economically dependent regions on hydrocarbons, the Middle East is in an especially precarious position. Generating a climate risk financial framework that leverages private and public capital will be vital to building resilience and recovery. Yet at the moment, fragmented cross-border governance and centralized national governance models are turning climate finance into a source of ongoing debt and decisionmaking paralysis that sidelines the most vulnerable groups and capable systems, such as civil society, the private sector, and youth activist groups.

Governance and policy planning challenges will only be compounded by the multisectoral and cross-social impacts of climate change. Polluting urban infrastructure impairs public health, water stress curtails food production in both rural and urban areas, and national renewable energy projects often fail to account for local vulnerabilities. It is not uncommon for local needs to go unnoticed in the pursuit of national goals. Without localizing authority and thus creating official channels for integrating and developing the technical

capacities and expertise of local policymakers, NGOs, and activists, there is a high risk of disconnecting from on-the-ground realities. For this reason, integrated management and representative governance will have to be prioritized before long-term, systemic resilience can be realized. Local, subnational, and regional governments in the Middle East have significant influence over resource allocation and demands, yet governance remains siloed.

The research in this series on climate resilience and governance focuses on several key questions:

- How do governance deficits—financial, technical, and regulatory—impact climate governance nationally and climate action at the local levels? What are the most significant short-term and long-term impacts of these challenges for climate risk mitigation and adaptation?

- How do socioeconomic challenges undermine the adaptive capacities of vulnerable groups—such as women, minorities, low-income individuals, and youth? How does the exclusion of vulnerable groups from policymaking influence adaptation and mitigation strategies?

- What is the role of local grassroots actors—such as smallholder farmers, local authorities, and civil society groups—at the country and regional levels? How does engagement and lack of engagement between governments and local stakeholders shape climate resilience?

- How do disparities in knowledge production, funding, and policy implementation marginalize local expertise and hinder equitable climate governance?

- How do integrated governance models—regionally and nationally—facilitate or disrupt MENA countries' environmental management efforts across sectors and commitments to resilient ecosystems, economic growth, and overall well-being?

In analyzing the MENA region's climate governance, our research pulls from the following analytical framework: The first step dissects the preexisting vulnerabilities that undermine climate resilience across MENA countries. This includes the analysis of socioeconomic fragility, such as poverty, economic reliance on fossil fuels, and poor infrastructure, which exacerbate the effects of climate change. A particular focus is placed on the governance deficits—financial, technical, and regulatory—that hinder both mitigation and adaptation efforts. By examining case studies across countries like Egypt, Morocco, and Iraq, the research highlights how preexisting political instability and infrastructural weaknesses create an environment ill-prepared for climate-related challenges, amplifying vulnerabilities for marginalized groups such as women, youth, and displaced populations.

The second step involves assessing the role of governance frameworks—or their absence—in climate risk mitigation. The research looks at how fragmented governance systems, where national and regional policies lack coherence or fail to engage local stakeholders, perpetuate environmental degradation and social inequalities. It emphasizes the importance of inclusive, multilevel governance approaches that integrate local knowledge and expertise into climate action plans, as exemplified by case studies on Morocco's renewable energy sector and Egypt's climate adaptation efforts.

Country-Specific and Regional Governance Case Studies

In his piece on climate information transparency in the MENA region, Khaled Sulaiman debates how the outdated environmental laws, absence of climate legislation, bureaucratic hurdles, and fragmented information systems duplicate challenges to effective climate governance. Other factors—such as state-controlled narratives, lack of interagency coordination, internal conflicts, and political instability—further exacerbate the climate crisis in the MENA region. Addressing these challenges requires structural changes to reduce climate-related risks. The adoption of modern climate laws, interregional cooperation, capacity building, and establishing independent research centers could improve climate resilience and governance.

As for the region at large, Sarah Yerkes and Saad Uakkas argue that the MENA region's youth bear the biggest brunt of the consequences of climate change, consequences that already affect nearly every aspect of their lives, including their economic stability, physical and mental health, and daily routines. Yet, despite representing a disproportionately large percentage of the region's population, youth are rarely consulted on policy decisions, including around climate adaptation and mitigation. Nevertheless, the region's youth have demonstrated climate leadership through a multitude of impactful actions, from leading community programs to creating innovative solutions and empowering their peers and vulnerable groups. But to fully unlock their potential, youth in the MENA region need institutional support, policy alignment, and regional collaboration. Using case studies of Egypt, Morocco and Tunisia, this article identifies successes and avenues for improvement. By fostering meaningful partnerships between youth, governments, and civil society, North African countries can harness the full potential of their young populations to drive long-term, transformative climate action for a more resilient future.

Karim Elgendy examines the critical role of multilevel climate governance in addressing climate challenges across the Eastern Mediterranean and Middle East region. Through detailed analysis of case studies from regional cities, the chapter demonstrates how different governance approaches—from Morocco's constitutional reforms to the UAE's techno-investment model—have shaped local climate action capabilities. The chapter argues that while the region faces significant obstacles, including limited municipal financing, weak

technical capacities, and insufficient coordination between governance levels, there are promising pathways forward through enhanced legal frameworks, vertical coordination mechanisms, and capacity-building programs. The chapter provides a comprehensive framework for improving climate governance in the region, emphasizing the need for context-specific solutions while highlighting opportunities for cross-regional learning and cooperation.

Ahmed Eladawy's article analyzes the intersections of climate governance, knowledge production, and regional cooperation in Africa and the Middle East and North Africa (MENA) regions. Through data-led analyses, it highlights disparities in knowledge production and funding and their role in marginalizing local expertise and priorities. The piece also examines the differences and interconnections in adaptive capacities across Africa and MENA, focusing on gaps in emissions profiles, renewable energy dependence, shortcomings in policy implementation, and the risks of greenwashing. It emphasizes the importance of cooperative strategies that consider cultural and local contexts, promote equitable transitions, local innovations and evidence-based adaptation measures. Even within the MENA and African regions, countries with low emissions should be compensated by those with high emissions for exceeding their fair share of the carbon budget. This compensation recognizes the burden placed on low-emitting nations to accelerate their mitigation efforts beyond what would ordinarily be necessary to prevent climate breakdown. By addressing these issues and fostering collaboration and societal empowerment, the piece offers insights to support more inclusive and effective climate actions.

In their chapter on Morocco, Frederic Wehrey and Andrew Bonney survey the country's vulnerabilities to climate stresses like rising temperatures, decreasing rainfall, and worsening droughts, while also highlighting its tremendous potential to emerge as a regional and even global leader in renewable energy. Endowed with competitive wind speeds, generous reserves of materials used in batteries, and vast swathes of sun-washed land ideal for solar power generation, Morocco's adaptation and mitigation efforts have been further bolstered by laudable government planning and some progress toward the application of green energy technologies.

That said, the authors also find that significant problems remain, especially in the areas of agricultural policy and water management. Inherited partly from French colonial rule and exacerbated under the independent monarchy, these deficiencies have included an unsustainable focus on profitable but water-intensive crops which, in tandem with an overreliance on dam-fed irrigation, has benefited a narrow stratum of regime-connected elites while leaving small holder farmers, oasis dwellers, and nomads acutely exposed to climate shocks like extended droughts. Drawing on field interviews with members of these imperiled communities, as well as leading Moroccan scientists and economists, they argue that the country's vulnerability to global warming has been worsened by the government's failure to fully involve grassroots actors like farming unions, municipal authorities, and civil society groups in the formulation and implementation of climate policies. What is

needed, they conclude, is a more equitable and inclusive climate strategy, one that harnesses the unique knowledge and expertise of these local actors as a vital adjunct to top-down, government-driven adaptation measures.

In the case of Egypt, Amr Hamzawy and Selma Khalil make the argument that Egypt's economic reliance on hydrocarbons, along with fiscal deficits and rising debt, limits its capacity to invest in green energy and climate adaptation projects. While Egypt has developed climate strategies and committed to renewable energy goals, progress has been hindered by gaps in implementation and dependence on international support. Key challenges include water scarcity, agricultural vulnerability, and reliance on fossil fuels. However, Egypt's national climate policies aim to improve resilience through initiatives like water preservation, modern irrigation, and increased use of renewable energy, although external funding remains critical for success.

Neeshad Shafi's article explores the role of activism and civil society organizations (CSOs) in climate action within the MENA region. He highlights how, despite operating within restrictive political environments, environmental activism has grown, driven by factors like urbanization, increased access to education, and the rise of social media. However, activists face challenges such as government repression, limited resources, fragmentation of efforts, and exclusion from decisionmaking processes. Despite these barriers, CSOs have made significant contributions in areas like water conservation, waste management, and renewable energy advocacy. The article underscores the importance of strengthening regional networks, improving funding access, and navigating political constraints to empower civil society and enhance its role in shaping climate policies. As the region grapples with escalating environmental challenges, empowering civic engagement is seen as key to building a more sustainable future.

In addition to the challenges of civic restrictions, the region is caught in the crosshairs of the Gulf's intra-regional competition in leading traditional and emerging energy markets. Aisha Al-Sarihi's chapter argues that Gulf countries are navigating the global energy transition with a dual strategy: maximizing the value of their hydrocarbon resources while investing in clean energy and economic diversification to reduce long-term dependence on fossil fuels. This transition is complicated by structural reliance on oil and gas for essential services like water, food, and cooling, as well as socioeconomic and political challenges tied to subsidy reform, public employment, and energy pricing. Gulf states are developing renewable energy, hydrogen, and carbon capture initiatives, while also promoting innovation and climate education. However, financing, political will, and human capital remain key constraints.

Conclusion

The path to climate resilience in the MENA region is inseparable from the transformation of its governance structures. As climate risks intensify, so must efforts to bridge governance gaps, empower local actors, and maximize the full capacities of youth, civil society, and marginalized communities. This volume makes clear that fragmented, top-down approaches can no longer meet the scale and complexity of imminent climate, socioeconomic and political challenges. Optimal governance that can alleviate vulnerabilities and yield sustainable and equitable growth will involve multilevel, inclusive, and context-specific solutions that prioritize transparency and collaboration.

01

Climate Information Transparency in the MENA Region

Khaled Sulaiman

Despite its low contribution to global greenhouse gas emissions, the MENA region is considered one of the most vulnerable regions to climate change. As human-induced climate change accelerates, the region faces extreme heat, declining rainfall, sandstorms, and other forms of environmental degradation. Additionally, outdated environmental laws, absence of climate legislations, bureaucratic hurdles and fragmented information systems duplicate challenges to effective climate governance. Other factors such as state-controlled narratives, lack of interagency coordination, internal conflicts and political instability, further exacerbates the climate crisis in the MENA region. Addressing these challenges requires structural changes to reduce climate-related risks. The adoption of modern climate laws, interregional cooperation, capacity building, and establishing independent research centers could improve climate resilience and governance.

Introduction

The Middle East and North Africa (MENA) region, home to 6.3 percent of the global population and only 1.4 percent of the world's total surface freshwater—is already enduring visible climate crisis impacts, such as drought, severe heat waves, floods, and water scarcity. Moreover, the region's continued population growth, expected to reach more than 724 million by 2050, coupled with worsening arid or semi-arid climate conditions, will only exacerbate its water scarcity challenge. This disparity between water availability and human demand will create significant pressure on the region's water sources, which are essential for daily life, the economy, and all other sectors such as agriculture, energy, land cover, and biodiversity.

The physical impacts of climate change in the MENA region are evident and interconnected, encompassing reduced seasonal rainfall, intense droughts, desertification, rising temperatures, frequent dust storms, wildfires, and floods. These challenges, compounded by ongoing global warming, are further exacerbated by unsustainable natural resource management, insufficient infrastructure, and a lack of energy efficiency, resulting in irreversible ecological and socioeconomic damage. Although the MENA region contributes less than 5 percent of global greenhouse gas emissions, its eastern part (the Middle East) contributes to global dust emissions (15–20 percent), affecting regional climate conditions, human lives, and terrestrial and marine ecosystems.

Despite scientific assessments classifying the region as one of the most vulnerable areas to climate change, a lack of transparency and accurate data plagues the information landscape. Many regional media outlets, including newspapers, television, and digital and social media, often lack access to reliable climate information, resulting in misleading reporting in some contexts. Interconnectivity and information sharing between state institutions are either insufficient or absent. Internal conflicts and war and media fragmentation, as well as hyperlocal media platforms that obtain their information from untrusted sources, hinder transparent information ecosystems in the MENA region, including those focused on the climate. As a result, official reports submitted to the United Nations Framework Convention on Climate Change (UNFCCC) by most Arab countries regarding climate goals do not accurately reflect the national climate and environmental conditions. Frequently, there is a gap between the local reality and the information presented to the UNFCCC, hindering efforts to achieve decarbonized economies and reduce climate risks.

The importance of transparent reporting on the climate crisis in the MENA region cannot be overstated. As I wrote in a paper with Charif Sada last year, "Despite the region's severe droughts, increasing temperatures, and expending desertification due to climate change, most media outlets provide sporadic and occasional coverage, which contributes to the spread of misleading information in some ways." This article aims to understand how trustless information ecosystems obstruct the free flow of climate information. It explores the factors behind the insufficient dissemination of climate information and how government entities, non-state actors, paramilitary forces, and private corporations all play a crucial role in fueling complex information ecosystems.

Incomplete Narrations

In covering climate events, state-owned media outlets often rely on official narrations, however information or press releases are limited or insufficient in accurately reflecting the scale of climate realities. In fact, climate coverage is not prioritized by government entities and the dominant media outlets in the MENA region. According to DW Akademie, climate coverage in the region "is limited to extreme weather events, government press conferences or international conferences on climate change. The most obvious is the lack of knowledge and expertise amongst journalists and within media organizations to cover climate change. More seriously, lack of knowledge has resulted in the dissemination of misleading information."

This problem of information transparency is not related to media establishments alone; it is also a part of state policies that similarly encompass a lack of transparency and sometimes corruption. In Iraq, for instance, the dissemination of climate information often takes place at conferences and official events, where officials enthusiastically present their policies. However, when it comes to implementing these policies, transparency seems to be an empty slogan. Despite numerous announcements about climate initiatives, there has been a lack of follow-up and accountability, hindering progress in addressing the country's climate challenges.

During the 2023 United Nations Climate Change Conference (COP28) in Dubai, the Central Bank of Iraq announced the launch of a "green" private financial institution with a capital of $300 million. The institution, called Green Bank, aims to mitigate the impacts of climate change by investing in environmentally friendly projects and creating green jobs, according to the Iraqi government's first press release. Mohammed Shakir, the founder and executive director of the Green Bank, announced publicly that the initiative's first phase aims to create 100,000 green job opportunities.

However, since the opening ceremony of the Iraqi Green Bank on November 7, 2023, there has been little follow-up on implementation of this initiative. According to local environmental reports, the main public information about this project dates back to the ceremony. Since then, no public contact information on the bank's project managers has been available. As a result, there appear to be many barriers to accessing up-to-date and accurate information on the project implementation process.

Iraq's information ecosystems concerning climate change and ways to reduce its risks are often ambiguous and contradictory. Ministries and other government entities contribute to contradictory and opaque information. For instance, the Ministry of Water Resources, despite announcing a national plan to develop the agricultural sector in mid-2023, suffers from an underfunded budget. According to existing studies, "only 1% of the national budget is allocated to both the Ministry of Water Resources and the Ministry of Agriculture, which leaves no capacity to mitigate the risk of climate change impact." Furthermore, The Ministry of Environment in Iraq is a relatively new and unstable component of government structures. Established in 2003, dissolved and merged with the Ministry of Health in 2015 and reinstated in 2022, the Ministry functioned inconsistently in the absence of climate policies in the country.

Outdated Environmental Laws

Lack of transparent information about climate change in many Arab countries goes back, in certain ways, to the absence of climate laws or new climate legislations. Most environmental protection and improvement laws in the region cover national regulations to protect, for example, ecological systems from pollution, soil degradation, and biodiversity. However, these laws have not been updated for decades in many Arab countries, posing significant challenges for environmental assessment, analysis, and the dissemination of accurate information.

In Iraq, for instance, the Environmental Protection and Improvement Law of 2009 (EPIL) has not been updated to suit Iraq's climate reality, "which is witnessing a sharp rise in temperatures and frequent dust storms, not to mention the shortages of water and energy." What is noteworthy is that climate change is not mentioned in a single article of this Iraqi EPIL, which makes it outdated and ineffective in combating the consequences of the climate crisis. It is well known that climate law comprises policies, laws, plans, voluntary codes, and governance methods aimed at addressing climate change by means of mitigation and adaptation.

Based on interviews with members of the Iraqi Parliament in three consecutive sessions since 2012, no new legislation has been issued regarding climate change and its effects on the country's ecological and human systems.[1] The reason for this, according to those interviewed, is that the legislative institution in Iraq does not pay attention to the climate crisis, even though the country is classified among the most vulnerable countries to climate change.

In Morocco, despite experiencing a sixth consecutive year of drought due to an unprecedented decline of seasonal rainfall, government responses have been limited to regional policies and local administrations and have not developed sufficiently comprehensive national environmental policies. The country has joined the UNFCCC, as well as the Paris Agreement, but except for some government directives, no new climate laws have been enacted as of the writing of this article.

Although the Moroccan Environmental Protection and Reclamation Law is ahead of many similar laws in Arab countries, it is somewhat old, as its issuance dates to 2003, and it does not respond to the effects of Morocco's current climate crisis. Similar to Iraq's law, the existing environmental law in Morocco is not well-suited to address climate change. It lacks the necessary provisions to mitigate the climate-related hazards impacting natural and human-developed systems, particularly the agricultural sector, which is a cornerstone of the Moroccan economy.

The situation in other Arab countries is not much different. In every country, national plans have been adopted to combat climate change, but these plans neither discuss the laws and legislation on which policies for mitigation and adaptation are based, nor how these policies confront the impact of climate change on livelihoods, health, the economy, and environmental systems.

In Tunisia, for example, most national legislation is shaped by agreements, treaties, and protocols on climate change ratified by the Tunisian government. Najiba Zayer, a Tunisian judge and writer, points out that the Tunisian national legislative mechanisms to reach the goals of the international legislative framework are limited. The Tunisian strategy for adapting to climate change apparently remains ambitious but is incomplete on the ground.[2]

In short, implementation delays—in terms of clear climate change mitigation and adaptation efforts to respond to climate crisis impacts—contribute to the flow of unreliable information. This is particularly evident when considering the different interpretations of climate change

among some skeptics. "On May 18, 2023, a virtual meeting that brought together a group of Iraqi experts took place via Zoom and was broadcasted on YouTube. In his opening remarks, Shaker al-Makhzoumi, the webinar director and former director general of the Iraqi Meteorological Committee, stated that the current water scarcity in Iraq has no connection to climate change. He explicitly denied any climatic changes in Iraq over the past eighty years. This example highlights the lack of reliable coverage of extreme climate events and scientific explanations in media outlets, which aligns with the absence of new legislation recognizing the existence of climate change.

The lack of climate-specific legislation in the MENA region could lead to more severe climate change impacts on the region's economic, agricultural, health, and public service sectors. Without effective regulations and policies, it becomes more difficult to adapt to the impacts of climate change, including rising temperatures, water scarcity, and extreme weather events. And it becomes harder to institutionalize transparent information and data sharing, which leads to poor climate governance.

Media coverage of climate issues in the MENA region often falls short of reflecting the local deterioration caused by climate change and environmental degradation. The reliance on government statements and a lack of independent reporting often leads to an underestimation of climate topics.

The struggle to access information, a fundamental right of people and media outlets, is still a primary goal of the civil movements in most Arab countries. However, most governments in the region see demands for access to information as stemming from collusion with foreign agencies and as a threat to national security. According to a study conducted by the Arab Reform Initiative, "these and other fuzzy accusations continue to hang like a sword above citizens' heads and suggest the rulers still believe they can get away with cosmetic reforms." There is no exception to this prevailing view on information, including when it comes to policies on climate and environmental information. Government programs confronting climate change are plagued by ambiguity and corruption, not to mention security restrictions.

Lack of Knowledge

Despite the global consensus that climate change is occurring, various factors prevent transparency in climate information. These include challenges in clearly communicating complex climate science to the public, the marginalization of climate topics in media outlets, greenwashing practices by governments and corporations, and a general lack of in-depth climate knowledge among journalists. Additionally, various factors hinder the clarity of information in the MENA region, such as restricted information flow or state-controlled narration in the best case and the lack of scientific studies explaining climate change. These factors make it challenging to distinguish between reliable and inaccurate information.

In a survey study about climate mis/disinformation in the MENA region, conducted by Internews and the Earth Journalism Network, around one-third of surveyed journalists expressed the belief that climate change is the will of God. This was the opinion of 40 percent of surveyed Yemeni journalists, compared to 30 percent and 19 percent of Iraqi and Moroccan journalists, respectively. This indicates how limited scientific knowledge on climate change contributes to untrustworthy and inaccurate information. Since climate change is a complex scientific issue and interconnected with other science aspects, a climate journalist needs a background in science.

However, climate journalists and the public cannot be solely blamed for their limited understanding of climate change. The issue is exacerbated by the absence of climate change considerations in public policies, including education and media policies. Along with all that, the lack of academic studies and research in universities and scientific centers further hinders the dissemination of reliable climate information in the MENA countries.

In countries facing conflict and instability, such as Yemen, leaders and politicians often take over scientific bodies, contributing to the widespread public denial of climate change and the dissemination of inaccurate climate information. Over the period 2021 to 2023, the Ministry of Agriculture and Irrigation released four shipments of methyl bromide pesticide after it was detained by customs for being banned and toxic. On May 19, 2024, Mahdi al-Mashat—the head of the Houthi rebels' extra-constitutional political institution, the Supreme Political Council—met with the ministry's leadership to discuss determining the types of pesticides permitted for agricultural use. Al-Mashat told the meeting attendees that the shipment of agricultural methyl bromide pesticide, which was released by customs, was previously used globally, before the product's company decided to discontinue production due to a protocol in Europe that says it has an effect on the ozone layer. He then confirmed the possibility of using the pesticide, saying that there is no problem with the ozone layer in Yemen and that they do not have global warming. This statement was made despite Yemen facing recurring climate impacts, such as increasing temperatures, droughts, and floods that have started to threaten large areas of the country.

In sum, internal conflicts, the influence of nonstate actors including armed groups, and dysconnectivity among state entities are all elements that hinder the free flow of climate information. In countries paralyzed by conflict and political instability, such as Libya, Sudan, Syria, and Yemen, climate narration often flows from unreliable sources. Armed groups' narration, media fragmentation, and the ideological denial of climate change are the main factors misleading information ecosystems.

Yet the challenge is not just climate misinformation, but also the withholding of information and the difficulty of accessing remote areas and verifying the effects of climate change. According to interviews with environmental journalists from the region, many Yemeni journalists don't have access to remote areas, where hyperlocal media related to armed groups are providing unverified climate information.[3]

Bureaucracy as a Challenge

After conducting extensive interviews with environmental journalists from Iraq, Morocco, and Yemen, it became clear that two other factors hinder the flow of information and transparency on climate change and environmental issues in the region.[4]

One significant challenge facing environmental journalists and researchers is the absence of a centralized online climate database for the MENA region. This database would serve as a repository for analyses, assessments, academic studies, and relevant data. Without such a resource, journalists are forced to rely on foreign agencies and international research centers, which often do not provide the in-depth, locally focused assessments needed to inform effective reporting.

Government agencies in the region frequently impose bureaucratic hurdles on journalists seeking information. The requirement to submit official requests, coupled with slow response times and limited cooperation from government officials, significantly delays the dissemination of information. Moreover, the data provided by government entities are often inaccurate or incomplete, failing to reflect the true extent of climate change and environmental degradation.

The issue of bureaucratic red tape extends beyond environmental and climate-specific agencies. It is symptomatic of a broader system that is both affected by and contributes to climate change. To enhance transparency in climate information, there is a critical need for improved intercommunication between government entities, including nonstate actors. By sharing data and information on public health, urban infrastructure, and other relevant areas, these agencies can foster a more comprehensive understanding of climate change and its impacts.

The governments of many Arab countries have yet to implement comprehensive environmental policies and often rely on underfunded and ineffective environmental agencies. The lack of preparedness among professionals in sectors such as health, energy, and municipal services further hampers the exchange of climate information and knowledge. To address these shortcomings, governments must invest in capacity building and establish stronger interagency coordination mechanisms.

In short, the lack of transparency in climate information within the region can also be attributed to the absence of a centralized online database, bureaucratic obstacles, siloed communication within government, and inadequate government policies. By addressing these challenges through the establishment of a comprehensive database, improved interagency coordination, and enhanced government capacity, it may be possible to foster a more informed and engaged public discourse on climate change and environmental issues.

Conclusion

Despite the MENA region being one of the world's most vulnerable areas to global warming and already experiencing a significant climate crisis, there is a lack of transparent and accurate information, posing a real challenge to the conducting of reliable assessments. The region's media establishments have limited access to reliable climate information, leading to misleading reporting. This reality, coupled with the region's ongoing conflicts and political instability, hinders the free flow of climate information.

Because of bureaucratic obstacles, weak climate governance, outdated environmental laws, untrusted information ecosystems, and lack of knowledge and expertise, media outlets often focus on extreme weather events rather than in-depth climate analysis. In addition, state-related media outlets often rely on official narratives, which can be insufficient. Independent journalists and media organizations in the region frequently face challenges in accessing information from government agencies and can therefore have limited understanding of climate science. Internal conflicts, the involvement of nonstate actors, and media fragmentation contribute to the spread of climate disinformation and misinformation.

To overcome these challenges, governments should implement transparency measures, reduce bureaucratic hurdles, and invest in capacity building and interagency coordination. Arab countries should adopt climate-specific laws and regulations through comprehensive and accessible online resources that can facilitate information sharing and analysis. The region needs an interregional climate reporting network and independent climate research centers.

02

Youth and Climate Change in the Middle East and North Africa

Sarah Yerkes and Saad Uakkas

In the Middle East and North Africa (MENA), young people (defined as fifteen to twenty-four years old) are going to bear the brunt of the climate crisis. Yet, despite representing a disproportionately large percentage of the region's population, youth are rarely consulted in policy decisions, including around climate adaptation and mitigation. This article examines the impact of climate change on youth in MENA focusing on North Africa and how young people are fighting to make their voices heard through formal and informal mechanisms. It also explores civil society's role in promoting youth inclusion in debates around climate, as well as the way North African governments are attempting, in sometimes meaningful ways, to incorporate the perspectives of the youth—a group that will be forced to reckon with the climate adaptation and mitigation failures of their parents and grandparents.

Impact of Climate Change on Youth in MENA

There is no question that ongoing climate change will have the greatest impact on youth. Young people will live more of their lives feeling the effects of climate change than will older generations. For young people in MENA, the consequences of climate change already affect nearly every aspect of their lives, including their economic stability, physical and mental health, and daily routines. In rural areas, climate disruptions reduce agricultural viability and in turn reduce employment opportunities in a limited job market. Urban youth face different challenges, including increased competition for jobs as rural-to-urban migration rises. This creates an urban labor surplus that exacerbates youth unemployment rates, which are currently among the highest in the world. As economic opportunities become even more scarce, many more young people will feel compelled to migrate abroad in search of

stable work, further contributing to "brain drain" and diminishing the region's potential for innovation and development.

The mental health impacts of climate change on youth are equally concerning. A growing number of young people report experiencing "eco-anxiety" as they witness the degradation of their natural environments and the uncertain future posed by climate instability. Feelings of anxiety, helplessness, and frustration over limited policy action contribute to a collective sense of urgency and distress. The direct health impacts of climate change also pose a threat to youth. Heat stress, respiratory issues from pollution, and waterborne diseases disproportionately affect young people, particularly those from low-income backgrounds who lack access to high-quality healthcare. In many Middle East and North African (MENA) countries, public healthcare infrastructure is of suboptimal quality, leaving young populations especially vulnerable to health crises exacerbated by climate change.

Socioeconomic factors compound these vulnerabilities. Youth from marginalized communities or those with limited access to education and healthcare face heightened risks from climate impacts. Gender also plays a role; young women, for example, are more likely to be involved in domestic labor and agricultural work, which can expose them to increased health risks as environmental conditions worsen. In summary, the compounded economic, health, and socio-environmental challenges brought by climate change intensify the day-to-day struggles of young people across the MENA region, putting their futures at significant risk.

In recognition of these challenges, many young people are already striving to confront some of the failures of their parents' and grandparents' generations by raising awareness around climate and working with governments and NGOs on adaptation in the wake of growing climate crises. Youth are developing creative means to mitigate further climate change–induced deterioration of resources and the economy. For instance, in Morocco, the startup company Jodoor is promoting hydroponic agriculture in MENA in an adapted way to reduce water needs and adapt to droughts. In Iraq, Green Hands organizes tree-planting events and water preservation awareness campaigns. In Gaza, Sunbox provides renewable solar energy to cope with frequent outages there.

The youth population is especially crucial to addressing climate change because of their size. Youth and children, defined here as ages zero to twenty-four years old, make up between 38 and 50 percent of the population in North Africa (44 percent in Algeria, 50 percent in Egypt, 45 percent in Libya, 42 percent in Morocco, and 38 percent in Tunisia). This is compared to a world youth population of 41 percent and a youth population of only 31 percent in the United States, 26 percent in Europe, and 31 percent in Eastern and Southern-Eastern Asia. Thus, it stands to reason that governments' climate adaptation and mitigation efforts in North Africa are likely to fail if they neglect the input of youth voices or do not adequately consider the impact of climate change on youth populations, who make up the plurality of their societies.

While youth experience the same climate-related challenges as older generations, including health problems, unemployment, education, and displacement, youth often feel the impacts in different ways. For example, as Elizabeth Robinson and Shouro Dasgupta argue, exposure to drought—a common problem in North Africa—is exacerbating child health problems, including malnourishment and stunting and wasting. The data tell an alarming story. According to the United Nations Children Fund's (UNICEF) Children's Climate Risk Index, a composite index of fifty-seven variables that measures "exposure to climate and environmental hazards, shocks and stresses" as well as "child vulnerability," most of North Africa is at a medium-high level of children's climate and environmental risk, with Egypt ranked as high and Tunisia ranked as low-medium. Overall, the region faces a high level of climate and environmental shocks, with Egypt ranked as extremely high and Tunisia ranked as medium-high.

The climate challenges facing the region, including water shortages, rising temperatures, and extreme weather events, also increase the chances of youth developing health problems such as respiratory and cardiovascular diseases. The droughts already plaguing North Africa are contributing to health complications, as children require more water than adults and are more susceptible to waterborne toxins that can lead to dehydration, cholera, diarrhea, and malnutrition. Food scarcity that comes from the negative impact of climate change on agriculture can also lead to malnutrition. Furthermore, UNICEF contends that children are both physically and psychologically more vulnerable to climate change–related outcomes than adults.

Another impact is displacement. UNICEF notes that by 2050, an estimated additional 19 million people will be on the move in North Africa due to climate change. Young people are already experiencing displacement in high numbers. In the MENA region writ large, more than 1 million children were displaced between 2016 and 2021 because of extreme weather events such as flooding, droughts, wildfires, and storms.

A second-order, but just as significant, impact of climate change on youth is decreased educational achievement; extreme temperatures and other weather phenomena can impact the ability of children to attend school and interfere with their in-classroom learning. And climate education in particular is lacking, especially in understanding the causes, consequences, and impacts of climate change generally and on the younger generation. In some places in the region, young people are better informed than older people. According to the 2024 Afrobarometer survey, 80 percent of Moroccans ages eighteen to twenty-five had heard about climate change, compared to just 51 percent of those ages fifty-six and above. But in Tunisia, only 44 percent of youth had heard about climate change, compared to 29 percent of those ages fifty-six and above.

Another potential outcome of climate change on young people is economic decline. The MENA region has been home to the highest youth unemployment rates for the past twenty-five years, with even worse unemployment rates for young women. The persistent lack of job opportunities has not only direct economic consequences for the region's youth, but also

contributes to their feelings of hopelessness and disconnection from society, which can lead to large numbers of migrants (both regular and irregular) and to instability via uprisings and violent extremist recruitment. And the problem could get even worse, as the MENA region is expected to experience a GDP loss of between 6 and 14 percent by 2050 from climate-related water issues, in addition to a 2.2 percent GDP loss already experienced due to air pollution.

Despite these current and projected climate change impacts, response efforts in the region remain limited by a lack of information access. MENA has been ranked worst when it comes to transparency and information accessibility. When confronted with shocks and climate change effects, governments and stakeholders need access to accurate and timely information to make the right decisions. The lack of press freedom in the region limits civil society's capacity to monitor and speak up about any harmful government or private sector policies and decisions.

Perceptions of the government's ability to address climate change also tell a pessimistic story. Malak Altaeb argues that MENA governments are failing to support youth-led climate activism. According to the Arab Youth Survey, in 2023, 47 percent of Arab youth respondents said they are not confident in their national government's ability to deal with climate change. According to the Arab Barometer, 56 percent of Lebanese youth and 65 percent of Tunisian youth think the government is handling climate change poorly. Absence of trust reduces the likelihood that youth will build a good relationship with governments. Mistrust discourages youth from engaging in climate policy processes and makes policy action harder to achieve for them. Youth need to be trusted, engaged, and supported so that they can overcome climate-related challenges and be more involved in climate decisionmaking.

Youth Climate Action: Opportunities and Obstacles

While Arab youth are facing multiple challenges due to climate change, they are stepping up in their communities, the private sector, and on the international stage to take action. Youth have unique advantages when it comes to addressing climate change, particularly in the realms of activism and technology. North Africa, the region that started the Arab Spring and that continues to see regular protest movements, has a long history of youth-led activism to bring about real change in the region. And young people are prepared to engage in climate-related activism. In a 2023 survey, 58 percent of youth in North Africa said they were ready to support calls to boycott brands that damage the environment.

Young people in North Africa have also been at the forefront of technological innovation, with youth entrepreneurs successfully creating small- and medium-sized enterprises to address a variety of issues. For instance, Green Watech provides solutions for grey water reuse for irrigation in Morocco and Africa. Dayra runs clothes recycling and upcycling services in Egypt. Garbaliser recycles biowaste in Lebanon and turns it into biofertilizers.

Bringing young people from around the region together, to learn from each other, has been one method of both raising awareness and sharing best practices for climate change in the MENA region. For example, following the 2012 United Nations Climate Change Conference (COP18) in Doha, Qatar, which was the first global climate conference hosted by an Arab country, youth in MENA created the Arab Youth Climate Movement, with chapters in more than fifteen Arab countries. Young Arabs had come together during COP18 to protest against their collective leaderships' inaction around climate change at home. This was meaningful for a variety of reasons. First, it was the first time Qatar experienced youth public protests outside of the social media space. A protest on December 1, 2012, in conjunction with COP18, saw around 300 people in the streets with slogans such as "Arab leaders, time to lead" and "climate action now." This protest helped raise awareness among the Arab public about climate and government inaction. It also helped bring together Arab youth from different countries to share best practices and build a stronger coalition to help address climate change across the region.

Youth first became formally involved in the United Nations Framework Convention on Climate Change (UNFCCC) process in 2011 when YOUNGO was recognized as the official representative of children and youth. The Pact coming out of COP26 in Glasgow "urged Parties to ensure meaningful youth participation and representation in climate decision-making at the local, national and international levels." And the COP27 Implementation Plan "encouraged the inclusion of youth in Party delegations to UNFCCC." COP27 witnessed historic youth engagement initiatives that are detailed later in this article.

Youth were then given a place of prominence at COP28 in Dubai in late 2023. During COP28, the International Youth Climate Delegate Program was launched, with the goal of bringing youth voices to the table. The program selected 100 delegates from around the world to participate in COP processes. COP28 also created the position of a Presidency Youth Climate Champion (PYCC), which Shamma al-Mazrui was selected to hold. Previously, at COP27 in Egypt, Omnia el-Omrani was selected to serve as the Climate Youth Envoy. Elevation of the position to climate champion at COP28 was meant to signal a more official role for youth within the COP process. The PYCC role was created to represent the COP28 presidency and act as a bridge between youth (ages eighteen to thirty-five) and decisionmakers and was tasked with working with youth around the world both in the lead up to and during COP28. The position was also specifically aimed at representing youth from vulnerable communities, including high-risk communities, Indigenous peoples, and youth with disabilities. The PYCC was expected to ensure that youth received both training and a seat at the table during COP28. A Youth Day was added to the COP28 agenda, and youth were "embedded" in the other thematic days.

That same year, the SB58 Bonn Climate Conference witnessed the first-ever Youth Stocktake organized by the COP28 presidency. During the event, negotiators and youth representatives reviewed how youth policy ideas are integrated into UNFCCC Global Stocktake discussions toward COP28. During the event, youth representatives highlighted critical themes such as equity, intergenerational justice, and systemic transformations across sectors.

They emphasized the need for the Global Stocktake to address equity criteria, ensure fair burden sharing, and recognize the historical responsibilities of developed nations. They also underscored the importance of transforming food systems to help reduce emissions and promote sustainable practices.

Many youth demands came out of COP28, such as (1) ensuring that all children receive access to education, including climate change education that "incorporates the best available science and principles of climate justice"; (2) increasing children's participation in UNFCCC events through making funding available for children and ensuring "their meaningful involvement in decision-making processes"; (3) prioritizing children's health concerns that result from climate change; and (4) better incorporating youth into decisionmaking processes through the creation of youth advisory boards at the local and national levels and through allocating funding to youth-led climate projects. The demands also included unleashing "the latent force of children and youth" by funding youth-led projects, creating green jobs for youth, investing in education and entrepreneurship, and building the capacity of youth.

At COP28, the Egyptian, Moroccan, and Tunisian delegations included youth delegates tasked with tangible roles, including as negotiators. In interviews with delegates, experiences varied, but some youths were involved in developing panels and programs within their country pavilions, others were negotiators in various side meetings, and others collaborated with older delegates, providing ideas and advice for the formal negotiations process. They also led the organization of the Children and Youth Pavilion. The Tunisian delegation had youth delegates negotiating on behalf of the country, continuing their involvement since COP26. Egypt had their first batch of youth delegates after creating the program officially after COP27, and Morocco had an official youth delegation that supported negotiators in negotiations. North African youth were some of the more active youths at COP28. According to YOUNGO youth engagement internal data, both COP27 and COP28 witnessed an increase in the number of North African youth participating, yet COP28 had more youth and witnessed more active involvement in the negotiations process.

Politically, there are some recent positive developments worth noting. A few North African countries have taken on leading roles in acknowledging and addressing both the impact of climate change on youth in the region and governments' role in addressing it. Egypt, Morocco, and Tunisia have incorporated UNICEF-approved criteria into their Nationally Determined Contributions (NDCs). UNICEF vets the criteria to ensure that the NDCs address the specific risks and vulnerabilities of children and youth and that they help meet young people's needs and increase youth participation in climate action. As more governments start to recognize unique youth vulnerabilities to climate change and their roles in combating it, this could open more doors for youth policy involvement in the region.

Yet it is important to note that some observers have pointed to fears of youth-washing, wherein the presence of youth activists at the various COPs (particularly the two most recent meetings held in Egypt and the United Arab Emirates) disguises the lack of substantive attention given to youth climate activists at home and their lack of a voice at the negotiating

table. Unsurprisingly, the repressive environments in Egypt and the Emirates created a "climate of fear" for civil society participants in both COP27 and COP28, where protests and criticism were highly restricted.

Youth Climate Action: Case Studies

Youth in North Africa have followed a variety of paths in advocating climate adaptation and mitigation with varying degrees of success. The below three country case studies showcase how youth in the region are concretely taking the lead in climate action and influencing their national ecosystems to make change. These case studies reveal what could be achieved all around the region and to what extent youth can get involved in climate action and advocacy—from creating national youth climate councils to participating in negotiations.

Egypt

Egypt has the largest youth population in the MENA region, with around 45 million young people between ages nineteen and twenty-nine, representing a significant demographic eager for active engagement in climate action. Despite the limitations posed by restrictive NGO laws, which place rigorous controls on civil society activities, Egypt has managed to foster one of the largest and most vibrant youth-led climate ecosystems in the region. This network of youth organizations has been pivotal in raising climate awareness, advocating policy change, and organizing on-the-ground environmental initiatives.

Youth climate NGOs

Several youth-led climate NGOs are actively working to advance climate action in Egypt, despite regulatory challenges. The following are among the most prominent.

Greenish works on climate education and capacity development for local communities, as well as climate policy. Their flagship program, Greenish Clubs, is a yearly program that creates environment clubs in over forty high schools to educate and engage youth in local climate action throughout the year. The program organizes national competitions to celebrate the most active clubs and to create a sense of community and exchange.

Athar is a youth-led climate innovation incubator and accelerator in upper Egypt. It engages youth in remote areas in climate entrepreneurship by building their capacity, hosting hackathons for ideation and prototyping, and supporting their incubation and implementation of solutions. They offer support, mentorship, and facilities and help youth access capital.

Seas, an Egyptian social enterprise founded in 2010 in Quseir City on the coast of the Red Sea, is dedicated to environmental education, cultural preservation, and youth empowerment. Through a community-centered approach, Seas raises environmental awareness

and celebrates Quseir's historical heritage via workshops, tours, and the Ajial program—a multi-year initiative fostering civic engagement among local youth. Some program graduates now hold leadership roles in the community, reflecting Seas' impact on youth development and environmental stewardship.

These organizations have not only cultivated a local movement but have also connected Egyptian youth to broader regional and international networks, amplifying their voices on a global scale.

Conference of Youth

In 2022, as Egypt prepared to host COP27, a milestone event took place: the Conference of Youth (COY17) in the town Sharm el-Sheikh, organized by five prominent youth climate NGOs. The event, which attracted hundreds of young climate activists, provided a platform for Egyptian and global youth to discuss pressing environmental issues, share best practices, and strategize on how to advocate for climate justice. Through workshops, panel discussions, and strategy sessions, young people were able to articulate their concerns and hopes and craft a set of youth recommendations. These recommendations ultimately became the global youth statement used to inform COP27's discussions, underscoring the critical role of youth as stakeholders in the global climate dialogue. The statement covered key topics such as climate finance, adaptation, and energy. For instance, specifically, youth advocated increasing adaptation finance and equitable and concessional funding and enhancing resilience strategies tailored to local contexts.

COY17 initiated a strong collaboration between Egyptian youth, UN agencies, and the government, especially the Ministry of Youth and Environment. This resulted in more official youth involvement in global climate spaces. It was also an opportunity for Egyptian youth to unite, organize the conference together, and build bridges for future collaboration.

Youth engagement at COP27

Egypt's role as the host of COP27 marked a historic moment for youth engagement at the UN climate summit. In an unprecedented move, Egypt designated Omnia el-Omrani as the COP27 Climate Youth Envoy, the first such role ever created for a UN climate conference. El-Omrani, a young Egyptian doctor and climate activist, became a symbolic representative of youth voices at the conference, advocating policies that address both climate resilience and intergenerational equity.

COP27 also witnessed the organization of the first-ever Children and Youth Pavilion, which was a space for youth to feel safe, engaged, and present and to network with peers and experts. It welcomed youth of all ages, including younger children ages seven and nine years old who were speakers in some panels. The pavilion was fully youth-led and had great success. Both the pavilion and the youth envoy position were included in the COP cover decision, the final agreement reached at the main summit, and are now institutionalized as part of every upcoming COP.

National Youth Climate Negotiators Program

Following COP27, the Egyptian Ministry of Environment, in collaboration with various Egyptian youth organizations, launched the National Youth Climate Negotiators Program. This initiative aims to train young Egyptians in the skills necessary for international climate negotiations, empowering them to contribute meaningfully to the policymaking process. Participants in the program receive training on negotiation techniques, climate policy, and international environmental law, preparing them to represent Egyptian youth at high-level discussions. For COP28, a youth delegation was sent, providing an unprecedented opportunity for Egyptian youth to directly influence climate negotiations on behalf of their country. According to feedback from youth climate actors from the country,[5] this program came as a joint initiative from the ministry and a group of youth in direct contact with the ministry. They added that more open communication is needed around the selection process in the future to ensure it is inclusive.

Challenges and opportunities

Egyptian youth climate organizations face multiple challenges. The NGO Law (No. 149 of 2019) imposes significant limitations on civil society. This law restricts funding sources, creates bureaucratic hurdles for project approvals, and places stringent controls on activities that do not align with government guidelines. This limits the ability of youth-led NGOs to access essential funding and resources.

Another issue is that the NGO ecosystem is fragmented with over 52,000 NGOs in Egypt, mostly focusing on charitable work rather than developmental or rights-based approaches. This creates difficulties in collaborating efficiently across different types of civil society.

Despite these challenges, youth have opportunities to position themselves as key actors in Egypt climate action efforts. COP27 and the influence of UN agencies and other actors encouraged the government to recognize and involve youth as central players. In addition, the 2019 law offers institutional frameworks for partnerships between NGOs and the government. NGOs such as ACTs and Youth Loves Egypt have used partnerships to get involved in national climate strategies. Another opportunity is the widespread presence of community development societies in rural areas, providing a valuable resource for partnerships for youth focused on grassroots work.

The Egyptian case demonstrates how the growing national youth climate movement managed to establish a systemic presence thanks to global mobilization and events, mainly COP27, which encouraged the national government to champion the youth climate agenda. The global momentum toward youth engagement—achieved through the UNFCCC and other key UN and organizational actors and resources (for example, UNICEF and the UN Development Program's MENA youth climate activist toolkit)—can continue to be harnessed by youth organizations to further influence government support and establish their presence nationally.

Morocco

Morocco stands out as a climate leader in the MENA region, with ambitious green energy initiatives such as the Noor Ouarzazate Solar Complex, the world's largest concentrated solar power plant. The nation's commitment extends to empowering youth to engage in climate policy, and as a result has created a dynamic ecosystem of youth-led organizations and government-supported initiatives that prioritize young voices in both national and international climate dialogues.

Youth climate NGOs and initiatives

Among the notable organizations is The Future Foundation (AFCD), based in Ait Ourir village near Marrakech. AFCD focuses on community-centered environmental initiatives to support sustainable development and primarily targets young people and decisionmakers. Its work spans environmental education, waste management, and local policy advocacy. AFCD's strong partnerships with local authorities and NGOs, including a major collaboration with the Ministry of Environment on sustainable waste-to-energy solutions, amplifies its impact. This collaboration has so far involved thirty-six consultations with municipalities and civil society and led to, for example, a pilot protected landfill project demonstrating sustainable waste practices.[6]

AFCD also hosts an eco-citizenship platform that enables local residents to report environmental issues, thereby bridging the gap between the public and policymakers. Additionally, AFCD runs environmental education workshops that promote renewable energy integration and sustainable practices among local cooperatives.

Youth for Climate Morocco (Y4CM) is another influential organization, recognized for capacity-building and collaborative projects. Y4CM has launched programs such as the Green Media Academy, which trains youth in climate journalism, as well as renewable energy advocacy workshops, often in partnership with UNICEF. Y4CM has successfully built a network of young climate advocates who participate in environmental policy discussions at local and national levels, amplifying youth voices in the call for effective climate action.

Youth-led innovations

In addition to established climate NGOs, Moroccan youth startups have pioneered innovative environmental solutions, particularly in renewable energy and waste management. One standout example is the Advanced Third Age Renewable Energies Company (ATAREC). Founded by Mohamed Taha el-Ouaryachi and Oussama Nour, the company focuses on harnessing wave energy to power coastal communities. ATAREC's pilot project at Tanger Med Port uses wave energy to improve energy autonomy and desalination capabilities. It has attracted interest from other regions facing similar energy challenges.

Shems for Lighting, founded by Youssef Chakroun, addresses rural and coastal electricity needs with solar-powered lamps designed for artisanal fishing boats and off-grid households.

Through solar festivals and educational partnerships, Shems for Lighting promotes renewable energy awareness. Their impact has extended across Africa and parts of Europe.

Zelij Invent, founded by Saif Eddine Laalej tackles Morocco's plastic waste issues by producing sustainable construction materials, including bricks and blocks, that incorporate 50 percent plastic waste. Based in Meknes, Zelij Invent's model allows local communities to convert plastic waste into valuable resources for construction and, in doing so, creates jobs and reduces the environmental impact.

Major events and milestones

In the lead-up to COP27 and COP28, Morocco hosted a Local Conference of Youth that brought youth climate leaders together to discuss Morocco's climate adaptation and mitigation strategies. This event, organized by local youth, served as a platform for consolidating climate agendas and bolstering the capacity for advocacy on international stages.

Another pivotal development was the formation of the Moroccan Youth Negotiators Council (MYNC), borne from dialogues between youth organizations and the Ministry of Energy Transition and Sustainable Development. MYNC provides Moroccan youth a formal mechanism to engage in climate policy. In 2024, MYNC organized a Regional Conference of Youth, which united over 250 youth from forty-five African nations. The gathering concluded with the African Youth Climate Statement, which included a powerful set of youth-driven recommendations set to influence COP29. Beyond events, MYNC provides badges, mentorship, and logistical support to Moroccan youth participating in COPs and other international climate forums; this work serves to foster a strong sense of unity and purpose.

A potential yet to be fully explored

Despite the abundance of initiatives and NGOs in Morocco, their policy impact and influence are still limited. First, youth NGOs are working separately from other NGOs, and there is a lack of collaboration and unity. Second, youth still struggle to establish strong and concrete collaboration with the government and are not represented in key policy frameworks and discussions. For instance, the recent dialogues and workshops conducted by the ministry updating the Moroccan NDC involved multiple stakeholders such as think tanks, experts, and civil society adults, but did not officially engage youth NGOs, which was a big missed opportunity. Youth go to COPs using government badges, but there is no official involvement and preparation to take the lead in the negotiations process. More trust in youth is needed so that they can take active roles and bring added value to policy processes.

Challenges and opportunities

Moroccan youth climate organizations—particularly those outside major cities such as Marrakech and Rabat—face other significant challenges as well, including limited permanent staff and inconsistent funding. Bureaucratic hurdles present additional obstacles for project implementation, with regulatory restrictions limiting operational flexibility in some cases.

Nevertheless, Morocco's global reputation for sustainability and renewable energy innovation offers valuable opportunities. As Morocco expands its green partnerships, such as those for green hydrogen with Germany, Moroccan youth are increasingly being positioned to play active roles in the energy transition. By maintaining strong support and resources, Moroccan youth can bridge local and national efforts with high-level climate diplomacy, shaping Morocco's future as a model for youth-led climate action in the MENA region.

Tunisia

Tunisia has also emerged as a leading force in climate engagement in the MENA region by leveraging its strong tradition of civil society activism to empower young people as key stakeholders in climate governance. It has shown a remarkable commitment to integrating youth voices into national and international climate policy. The country's efforts have extended from grassroots community initiatives to a groundbreaking example of youth inclusion in global climate negotiations. Tunisia has thus become a model for meaningful youth engagement.

Local innovations

At the grassroots level, organizations such as Djerba Insolite and Youth for Climate Tunisia exemplify how young Tunisians are driving climate action through community-centered and innovative approaches.

Djerba Insolite, based on the island of Djerba, champions ecotourism and sustainable development. The organization has built bike stations and circuits to encourage eco-friendly tourism and has educated locals about recycling and waste management. Additionally, Djerba Insolite empowers youth to create jobs by valuing cultural heritage, traditional craftsmanship, and natural local products. Their initiatives blend environmental stewardship with economic development, offering a replicable model for other regions in Tunisia and beyond.

Meanwhile, Youth for Climate Tunisia has mobilized thousands of young people through impactful advocacy campaigns, climate strikes, and educational programs. By organizing events such as the Janub Festival, which fuses environmental activism with arts and culture, the group engages a broad audience in increasing climate awareness. Additionally, their "coffee talks" provide a space for young people to discuss climate issues and collaborate on solutions. Youth for Climate Tunisia also conducts specialized training, such as policy brief writing workshops, to equip youth with the tools to influence environmental policies. Their work highlights the transformative power of youth-led activism in raising public awareness and driving policy change.

Tunisian Young Climate Change Negotiators initiative

A defining feature of Tunisia's climate leadership is the Tunisian Young Climate Change Negotiators (TYCN) initiative. Founded in 2021 by the Ministry of Environment, TYCN is the first program in the MENA region to officially integrate youth into a country's climate

negotiation process at the UNFCCC level. This pioneering initiative has positioned Tunisia as a global leader in youth-inclusive climate policy and inspired other nations to adopt similar models.

TYCN's mission is to empower young Tunisians to contribute meaningfully to global climate negotiations while advocating for ambitious climate action aligned with the Paris Agreement. As part of Tunisia's official delegation, TYCN members actively shape national climate policy by providing critical insights into adaptation, mitigation, and climate finance. Their contributions have been instrumental in crafting Tunisia's NDCs, ensuring that they reflect the needs and aspirations of younger generations.

During COP28, Tunisia's delegation, with TYCN at its core, was recognized by UNFCCC as one of the most inclusive youth delegations. TYCN members participated in high-level panels, roundtables, and workshops, where they showcased Tunisia's commitment to equity and intergenerational collaboration in climate governance.

Beyond the international stage, TYCN plays a crucial role in advancing climate action at the local level. The group has advocated integrating municipal climate plans into national strategies in an effort to align national commitments with local realities. This decentralized approach has empowered cities and municipalities to take an active role in Tunisia's climate reporting and policy implementation.

TYCN's work also extends to equipping its members with the skills to navigate complex climate negotiations. Training programs cover critical areas such as Article 6 of the Paris Agreement, climate finance mechanisms, and adaptation strategies. By ensuring that youth negotiators are well prepared, TYCN enables meaningful participation in high-level discussions within the UNFCCC's African Group of Negotiators and the broader UNFCCC framework.

Youth-government partnership

The success of TYCN is based on a unique partnership between Tunisia's youth and its government. Recognizing the value of youth perspectives, the Ministry of Environment provided institutional support and mentorship to establish TYCN as a formal entity within the national climate delegation. This collaboration demonstrates the power of co-creation in policy development, where youth and policymakers work hand in hand to address shared challenges.

Tunisia's approach is now a source of inspiration globally. As Wafa Hmadi, the TYCN group's coordinator, said in an interview:[7] Several countries have expressed interest in replicating the TYCN model, which underscores the importance of youth-led initiatives in achieving climate resilience and equity.

Challenges and opportunities

Despite the country's notable achievements in youth climate engagement, significant challenges still persist. One key obstacle is limited access to consistent funding. Grassroot

organizations such as Djerba Insolite rely on intermittent project-based funding. International funding constitutes 90–95 percent of resources for some organizations, imposing pressures to meet donor requirements. And this reality may become even more troublesome because of a proposed draft NGO law currently under review, which, if passed, will tighten regulations and control all funding from abroad and require civil society organizations to receive government authorization to operate and to obtain prior approval of foreign funding from the Central Bank. Another issue is that multiple NGOs have secret ties with major political parties causing a public mistrust in NGOs.

Nevertheless, Tunisia's strong tradition of civil society activism represents a solid ground for increasing youth climate participation. Initiatives such as TYCN are creating spaces where youth have a platform to officially influence the country's climate policy. Communication with government and international donors is essential to establish trust and ensure diverse sources of funding for youth climate NGOs.

Tunisia's climate action journey illustrates the transformative potential of youth engagement, from grassroots innovations by organizations such as Djerba Insolite and Youth for Climate Tunisia to groundbreaking national initiatives such as the Tunisian Young Climate Change Negotiators. By integrating youth participation in climate governance at all levels, Tunisia has set a precedent for inclusive and sustainable development. Tunisian youth are able to influence global climate decisions, yet, more efforts are needed to optimize legislative processes so that youth NGOs can thrive and be able to influence local and national decisions as well.

Conclusion

North African youth have demonstrated climate leadership through a multitude of impactful actions, from leading community programs to creating innovative solutions and empowering their peers and vulnerable groups. Youth climate action in the region offers valuable lessons to learn from and duplicate.

Undoubtedly, NGOs in North African countries face limited resources and restrictive legal and political frameworks that impede the full potential of youth climate activism. But the institutionalization of youth engagement has still occurred to some extent in several countries in particular. For instance, Tunisia's inclusion of TYCN as part of the UNFCCC official delegation has set a benchmark for youth climate policy involvement. And Egyptian youth have been actively engaged in climate action despite restrictive NGO laws limiting their operational flexibility. Morocco is now a renewable energy leader in the region, notwithstanding youth organizations' challenges in accessing funding and decisionmaking; these organizations are currently thriving in their decentralized settings.

Examining how the three countries have worked around restrictive legal environments reveals valuable lessons. Tunisia's TYCN presents the potential of youth-government collaboration to influence international negotiations. Morocco's decentralized youth action and

innovation emphasizes the role of grassroot action in addressing climate challenges. Egypt, despite its legal restrictions, demonstrates how strategic partnerships and key events such as COP27 can amplify youth voices and create structural change. These cases point to the need for institutional support, policy alignment, and regional collaboration to unlock youth climate potential in the MENA region.

One way forward is for North African governments to be more proactive in incorporating youth voices into their climate policy and in working with youth-led civil society groups in attempting to mitigate climate change. The green economy and green jobs could be other avenues to both provide some solutions to socioeconomic challenges facing youth (such as unemployment) and to harness youth skills to address some of the main climate challenges. By fostering meaningful partnerships between youth, governments, and civil society, North African countries can harness the full potential of their young populations to drive long-term, transformative climate action for a more resilient future.

03

Empowering Cities: Transformative Climate Action in the Eastern Mediterranean and Middle East

Karim Elgendy

Cultivating Climate Resilience in the Cradle of Civilization

The Eastern Mediterranean and Middle East (EMME) region faces unprecedented climate change challenges. The region is warming at twice the global average rate, intensifying existing environmental stresses such as water scarcity, extreme weather events, and vulnerability to sea-level rise. Beyond environmental concerns, the impacts are increasingly threatening economic stability, social cohesion, and political security across the EMME.

Addressing these multifaceted challenges requires coordinated action spanning multiple governance levels, from local to national and international. However, the region's complex geopolitical landscape—characterized by diverse political relationships, varying economic development, and distinct social structures—presents unique obstacles to effective climate governance.

This article builds upon the author's work on inclusive climate governance in the EU's Southern Neighborhood and his recent exploration of global urban climate governance. The analysis focuses on the broader EMME region and encompasses both urban and rural contexts. It also explores the potential for multilevel climate governance, emphasizing the role of cities and regions as key drivers of climate action.

By examining current governance structures for climate action, the analysis aims to identify gaps and propose a framework that enhances local-level implementation of climate policies while addressing region-specific challenges. Inspiration is drawn from successful initiatives in regional cities that have shown local leadership potential despite limited resources and autonomy. In contributing to the growing literature on climate action in the EMME, this study offers practical insights for policymakers, planners, and practitioners working to enhance climate action and resilience across urban, peri-urban, and rural landscapes in this vulnerable part of the world.

Regional cities and regions can reshape climate governance by leveraging their unique positions as centers of innovation, economic activity, and population concentration, while also addressing the critical linkages between urban and rural areas in climate action. By enhancing the capabilities of both urban and rural actors, the EMME can potentially accelerate climate action and improve resilience. This approach aligns with global trends toward decentralized and participatory climate governance, as seen in transnational city networks, but extends beyond city boundaries to include subnational regions.

Ultimately, however, the success of multilevel governance in the EMME region depends on overcoming significant barriers, including limited decentralization, insufficient financial resources, and weak institutional capacities at the local and regional levels. Addressing these barriers will require taking steps to enhance cooperation between national, subnational, and local actors; improve access to climate finance; and build technical capacities across the region's diverse geographical contexts.

A Potential Tapestry of Collaborative Climate Action

Multilevel climate governance recognizes that addressing climate change necessitates coordinated action across different scales of government and society. This approach acknowledges the interdependence between national, subnational, and local actors in formulating and implementing effective climate policies. While the global response to climate change was initially focused on nation states and supranational bodies such as the EU, this state-centric approach has proven insufficient to address the complex, multifaceted challenges posed by climate change.

The concept of multilevel climate governance assumes that different levels of government are mutually dependent when implementing climate agreements and policies. It recognizes both the diffusion of climate change policymaking across levels of government and the implications this has for the role of the state, civil society, and the private sector. National governments rely on regional and local governments to help execute national climate strategies. Conversely, local and regional governments are affected by the legal, institutional, and financial frameworks established by higher levels of government, which can either support or hinder local climate action. This interdependence is particularly evident in the implementation of climate mitigation and adaptation measures, where local knowledge and context-specific solutions are crucial for success. For instance, while national governments may

set overarching emissions reduction targets, it is often local authorities who must implement the necessary changes in urban planning, transportation systems, and building regulations. Similarly, adaptation strategies require a nuanced understanding of local vulnerabilities and resources, which subnational governments are often best positioned to provide. The effectiveness of multilevel climate governance thus hinges on the ability of multiple governmental levels to share information, resources, and responsibilities in a coordinated manner to address the multifaceted challenges posed by climate change.

Two types of multilevel governance are relevant in the context of climate governance: Type I, which focuses on power-sharing between different levels of government within a stable jurisdictional framework, and Type II, which involves flexible, task-specific jurisdictions. Both types allow for structured cooperation between established government levels and more flexible, issue-specific collaborations. Type I governance is characterized by general-purpose jurisdictions, nonintersecting memberships, a limited number of jurisdictional levels, and a system-wide architecture. This type of governance bundles multiple functions together and is typically organized in a nested hierarchy, such as local, regional, and national levels. Type II governance, in contrast, is characterized by task-specific jurisdictions, intersecting memberships, no limit to the number of jurisdictional levels, and a flexible design. This type allows for numerous, overlapping jurisdictions that are tailored to particular policy problems or service requirements.

The principle of subsidiarity in multilevel climate governance emphasizes that decisions should be made at the most appropriate level of government. This principle is particularly relevant for climate policy, as many mitigation and adaptation measures are most effectively implemented at the local or regional level. For example, urban planning for climate resilience or local renewable energy initiatives often benefit from localized decisionmaking. Subsidiarity recognizes the unique potential of each governance level to contribute to climate action, from global agreements to community-level implementation.

Multilevel climate governance, involving coordination between national, regional, and local authorities, is particularly crucial in the EMME region due to its diverse political systems, varying levels of economic development, and complex geopolitical relationships. These factors create challenges for implementing cohesive climate policies across different scales of governance. The convergence of harsh climatic conditions, such as increasing temperatures and water scarcity, with rapid, unsustainable urbanization and associated socioeconomic burdens can exacerbate existing political instability, conflict-induced migration, and poverty. For example, climate-induced water shortages can increase competition for resources in urban areas, potentially leading to social unrest. Addressing these interconnected challenges requires a coordinated approach that leverages the strengths of different levels of government and considers the unique context of each city in the region. Effective multilevel climate governance in the EMME region could help overcome some of the its unique challenges, such as political instability, economic disparities, water scarcity, food security issues, energy sector transitions, and rapid urbanization. Cities from across the world have demonstrated the potential for subnational actors to drive significant climate action when empowered within a multilevel governance framework.

However, implementing effective multilevel climate governance in the region faces significant obstacles. The prevalence of highly centralized administrative systems and incomplete decentralization reforms hamper local capacity building and decisionmaking, which are prerequisites for effective adaptation and resilience. Overcoming these barriers will require concerted efforts to build institutional capacity, foster political will, and create enabling environments for local and regional climate action tailored to unique contexts.

The Role of Cities and Regions in Climate Action

Cities and regions play a crucial role in addressing climate change, particularly in the EMME region where rapid urbanization is occurring. Urban areas are major contributors to greenhouse gas emissions due to energy consumption, transportation, and waste management practices. At the same time, they are highly vulnerable to climate impacts such as heat waves, water shortages, and, in some instances, sea-level rise.

Local and regional governments often have significant influence over key sectors relevant to climate change mitigation and adaptation. These areas include land use planning and zoning, building codes and energy efficiency standards, public transportation and urban mobility, water management and conservation, waste management and recycling, and green space development and urban forestry. By leveraging competencies in these areas, cities and regions can implement targeted climate actions that contribute to national and international climate goals while addressing local priorities and needs.

Moreover, subnational governments can serve as laboratories for innovative climate solutions, testing new approaches that can later be scaled up to the national level. They can also act as bridges between national policies and local implementation, ensuring that climate strategies are tailored to specific local contexts.

Cities account for 67–72 percent of all carbon emissions globally. This urban contribution to emissions is particularly relevant in the EMME region, where rapid urbanization is ongoing and therefore the potential for climate action is significant. Enhancing public transportation systems and promoting sustainable mobility could substantially decrease transport-related emissions, which constitute a significant portion of urban greenhouse gas emissions in the region. However, the relationship between climate change and urban energy demand is complex and circular. More frequent heat waves, a consequence of climate change, are likely to increase energy consumption in cities, primarily for space cooling. Furthermore, as fresh water becomes scarcer, the increased reliance on energy-intensive desalination processes to meet rising water needs will further drive up energy consumption.

Realizing the potential for impactful urban climate action requires overcoming several challenges. Many cities in the EMME region lack the financial resources, technical expertise, and institutional capacity to effectively plan and implement comprehensive climate strategies. This includes almost all small cities and many large and medium-sized cities of the

Levant and Egypt, including Tripoli and Sidon in Lebanon and Alexandria and Damietta in Egypt. It also includes all cities that have experienced conflict in the last decade—conflict that has all but eliminated their capacity. These include Syrian cities such as Aleppo, Damascus, Hama, and Homs; Iraqi cities such as Baghdad, Basra, Erbil, and Mosul; and Palestinian cities such as Gaza City and Khan Yunis. Additionally, the highly centralized nature of governance in many EMME countries can limit the autonomy of local authorities to take decisive climate action. Small states of the Gulf, including Bahrain, Kuwait, and Qatar, particularly lack agency given that most competences are exercised at the national rather than city level.

Despite these challenges, there are promising examples of cities in the EMME region taking proactive steps on climate change. For instance, Byblos in Lebanon has developed a Resilience Strategy that, while not solely focused on climate change, includes several climate-related elements. The strategy addresses coastal flooding risks, proposes developing blue-green networks and urban greening strategies, and includes plans for sustainable resource management. Cities in Saudi Arabia and the United Arab Emirates (UAE), despite being part of centralized governance, continue to improve their technical expertise and institutional capacity.

To further enhance the role of cities and regions in climate action, several steps will be crucial:

- Strengthening multilevel governance frameworks to enable better coordination between national, regional, and local climate policies;
- Enhancing the capacity of local governments through training programs, knowledge sharing, and technical assistance;
- Improving access to climate finance for subnational governments, including through international climate funds and innovative financing mechanisms; and
- Promoting partnerships between cities, both within the EMME region and internationally, to facilitate the exchange of best practices and lessons learned. These partnerships could be modeled after national city networks such as the Moroccan Association for Eco-Cities, or transnational ones, such as MedCities.

Case Studies of Local Climate Initiatives in the EMME Region

Several EMME cities have demonstrated leadership in climate action, despite the challenges they face. These case studies highlight the potential for subnational governments in the region to drive significant climate progress.

Amman, Jordan. The capital city has demonstrated a multifaceted approach to addressing climate change and urban resilience. In 2017, Amman developed its Resilience Strategy,

focusing on five key pillars including becoming an environmentally proactive city. Building on this step, Amman launched a comprehensive Climate Action Plan in 2019, aiming to reduce greenhouse gas emissions by 40 percent by 2030 compared to a business-as-usual scenario.

The case of Amman illustrates how multilevel governance structures influence urban climate action in Jordan. Recent reforms have established a complex yet coordinated system where national, metropolitan, and local authorities intersect in urban climate policy implementation. At the national level, the Jordan National Urban Policy provides an overarching framework that requires climate considerations to be integrated across sectors. This is overseen by the National Urbanization Commission, which coordinates with metropolitan bodies such as the Greater Amman Municipality's Planning Council and City Planning Commission (Greater Amman Municipality, 2024). At the local level, district planning commissions and newly proposed community design and innovation hubs serve as implementation vehicles, engaging directly with communities on climate-related urban initiatives. This multilevel structure is designed to enable vertical integration of climate action, though challenges remain in coordinating across traditionally siloed sectors and ensuring consistent implementation. The system represents an evolution from Jordan's historically centralized approach toward a more decentralized model that aims to better integrate climate considerations across governance levels while maintaining alignment with national priorities.

Key initiatives include implementing a Bus Rapid Transit system, improving energy efficiency in buildings, expanding renewable energy use, and enhancing walkability. The city is also addressing water scarcity through rainwater harvesting and greywater recycling, while improving waste management with waste-to-energy facilities.

Both the Resilience Strategy and the Climate Action Plan emphasize public participation and engagement, including youth integration in decisionmaking processes. However, Amman faces implementation challenges due to limited resources and rapid population growth, partly from refugee influxes.

Dubai, United Arab Emirates. The emirate of Dubai presents a unique case study in urban sustainability and climate action within the EMME region. Unlike many other cities in the area, Dubai benefits from its dual status as both a city and one of the seven emirates in the UAE federation, allowing for more coordinated and ambitious policymaking.

Central to Dubai's climate efforts is the Dubai Clean Energy Strategy, which aims to source 75 percent of the emirate's energy from clean sources by 2050. This ambitious target is supported by large-scale projects and comprehensive programs that span multiple governance levels:

- Renewable energy—The Mohammed bin Rashid Al Maktoum Solar Park, one of the world's largest single-site solar installations, exemplifies Dubai's commitment to large-scale renewable energy projects.

- Energy efficiency—The Al Sa'fat green building rating system mandates sustainability standards for new constructions, while the Etihad Energy Services program focuses on retrofitting existing buildings, demonstrating a dual approach to improving energy efficiency across the built environment.

- Sustainable transportation—The Dubai Metro forms the backbone of a growing public transit network, complemented by initiatives promoting electric vehicles. This multimodal approach to sustainable transportation aligns with the multilevel governance principle of addressing climate change through various sectors and strategies.

- Water management—Given the region's arid climate, Dubai has invested heavily in water conservation, implementing advanced desalination technologies and promoting water recycling. This approach addresses the water scarcity challenges common to many EMME cities, as highlighted earlier in this article.

- Urban planning—The Dubai 2040 Urban Master Plan emphasizes compact, mixed-use development centered around transit nodes, aligning with global best practices in sustainable urban development and demonstrating how long-term planning can integrate climate considerations at the city level.

Dubai's approach to climate resilience is being increasingly integrated into its planning processes, with particular attention to risks from sea-level rise and increasing temperatures. These initiatives are coordinated through a multilevel governance approach, with entities such as the Dubai Supreme Council of Energy playing crucial roles in aligning policies across different sectors and levels of government.

While Dubai faces ongoing challenges in reducing overall energy consumption and adapting to climate impacts, its recent initiatives demonstrate a commitment to a more sustainable urban model. The emirate's experience offers valuable lessons for other cities in the EMME region, particularly in how to leverage a city's unique governance structure to implement ambitious climate policies. However, it's important to note that Dubai's financial resources and political structure are not typical of most cities in the region.

Gabès, Tunisia. This coastal city of approximately 110,000 inhabitants represents a unique case of climate action in a medium-sized Mediterranean city. The city is notable for its rare oasis ecosystem that provides the bulk of local fruits and vegetables, making it a critical case study for the water-energy-food nexus in urban settings. Unlike Dubai and Amman, Gabès exemplifies the challenges and opportunities faced by small and medium-sized cities in the region working to build climate resilience with limited resources.

Central to Gabès's climate efforts is the Madinatouna project, implemented within the Cities Alliance framework, which coordinates strategic urban planning initiatives with multiple international partners including the United Nations Development Program, MedCities, and Germany's development agency (GIZ). This multilateral partnership approach has enabled the city to develop inclusive, sustainable urban strategies despite resource constraints.

The city's approach to climate resilience operates across several vital areas:

- Water resource management—The city has established partnerships with France's development agency (AFD) and NGO networks such as the Sustainable Development Association Network of Oases (RADDO) to address groundwater management in the oasis. These initiatives focus on managing competition for water resources between urban, agricultural, and industrial uses, while addressing critical groundwater salinity issues.

- Agricultural sustainability—Programs focus on protecting and restoring the traditional oasis ecosystem, which faces degradation from soil infertility and increasing salinity. This work is particularly crucial, as the oasis provides most of the city's fruits and vegetables.

- Environmental protection—The city has worked with the EU on environmental governance projects, particularly those addressing industrial pollution in the Gulf of Gabès. These efforts include the exploration of sustainable water solutions such as seawater desalination for industrial use.

- Energy transition—Despite high potential for renewable energy, deployment remains minimal, highlighting the gap between climate ambitions and implementation capacity in medium-sized Mediterranean cities.

These initiatives are coordinated through a complex governance structure that reflects Tunisia's ongoing decentralization process. Tunisia's 2014 Constitution dedicated an entire chapter to administrative, political, and fiscal decentralization, and, in 2018, a new Local Authorities Code was adopted to transfer powers to local and regional councils. However, this decentralization process continues to face structural and logistical challenges that impact climate action implementation. At the national level, climate change governance remains fragmented; it has not been mainstreamed across ministries, with only the Ministry of Agriculture, Water Resources, and Fisheries maintaining a dedicated Climate Change Focal Point.

The city's climate initiatives operate within this evolving governance framework, where local authorities are gaining new responsibilities but often lack corresponding resources and technical capacity. As a result, unlike Amman and Dubai, Gabès faces significant implementation challenges. The city remains highly dependent on international funding and support for its climate initiatives.

The Gabès case demonstrates both the potential and limitations of climate action in medium-sized Mediterranean cities. While it highlights the need for integrated approaches to water, energy, and food security challenges, it also illustrates how international partnerships can help bridge resource and capacity gaps in smaller urban centers.

Collectively, these case studies demonstrate that cities in the EMME region have the potential to implement ambitious climate actions across various sectors, including energy, water, and ecosystem management. They show how local initiatives can address multiple challenges simultaneously, while tailoring approaches to local needs and resources. The initiatives, carried out in large capital cities to small towns, illustrate the diverse range of possibilities for urban climate action in the region. The case studies also underscore the importance of international cooperation and knowledge sharing in enabling and scaling up such efforts.

Navigating the Challenges to Climate Governance

Despite the potential for action, EMME cities and regions face numerous obstacles in implementing effective climate governance.

Limited governance powers. In many countries in the region, local and regional governments have restricted authority over key policy areas relevant to climate action. This centralization of power can hinder the ability of subnational entities to develop and implement tailored climate strategies. For example, in Lebanon, despite decentralization being enshrined in the constitution, municipalities often face significant challenges in fulfilling their roles. According to a 2017 report by Democracy Reporting International, 75 percent of municipalities in Lebanon report lacking sufficient funds to hire civil servants. This financial constraint severely limits their capacity to perform basic governance functions, which would likely include addressing climate-related issues. The report also notes that 36 percent of municipalities function with only one permanent civil servant, while 51 percent have between two and five civil servants, highlighting the severe understaffing issues that can impede effective local governance and climate action.

Financial constraints. Many cities and regions in the EMME region lack sufficient financial resources to invest in climate mitigation and adaptation measures. This is particularly true for smaller municipalities and economically disadvantaged areas, but not for most Gulf cities that do not seek external financing. A study by the International Finance Corporation found that many municipalities in the region lack creditworthiness, bankability, and the ability to attract international project funding.

Technical capacity gaps. Subnational governments often lack the technical expertise and human resources needed to develop comprehensive climate plans, conduct emissions inventories, or implement complex mitigation and adaptation projects. This capacity deficit is especially pronounced in smaller cities and rural areas where municipalities lack dedicated staff with technical knowledge.

Data and information barriers. Access to reliable climate data and localized impact assessments can be limited, making it difficult for cities and regions to make informed decisions and prioritize actions. For example, in Egyptian cities, most datasets are not availably publicly. In Jordan, limited coordination is worsened by the fact that most urban climate action is funded by external donors and Western development agencies that are disjointed and do not share data with each other. The lack of standardized methodologies for urban climate risk assessments further complicates this issue.

Political instability. In some parts of the EMME region, ongoing conflicts and political uncertainties can disrupt long-term planning and implementation of climate policies at all levels of government. This has adversely affected capital cities such a Beirut in Lebanon, Damascus in Syria, Tripoli in Libya, and Baghdad in Iraq. While political turmoil may not be the primary driver of climate-related issues, it acts as a "threat multiplier," exacerbating existing problems.

Lack of coordination. Insufficient mechanisms for vertical and horizontal coordination between different levels of government can lead to policy inconsistencies and inefficiencies in climate action, particularly in transboundary contexts where multiple countries and sectors are involved. In Saudi Arabia, this challenge has been somehow addressed by creating royal commissions for important cities whose role is to coordinate between all relevant national and local stakeholders. In addition, the complex interdependencies within the water-energy-food nexus pose significant challenges for coordinated and coherent approaches in the EMME region. Bureaucratic structures often struggle to effectively integrate planning, management, and governance across sectors and stakeholders. Studies have shown that traditional linear approaches to policy integration may be insufficient to address the complexity of the nexus, and, thus, they call for more adaptive and context-driven strategies.

Energy sector dependencies. For parts of the region heavily reliant on fossil fuel industries, transitioning to low-carbon economies presents significant economic and social challenges. This is particularly evident in oil-producing countries of the Gulf Cooperation Council, where economic diversification efforts are ongoing but face substantial hurdles.

Water scarcity. The EMME region is one of the most water-stressed globally, and climate change is exacerbating this issue. The city of Sanaa in Yemen is particularly water-stressed due to the depletion of its groundwater resources upon which it is dependent. Managing water resources in a changing climate requires complex, cross-jurisdictional cooperation. The United Nations Economic and Social Commission for Western Asia projects that climate change will lead to increased water scarcity in the region, with potentially severe socioeconomic consequences.

Uneven urban development. Rapid urbanization in many EMME countries has led to the growth of informal settlements and inadequate infrastructure, which increases vulnerability to climate impacts. This unplanned urban expansion often outpaces the capacity of local governments to provide essential services and implement climate-resilient development strategies, especially in Levantine and North African cities.

Addressing these challenges requires a concerted effort to enhance the capacity of cities and regions, reform governance structures, and foster greater collaboration between different levels of government. International cooperation and support, such as through the EU's external action around the European Green Deal, can play a crucial role in overcoming these obstacles and enabling more effective climate governance at the subnational level in the EMME region.

A Blueprint for Climate-Resilient EMME Cities and Regions

To overcome the challenges and capitalize on the potential of EMME cities and regions, a more inclusive and effective multilevel climate governance framework is needed. This framework should be built on these seven principles:

1. Subsidiarity—Decisions should be made at the most appropriate level of government, with local and regional authorities empowered to act on climate issues within their jurisdictions.

2. Policy coherence—Climate policies and actions should be aligned across different levels of government to ensure consistency and maximize impact.

3. Fiscal decentralization—Adequate financial resources should be allocated to subnational governments to support climate action, coupled with increased capacity for local revenue generation.

4. Capacity building—Continuous efforts should be made to enhance the technical and institutional capacities of local and regional governments in climate-related areas.

5. Participatory decisionmaking—Mechanisms should be established to ensure the meaningful participation of subnational actors in national climate policy formulation and implementation.

6. Information sharing—Improved systems for data collection, analysis, and dissemination should be developed to support evidence-based decisionmaking at all levels.

7. Regional cooperation—Cross-border collaboration between cities and regions should be encouraged to address shared climate challenges and exchange best practices.

Based on these principles, the following recommendations could enhance multilevel climate governance in the EMME region.

Legal and institutional reforms. National governments should review and reform legal frameworks to grant greater autonomy to cities and regions in climate-relevant policy areas. While Morocco is not in the EMME region, its decentralization reforms of 2011 could serve as an example. Reforms could include:

- Revising urban planning laws to give municipalities more control over land use and zoning decisions that affect climate resilience and mitigation.
- Empowering local authorities to set and enforce stricter building energy efficiency standards.
- Allowing cities and regions to directly access international climate finance mechanisms.
- Ensuring reforms are fully implemented and translate into real devolution of power and resources to local authorities.

Vertical coordination mechanisms. Formal structures should be established for regular dialogue and coordination between national, regional, and local governments on climate issues. Example structures could include:

- A national climate change committee with representation from subnational governments.
- Regular climate policy summits bringing together leaders from all levels of government.
- Joint working groups on specific climate-related topics (for example, renewable energy deployment and water management).
- Clear mechanisms for coordination between regional governors and local authorities.

Horizontal collaboration platforms. EMME countries should facilitate knowledge sharing and collaboration among cities and regions facing similar climate challenges. This facilitation could involve:

- Creating a regional network of cities committed to climate action, similar to the Covenant of Mayors in Europe.
- Establishing thematic working groups on topics such as urban heat island effects or coastal adaptation.
- Developing a digital platform for sharing best practices and lessons learned in local climate governance.
- Supporting the creation of local associations focused on sustainable development and climate action.

Capacity-building programs. Investment should be made in building the technical and institutional capacities of subnational governments to effectively plan and implement climate actions. This capacity-building could include:

- Training programs for local officials on climate science, policy, and finance.
- Technical assistance for developing local climate action plans and conducting greenhouse gas inventories.
- Supporting municipalities in developing multiyear action plans aligned with regional and national climate strategies.
- Secondment programs to facilitate knowledge transfer between different levels of government.

Fiscal measures and incentives. National governments should develop financial mechanisms to support climate action at the subnational level and incentivize ambitious local initiatives. Potential measures include:

- Establishing a dedicated national fund for local climate projects, with a transparent allocation process.
- Implementing a system of performance-based grants tied to climate action achievements.
- Allowing cities and regions to issue green bonds for climate-related infrastructure projects.
- Ensuring sufficient fiscal decentralization to reduce local authorities' dependence on central government transfers.

Data and monitoring systems. The availability and quality of climate-related data at the local and regional levels should be improved to support evidence-based policymaking. The improvements could involve:

- Developing standardized methodologies for local greenhouse gas inventories and climate vulnerability assessments.
- Creating a centralized database of climate indicators accessible to all levels of government.
- Implementing regular monitoring and reporting processes to track progress on local climate actions.
- Developing local energy accounting and management systems to track and communicate energy use at the municipal level.

Regional cooperation initiatives. Cross-border collaboration on climate issues should be promoted to address shared challenges and leverage collective resources. Potential initiatives include:

- Establishing transboundary climate adaptation plans for shared ecosystems (for example, the Tigris and Euphrates river basins and coastal areas around the Mediterranean and the Gulf).
- Developing regional renewable energy projects that benefit multiple jurisdictions and encouraging interconnections between regions across borders.
- Creating a regional climate innovation hub to foster technological solutions adapted to EMME contexts.
- Encouraging regional cities to participate in international climate initiatives and city networks to gain exposure to global best practices.

The proposed multilevel climate governance framework for the EMME offers significant opportunities to enhance climate action and resilience in the region. The main opportunities include:

- Accelerated climate action—By empowering cities and regions, the framework can unlock significant mitigation and adaptation potential, helping countries in the EMME region to achieve and potentially exceed their nationally determined contributions under the Paris Agreement.
- Improved policy effectiveness—Aligning climate policies across different levels of government can lead to more coherent, effective and transparent implementation, increasing synergies and reducing inefficiencies and contradictions.
- Enhanced resilience—Local and regional tailoring of adaptation strategies can improve the resilience of communities to climate impacts, addressing context-specific vulnerabilities.
- Economic benefits—The framework can stimulate local green economies, creating jobs in sectors such as renewable energy, sustainable construction, and ecotourism.
- Increased international engagement—Empowered cities and regions can more effectively engage with international climate initiatives and funding mechanisms, bringing additional resources to the EMME region.

Forging Resilience to the EMME Region's Climate Crucible

The EMME region faces significant climate challenges that require coordinated action across all levels of governance. However, countries in the region have adopted markedly different approaches to climate action. Morocco and Tunisia have made notable progress in decentralization reforms empowered by a social contract that includes climate action in a constitutional and participatory manner. Lebanon's decentralization efforts remain largely unrealized despite being enshrined in its constitution. Meanwhile, Gulf cities in countries such as the UAE and Saudi Arabia, with a techno-investment approach to climate action, have found another approach to empowering city climate action through mechanisms such as the Saudi royal commissions.

Despite these differences, common challenges persist across the region. Cities in the Levant and North Africa particularly struggle with limited municipal financing for climate action and weak technical capacities at local levels, and most regional cities struggle with insufficient coordination between national and subnational governments. The proposed framework and recommendations here offer a pathway to address these shared challenges while acknowledging the need for locally adapted solutions.

As the global community intensifies efforts to address climate change, the EMME region has an opportunity to learn from these diverse national experiences. Countries that have made greater progress, such as Morocco with its climate-compatible policies, could provide valuable lessons for others in the region. The journey toward inclusive multilevel climate governance in the EMME region will require different approaches tailored to each country's institutional and political context. While some cities may be able to pursue ambitious decentralization reforms, others may need to focus first on building basic institutional capacities. Success will depend on recognizing the needs of each city while maintaining focus on the shared goal of enhanced climate action across the region.

04

Climate Governance in MENA and Africa: Knowledge, Policies, and Cooperation

Ahmed Eladawy

Globally, developing effective and inclusive government strategies for climate crisis mitigation and adaptation is becoming increasingly challenging. The difficulties in accurately predicting impacts, along with the limitations in quantifying Earth's carbon sequestration capacity and the challenges in determining critical tipping points, potentially add layers of complexity to climate governance in the least studied regions of Africa. These regions, heavily reliant on climate-sensitive sectors such as agriculture and hydropower, face significant constraints in adaptive capacity due to economic and political limitations. Similarly, the Middle East and North Africa (MENA) region contends with extreme heat events, unprecedented flash floods, and chronic water stress, exacerbated by urbanization and rapid population growth that impedes their adaptation efforts. Given these threats and the barriers to effective governance, this article draws on existing data to assess the regions' shared challenges and opportunities around climate knowledge production and dissemination, climate governance policy development and implementation, and regional collective action.

Africa and the MENA region have different ranges of climate adaptation resilience capacity, but they face similar dire effects of the climate crisis (for example, water scarcity and food insecurity). The two regions have a production-based carbon footprint larger than their domestic consumption-based carbon footprint. This reflects their role in the global economy as producers of fossil fuels/carbon-intensive goods that are consumed in other parts of the world. While acknowledging the significant disparities in resilience and resources between countries, there is the potential for equitable cooperation, and it will be crucial in addressing the increasing impacts of climate change.

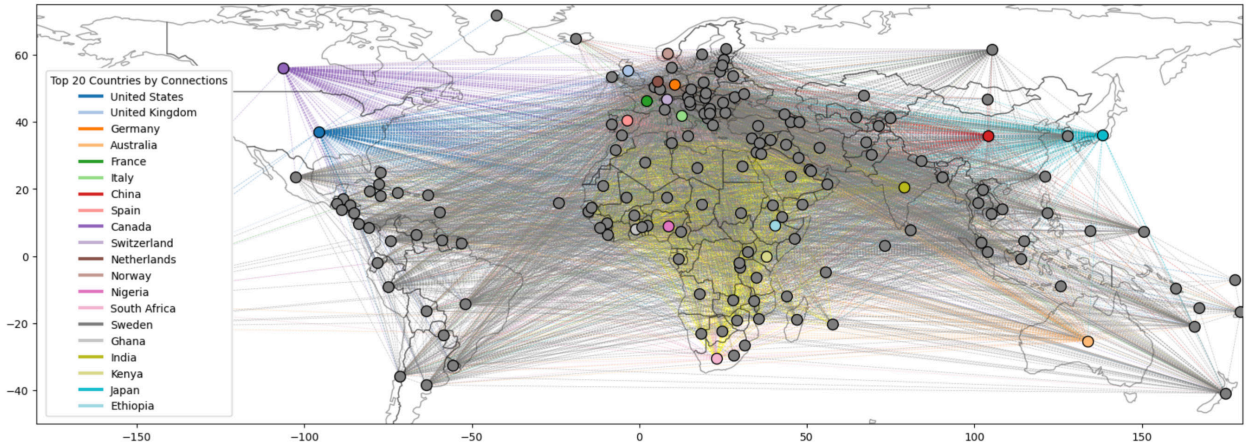
Climate Knowledge Production and Dissemination

Effective climate action and policymaking in MENA and Africa are highly contingent on overcoming the challenges facing climate knowledge production and dissemination. The most well-documented challenge is the lack of sufficient climate research funding, which hinders the ability to conduct in-depth climate research. The Second Working Group contribution to the sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC) mapped that African countries have the lowest number of adaptation research projects. Interestingly, the report also highlighted a noticeable imbalance between the funding allocated for adaptation versus the funding allocated for mitigation projects, especially in North Africa.

Inadequate data collection and information sharing, unstable political realities, and insufficient research approaches focused on global rather than local issues hinder the development of more resilient and informed responses to climate change in Africa and MENA. For instance, as one comparative study noted, media framing in Norway is primarily influenced by enterprising journalism and academic perspectives, while media framing in Ghana is predominantly shaped by politicians and public officials, with a significant reliance on international sources. This study emphasizes the importance of local, evidence-based narratives and collaboration, offering valuable insights that African countries could adapt to enhance their responses to climate change. There are systemic gaps in the production and dissemination of conservation knowledge in African countries, as most funding, authors, and publication outlets are concentrated in European and North American countries. These gaps disproportionately affect local researchers, Indigenous communities, and grassroots organizations, who are often sidelined from active participation in knowledge production processes. They limit the inclusion of local perspectives and priorities, perpetuating historical and ongoing systems of unequal power structures in environmental conservation sciences. As a result, adopted strategies may lack the cultural and contextual relevance necessary for sustainable impact.

An analysis of 25,899 publications from the Web of Science database on only climate change in MENA and African countries reveals that only a little over 12 percent of these studies originate within the MENA and Africa regions. Furthermore, just four African nations—and none from MENA—are listed among the top twenty countries in global research collaboration networks producing climate studies for MENA and Africa (see Figure 1). While international collaborations can introduce diverse perspectives and advanced technologies, they often fail to integrate local knowledge and voices, potentially marginalizing regional expertise in climate discourse. Inequalities in knowledge production toward MENA and African states can also be seen with funding flows. For example, only 3.8 percent of global funding for climate change research is spent on African topics, and African institutions received only 14.5 percent of it.

Figure 1. Global Collaboration Network of MENA and Africa Climate Studies



Source: Author analysis and mapping based on 25,899 publications discussing climate change in Africa and MENA as indexed in the online database Web of Science (WOS, www.webofscience.com). The publications metadata used for the analysis of the connections is uploaded here (https://drive.google.com/drive/folders/1M4UKNgjyEBkun1L4yOATUMwxtL51FA0Y?usp=sharing). The top twenty countries by number of connections are represented with different colors, as indicated in the color bar, while studies exclusively conducted within the MENA and Africa regions are highlighted in yellow.

Such disparities, coupled with data collection challenges, raise concerns about biased research outcomes and the potential for greenwashing, where research serves to reinforce certain political or economic agendas. For instance, studies that downplay specific countries' carbon emissions or overstate their adaptation capacities have become increasingly common, contributing to an atmosphere where critical debate is limited

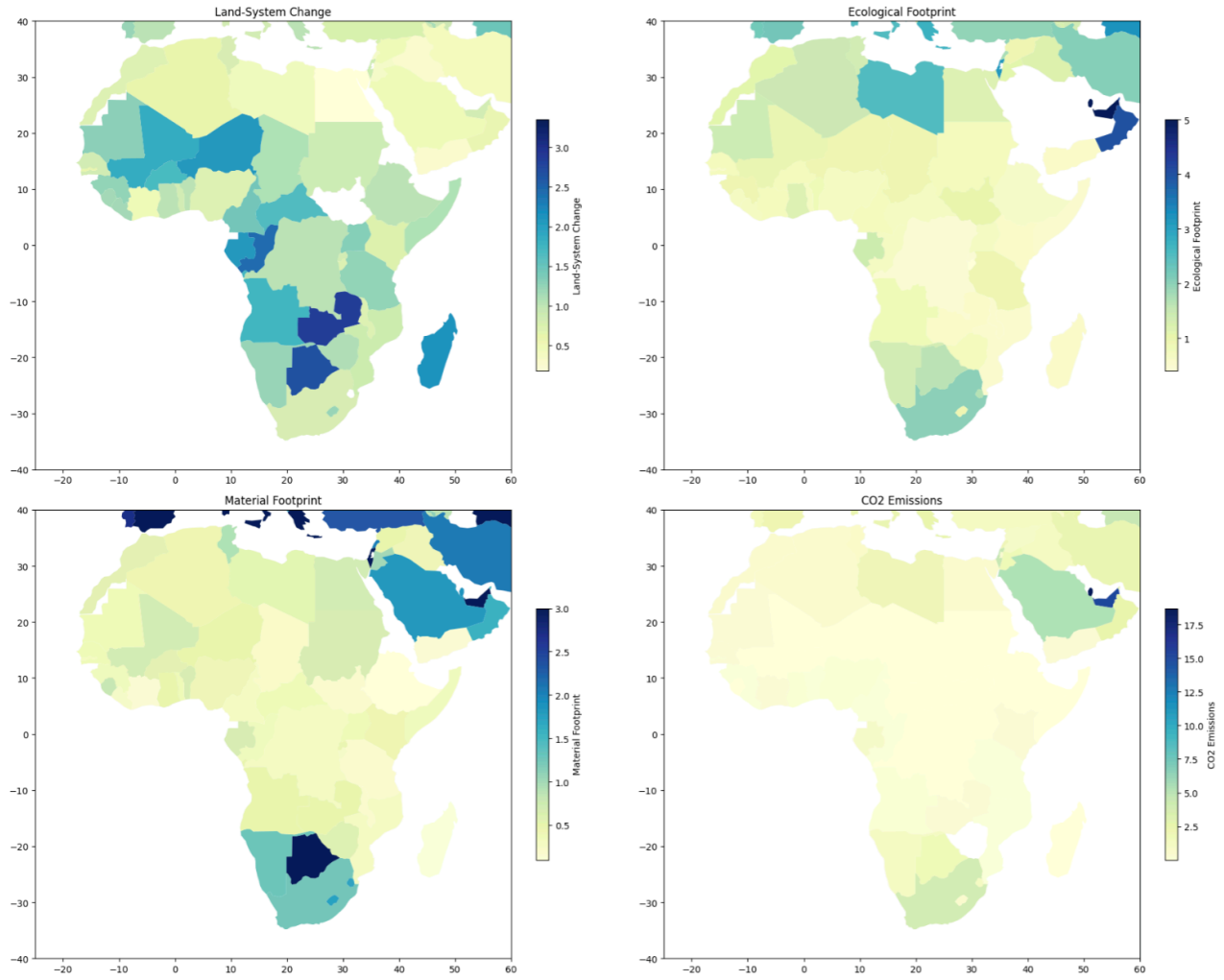
In global discourse, a meaningful comparative analysis of regional emissions must extend beyond per capita emissions or the temporal trends in emissions. It should also integrate historical emissions, sectoral contributions, material footprints, land-based pollution (for example, nutrient runoffs), and key socioeconomic contexts. Incorporating these factors provides a more nuanced understanding of each region's responsibilities and strategies for emissions mitigation over the coming decades. The sixth assessment report of the IPCC highlights that while global emissions have risen in most regions, their distribution remains highly uneven. Notably, cumulative anthropogenic carbon dioxide (CO_2) emissions from 1850 to 2019 account for just 4 percent in Africa and 2 percent in the Middle East. However, the report also points out Africa's disproportionately high share of emissions from land use, land-use change, and forestry relative to its total emissions, underscoring the regional variation in emission sources. Additionally, Africa exhibits the highest emissions per unit of revenue, signaling the critical need to prioritize forest conservation, improve carbon efficiency in production processes, and adopt sustainable land management practices across the continent.

Given the disparity in emissions and resilience between the global North and South, it is essential to develop region-specific mitigation and adaptation strategies. Adopting a framework that assesses each country's contributions in detail—across various sectors and social metrics—is crucial for effective policy planning. For example, the "safe and just space" framework, also known as the "Doughnut Model," provides a holistic lens that integrates environmental and social metrics, building on the foundational "planetary boundaries" framework. This boundaries framework envisions a "safe space" where humanity can thrive without exceeding ecological limits (the outer boundary) or falling short on essential social foundations (the inner boundary). Biophysical boundaries include not only safe levels of greenhouse gas emissions but also limits on nutrient loading and biodiversity loss. Based on their assessments, they observed that countries exceed biophysical limits more rapidly than they meet social thresholds. Figure 2 illustrates the significant variability among countries in the MENA and Africa regions concerning the extent to which they exceed their biophysical boundaries.

In African countries, land-use changes are particularly impactful, whereas, in the Arab Gulf Cooperation Council (GCC) states, material footprint and emissions are more prominent. For instance, Qatar and the United Arab Emirates (UAE) ranked among the highest in CO2 emissions per capita. Notably, the UAE also exhibited a significant ecological footprint and had the second-largest material footprint globally, following Singapore. According to research by Andrew Fanning and others, although the GCC states and Libya exceed most biophysical boundaries, they have not yet fully achieved certain social thresholds, such as democratic quality and equality. This situation is comparable to that in many Global North countries, where high levels of social achievements have been attained but often at the expense of ecological sustainability.

The research involved analyzing data on eleven social indicators (for example, life expectancy, educational enrollment, and equality) and six biophysical indicators (for example, carbon emissions and ecological impact) across more than 140 countries from 1992 to 2015, supplemented with business-as-usual projections to 2050. The study findings highlight the necessity of adopting a comprehensive approach that not only addresses emissions but also considers other central socioeconomic factors. Incorporating these dimensions is crucial, especially given the significant intraregional inequalities. For instance, spatial inequalities in access to water and energy underscore the need for in-depth studies that can inform evidence-based mitigation and adaptation strategies. Such measures must be tailored to the specific economic, social, and environmental contexts of each region to ensure they are both equitable and effective.

Figure 2. Biophysical Boundaries Transgressed by Countries in MENA and Africa

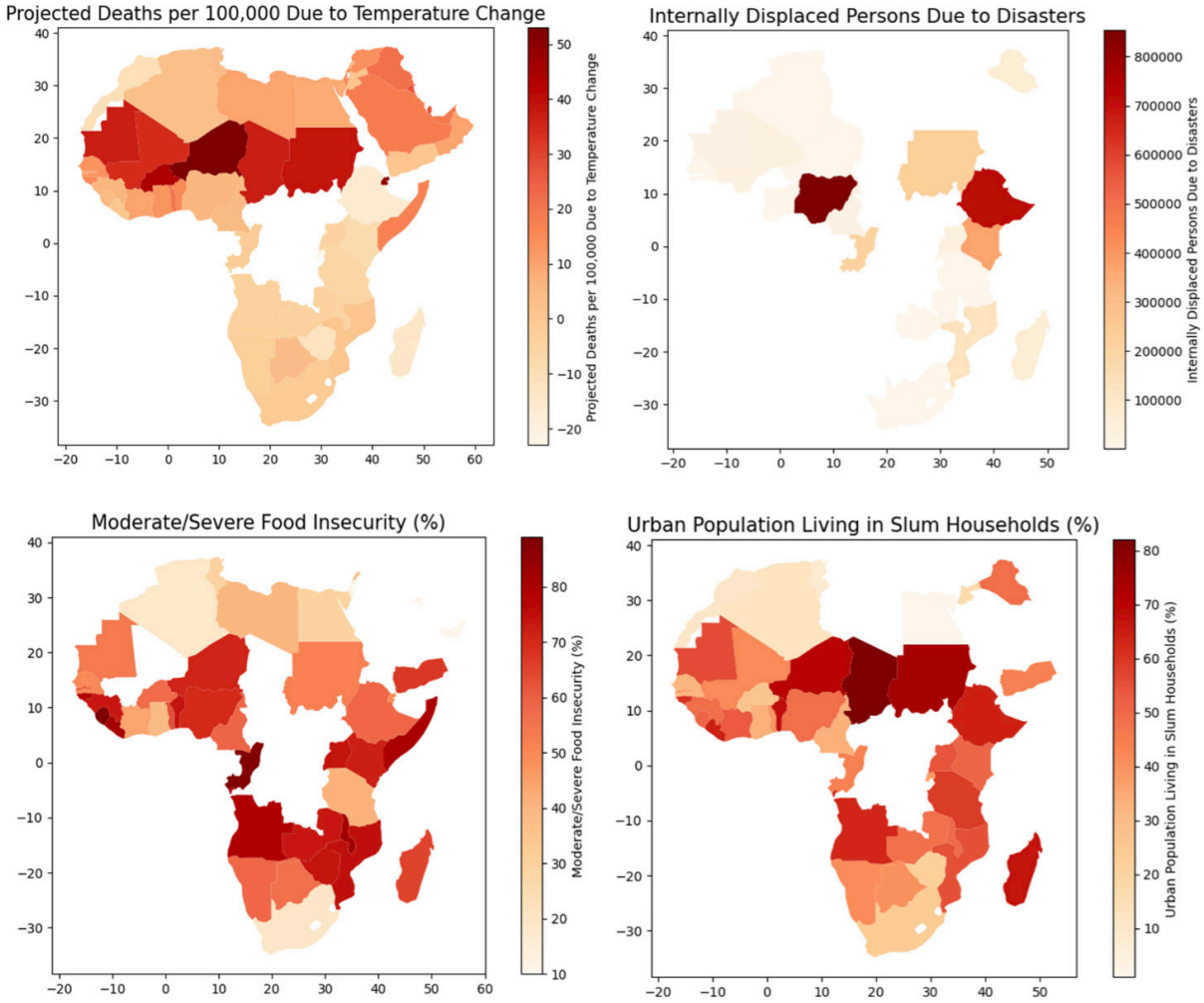


Source: Data plotted by the author and drawn from Andrew Fanning and others' research titled "The Social Shortfall and Ecological Overshoot of Nations." Biophysical data is normalized to the biophysical boundary for each indicator such that the value of 1 represents the biophysical boundary. Beyond these planetary boundary limits, the environment may not be able to self-regulate anymore. More blue means more ecological overshoot of the country, as per the data of 2015.

Contributions to ecological degradation and emissions vary significantly among countries in the MENA and African regions, and similarly, the impacts of climate change are unevenly distributed across these areas. Projected mortality rates from climate change are expected to be highest in the MENA and Sahel regions (see Figure 3). However, the adaptive capacities of North African and GCC states are considerably stronger than those of sub-Saharan countries. For example, sub-Saharan Africa has a much higher proportion of urban populations living in informal settlements or slums, which heightens their vulnerability to climate impacts.[8] Additionally, the large number of internally displaced persons in East

Africa, resulting from ongoing climate-related disasters, complicates efforts to plan for future adaptation. This challenge is compounded by the fact that migration from Africa—defined as individuals born in Africa now residing outside the continent, primarily in Europe or North America—has tripled over the past three decades. The significant increase in migration reflects the socioeconomic strains and environmental pressures facing many African countries, which are expected to intensify under more extreme future climate scenarios. These challenges underscore the urgency of fostering more socioeconomically sensitive and inclusive knowledge production mechanisms in the climate space, ensuring that adaptation and mitigation strategies are equitable and effective across diverse regional contexts.

Figure 2. Biophysical Boundaries Transgressed by Countries in MENA and Africa



Source: Data drawn from the Population Reference Bureau's 2023 world population data sheet and plotted by the author. The projected deaths per 100,000 due to temperature change are calculated based on average climate scenarios for the period 2040–2059. Countries for which data are unavailable are represented in white on the map.

Climate Challenges and Governance

In 2015, over half of the global population were living under conditions of permanently poor water security, with Africa identified as one of the most severely affected regions, as indicated by the Global Water Security Index (GWSI). Approximately 844 million people globally lacked access to safe drinking water, and about 2.3 billion people lacked access to safe sanitation. Africa had the highest concentration of people without safe water access. The GWSI highlights that most of Africa's population does not have access to safe water or adequate sanitary conditions, contributing significantly to the continent's water security challenges. Another challenge is the impact on Africa's water resources, which are already strained by variability in rainfall and increasing temperatures. Africa's reliance on rain-fed agriculture (94.5 percent or 728,830,680 hectares) and shared transboundary water resources makes the continent particularly vulnerable to conflicts exacerbated by climate-induced stress on water availability. Similarly, while hydropower in Africa offers a relatively cleaner energy option, it faces operational challenges due to unprecedented floods and droughts.

In addition to the widely reported challenges of water scarcity and unprecedented extreme weather events in the MENA region, the sixth assessment report by the IPCC highlights the high likelihood of local extinctions of indigenous species in the southwest Arab Gulf and off the coasts of Qatar, Saudi Arabia, and the UAE. In regions reliant on groundwater resources, such as Gaza and the West Bank, a reduction in average rainfall by 10 percent could lead to a corresponding decrease in aquifer recharge rates by approximately 14 to 24 percent. Furthermore, a 15-percent decline in rainfall could reduce recharge by 28 to 50 percent. Unfortunately, according to researchers Jeremy Pal and Elfatih Eltahir, under a business-as-usual greenhouse gas scenario, human adaptability thresholds in the region may reach their limit by 2100. In addition to the risks of biodiversity loss, the Arabian Gulf faces increasing environmental challenges, including rising dust storms and seawater intrusion into coastal aquifers. Moreover, researcher Banafsheh Keynoush suggests that severe climate impacts in Southeast Asia and sub-Saharan Africa could drive climate-induced migration to the GCC states, adding further pressure to that region.

The MENA region's ability to address these challenges is hindered by political tensions, which complicate the adoption of integrated environmental policies. These tensions often result in insufficient investments in renewable energy and delays in implementing climate-resilient infrastructure. Northern Africa (the world's most water-stressed region) is projected to experience increased temperatures, reduced precipitation, and more frequent extreme weather events, such as flash floods, heat waves, and droughts. Weak coordination between national and local governments, limited public participation in policy formulation, overcentralization, and inadequate resource allocation can hinder efforts to address climate change impacts. The relatively limited capacity for climate adaptation to water shortages, food insecurity, and rising temperatures could also drive migration and fuel conflicts, particularly in rural areas where livelihoods depend on agriculture. Addressing these governance and policy gaps is critical to enhancing MENA's ability to navigate the complex interplay of climate and socioeconomic pressures.

In Africa, biophysical changes, such as rising temperatures and unpredictable flash floods, interact with sociopolitical factors, such as power imbalances and social inequalities, consequently influencing the effectiveness of climate adaptation strategies. Targeted interventions and policies are needed to promote the adoption of climate-resilient crops, particularly drought-tolerant varieties, by small-scale producers in Africa, and they should take into account socioeconomic and educational disparities. Socioeconomic barriers can hinder the implementation of agricultural practices, such as adopting drought-resistant crops, practicing dry season farming, and using mulching techniques.

Although Climate-Smart Agriculture is gaining traction in low-income countries, a key challenge lies in its suitability for small-scale farmers (who make up 80 percent of Africa's farmers), as the approach may lead to increased input costs and be further constrained by declining commodity. Finally, gender-responsive climate policies should leverage both modern technologies and indigenous knowledge to strengthen resilience to climate change, while also promoting green reskilling initiatives for women.

Climate Policy Implementation

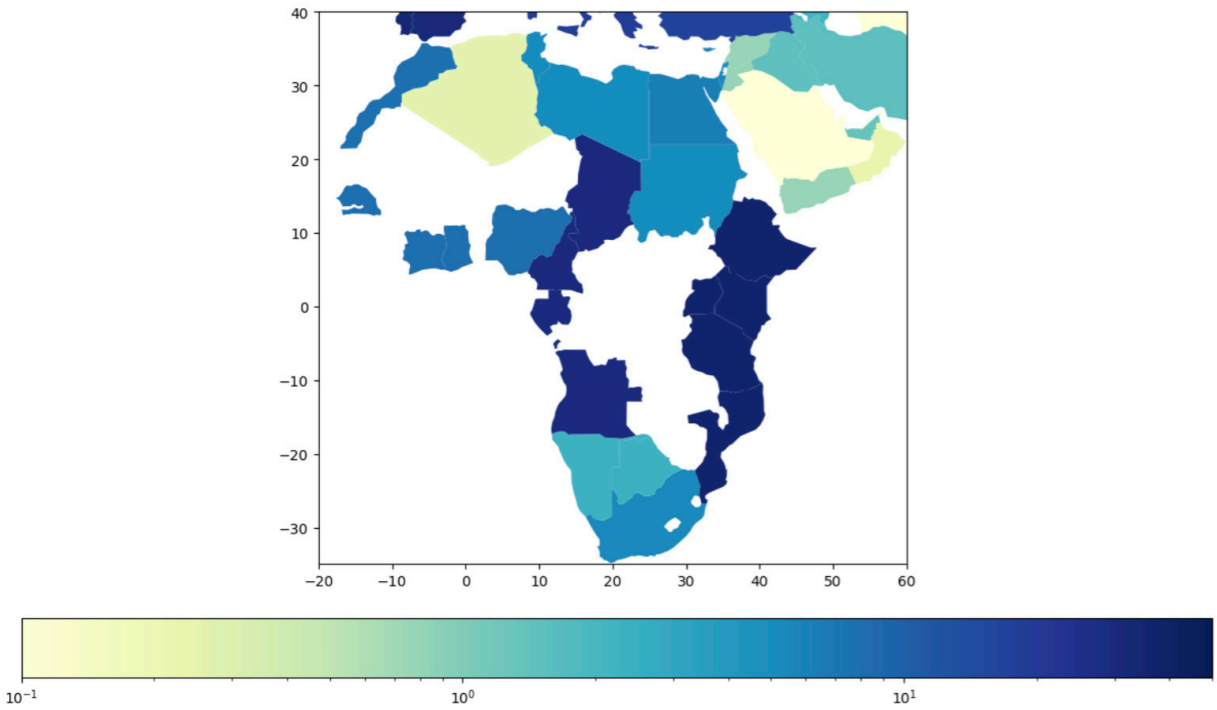
This section highlights climate policies implemented across Africa and MENA, focusing on samples of key initiatives for mitigating climate change and promoting environmental conservation. Globally, over 3 billion people continue to rely on traditional biomass fuels for cooking, with sub-Saharan Africa expected to maintain a high dependence on wood as a primary energy source. Consequently, Senegal's biogas initiative, part of the National Domestic Biogas Program, aimed to provide a sustainable alternative to traditional biomass fuels, addressing environmental and health concerns. However, despite government support and technical potential, the initiative struggled with high costs, limited financial access, and inadequate infrastructure. Of the 8,000 digesters planned for the period 2009–2013, fewer than 600 were installed, many of which became nonfunctional. The main barriers included poverty, financial limitations, and a lack of market-oriented farming.

Similarly, South Africa, Africa's highest carbon emitter, signed into law the Climate Change Act in July 2024 (originally published in 2018), establishing a framework to reduce greenhouse gas emissions and enhance climate resilience. The law mandates sectoral emission targets and carbon budget compliance for major emitters. But the promising plans could be challenged by South Africa's reliance on coal for electricity generation, along with little focus on adaptation and resilience and limited financial resources.

Likewise, the Green Legacy Initiative in Ethiopia aims to restore ecosystems, combat climate change, and promote environmental awareness through tree planting. While it has shown positive outcomes in carbon sequestration, biodiversity, and soil conservation, further studies are required to fully assess its long-term impacts. Finally, the Africa Carbon Markets Initiative, launched at the 2022 United Nations Climate Change Conference, aims to provide significant revenues to African economies but is raising concerns related to incentivizing land-grabbing practices (as one form of green grabbing), especially through tree plantation, solar, and hydropower projects.

Before discussing the MENA region's initiatives, it is important to recognize the differences in capacities and policies within the region. For example, Figure 4 shows the varying low-carbon energy percentages in MENA and Africa. All GCC states remain significantly less reliant on low-carbon energy sources, primarily renewables, compared to both low-income countries in the region and globally. As illustrated in the figure, the proportion of low-carbon energy (including fossil fuels with carbon capture and storage) in the primary energy mix is less than 0.1–0.2 percent in all GCC countries and only 1 percent in the UAE. In contrast, many African countries achieve a significantly higher share, with low-carbon energy comprising around 10 percent of their primary energy mix. Ironically, this comes with a flourishing investment outside the GCC states. For example, the UAE's Masdar, a leading global renewable energy company focused on advancing clean energy solutions, has recently signed agreements with Angola, Uganda, and Zambia to invest in renewable energy projects totaling 5 gigawatts, alongside a 500 megawatt investment in Ethiopia.

Figure 4. Low-Carbon Energy (Percent Equivalent Primary Energy)



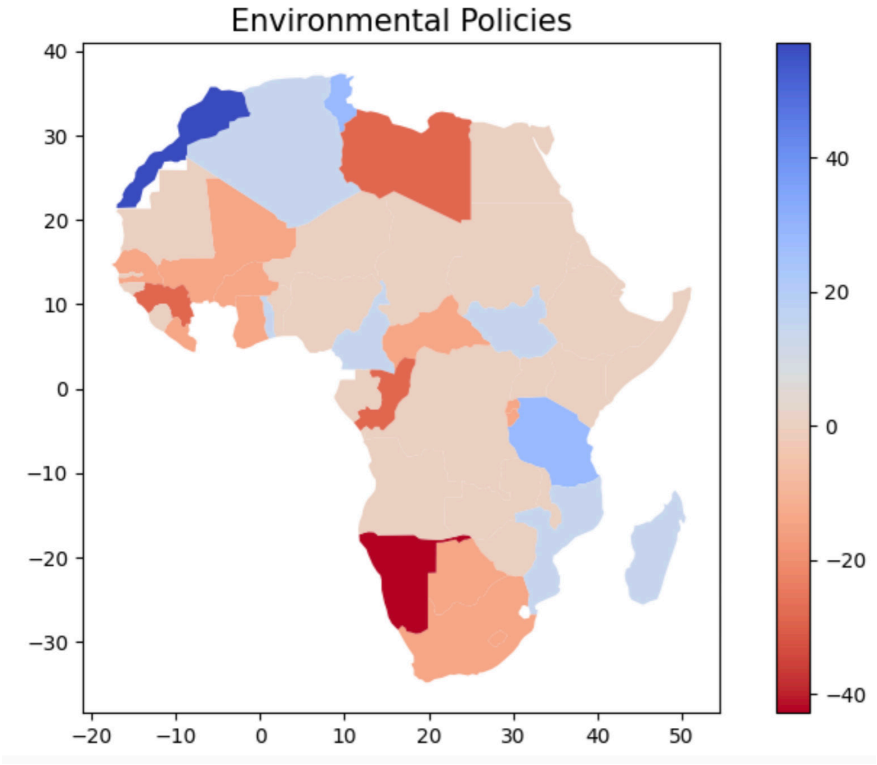
Source: The figure represents the latest available percentages of primary energy from renewables in Africa and MENA. The raw data are drawn from the Energy Institute's 2024 Statistical Review of World Energy. Countries represented in white indicate a lack of available data. The color scale, set in logarithmic terms (representing values of 0.1 percent, 1 percent, and 10 percent), is used to illustrate the considerable variation among MENA and African countries.

On the other hand, North African countries tend to implement green projects within their borders via partnerships with both GCC states and the EU. Morocco and Egypt lead the renewable energy development in the region. Over the past decade, North Africa has successfully increased its renewable energy output by 40 percent, adding 4.5 gigawatts of capacity from wind, solar photovoltaic (PV), and solar thermal sources to its energy portfolio. The Saudi Green Initiative, launched in 2021, aims to plant 10 billion trees, rehabilitate 40 million hectares of land, and ensure that 50 percent of the country's energy comes from renewable sources by 2030. MENA countries such as Saudi Arabia, the UAE, and Egypt have also launched carbon market initiatives, but just as in Africa, there are concerns about transparency and greenwashing, with companies potentially offsetting emissions without making meaningful environmental changes.

Political instability and conflicts in certain areas of MENA and Africa disrupt development efforts and exacerbate impacts of climate change. To illustrate, the conflict and state fragility in Libya contributed to unsuccessful dam reassessments and maintenance in the country's coastal town Derna. Improving governance and reducing conflicts could create a conducive environment for cooperation. Based on the Ibrahim Index of African Governance (IIAG), few countries have shown increased improvement in overall governance over the last decade. The IIAG evaluates governance performance through four key categories: security and rule of law, participation, rights and inclusion, foundations for economic opportunity, and human development. Each category encompasses subcategories and indicators that assess specific aspects of governance. Within the human development category, the sustainable environment subcategory monitors progress in areas such as environmental policy improvement trends.

Regrettably, a small number of countries have exhibited slower progress in advancing environmental policies and enforcing regulations during this period (see Figure 5). Weak governance has been linked to negative environmental outcomes, including the degradation of carbon sinks such as forests and wetlands. According to the Mo Ibrahim Foundation, except for Tanzania, all countries within or partially in the Congo Basin have shown no improvement in performance over the last decade. This poses a significant threat to the basin, which is the world's largest carbon sink, absorbing more carbon than even the Amazon. Additionally, several countries, including the Democratic Republic of the Congo, Niger, South Africa, and Zimbabwe, have experienced widespread artisanal mining, which has led to significant wetland and habitat loss, eco-hydrological degradation, riverbed siltation, and mercury pollution.

Figure 5. Trends in Performance of Environmental Policies



Source: Data are drawn from the Mo Ibrahim Foundation's governance data portal (https://iiag.online/) and plotted by the author. The figure shows the trends of improvement (positive) and deterioration (negative) in environmental policies in Africa based on the foundation's assessment during 2012–2021.

Funding Burden and Gaps

Except for the GCC states and Libya (refer to the data released by Andrew Fanning and others in 2022), the rest of the MENA region experiences a significantly disproportionate impact from climate change, despite contributing only low-to-moderate levels of emissions. For example, the sixth assessment report of the IPCC documented an accumulative loss of 11–12 percent of GDP per capita in Egypt due to climate change during 1991–2010. Even if the Paris Agreement target of 1.5 degrees Celsius is achieved, child mortality in Egypt is expected to rise by approximately 2.3 percent by 2050 and by about 1.4 percent by 2070. Hence, Egypt has committed significant financial resources for climate adaptation projects, with plans to allocate $52 billion from 2022 to 2050 for the agriculture sector and $59 billion from 2020 to 2037 for water resource management. Despite these substantial commitments, the funding gaps for adaptation and mitigation projects remain staggering at $94.7 billion and $153.6 billion, respectively. This highlights the immense financial challenge Egypt faces in fully addressing its climate resilience goals.

The disproportionate burden on Africa, despite its minimal contribution to global emissions, necessitates urgent global action. The financial burden of climate adaptation in sub-Saharan Africa is projected to be between $30 billion and $50 billion annually over the next decade, which corresponds to approximately 2–3 percent of the region's GDP. Wealthy nations—including those in MENA—should prioritize providing climate finance, enhancing resilience, and addressing both adaptation and mitigation to prevent widespread destabilization and health crises in Africa and beyond. Africa's climate finance needs are vast, with an estimated $2.8 trillion needed annually by 2030 to implement nationally determined contributions. But current annual climate finance flows are only around $30 billion, far below the necessary amount.

A recent analysis found that wealthy nations have benefited from climate funding meant for developing countries by attaching interest rates or conditions that favor their own economies. This includes $18 billion in market-rate loans and $11 billion linked to purchases from donor-country companies. Egypt and Kenya, followed by Sri Lanka, Tunisia, and Iraq, have emerged as the largest recipients of these climate-related loans. The 2022 UN report titled "Avoiding 'Too Little Too Late' on International Debt Relief" emphasized the critical positions of Egypt and Kenya, which rank high in both debt sustainability assessment risk and climate vulnerability. Given the substantial climate funding gaps mentioned earlier, this situation is highly concerning. Moreover, it could undermine the original objective of compensating poorer nations for the disproportionate impacts they face due to climate change.

Regional Cooperation Between Africa and MENA

There is a significant opportunity to enhance knowledge production and exchange between MENA and African countries, particularly in response to their shared climate change challenges. Collaborative efforts focused on developing innovative technologies tailored to the social contexts of neighboring regions, securing financial resources, and strengthening local institutions should be central to an effective climate change strategy. This approach emphasizes a shift away from the prevailing model of Global North funding and support toward one that fosters greater regional autonomy and resilience.

Several measures can serve as essential pillars for fostering regional cooperation between the MENA region and Africa. The Second Working Group contribution to the IPCC's sixth assessment report highlights the critical role of early warning systems and seasonal and dynamical forecasting, both of which received the highest scores for feasibility and effectiveness in facilitating socio-institutional adaptation to climate change. Additionally, institutional transboundary agreements and financial and market mechanisms, along with active participation (beyond mere public awareness), were rated as highly effective in reducing climate change risks.

Outlined below are suggested strategies to ensure the effectiveness of regional cooperation in addressing climate change:

Just transition. The transition from fossil fuels to renewable energy in MENA and African countries could drive significant social and political transformations. In the MENA region, where economies are heavily reliant on fossil fuels, Professor Ali Khalifa Al-Kuwari argued in 1974 that oil revenues have historically concentrated power in the hands of regional rulers. And the current economic diversification strategies in the GCC states, which partially rely on investing in high-emission sectors such as maritime transport and coastal and marine resources based tourism, do not necessarily ensure substantial reductions in emissions.

North African countries could further advance their efforts in renewable energy investment by not only focusing on large-scale centralized solar and wind projects but also by promoting decentralized renewable initiatives. These decentralized projects would ensure broader accessibility across all economic segments of society. Finally, financing a just transition in Africa is critical to ensure the continent can move toward low-carbon, resilient economies without sacrificing development goals such as poverty alleviation and job creation. African countries need tailored financial strategies, with a focus on balancing green investments and social protections to avoid worsening inequalities during this transition.

Peace and stability. Political instability and conflicts in certain areas of MENA and Africa disrupt development efforts. Improving governance and reducing conflicts can create a conducive environment for cooperation. While there is no compelling case of past climate-related interstate war in the region, there are plausible future contingencies for this outcome. Conflict-related environmental destruction and climate change exacerbate each other, creating a vicious cycle of degradation, vulnerability, and incapacity for adaptation.

One potential way to mitigate these risks is through aligning GCC investments in renewable energy (solar and wind) with regions at risk of water conflicts, such as near the controversial Ethiopian Grand Renaissance Dam. Strategic investments in renewable energy could help partially mitigate the dam's impacts on downstream countries. However, this is not as simple as it seems, as fostering cooperation beyond the river in the Eastern Nile requires open negotiations, built on shared benefits, equitable terms of engagement, and trust, rather than proposing ambitious projects without addressing underlying issues of mistrust and differing perceptions.

Moreover, GCC states should move beyond mere land acquisition and adopt a holistic approach to agro-investments. This approach should emphasize collaborative projects that integrate local communities into the value chain, ensuring that investments contribute to local food security, employment, and sustainable land management practices. The current approaches transfer significant biophysical resources—including water and soil nutrients—from Africa to the Gulf, creating a form of ecologically unequal exchange that depletes local resources without commensurate benefits to the local population.

Knowledge production. To strengthen governance in MENA and Africa, national universities, as key players, must address natural and environmental governance and accountability constraints by adopting more transparent and autonomous governing structures, enabling them to function independently, foster academic freedom, and contribute to the development of good governance practices. For example, to promote a more equitable and sustainable energy transition in MENA and Africa, it is crucial to foster transparent discussions around the current centralized energy projects and to critically examine the structure of power purchase agreements. Additionally, there should be a strong focus on encouraging decentralized renewable energy projects, which can enhance local energy resilience and facilitate broader community involvement in the transition to clean energy.

This approach would ensure that energy benefits are more evenly distributed across urban and rural areas, while also increasing flexibility in energy systems. The inefficiency in knowledge production across both regions, as previously discussed, cannot serve as a sustainable approach to addressing the ongoing impacts of the climate crisis.

Cooperation, not green colonization. African tropical forests play a critical role as carbon sinks, helping to mitigate global warming. Protecting these forests from illegal logging and poor agricultural practices is vital. At the same time, a growing regional interest in carbon offset projects in Africa is evident. These projects are framed as environmental initiatives but are criticized as a new form of exploitation, akin to a "scramble for Africa," where vast tracts of land are acquired for carbon credits. A more equitable regional framework must be developed to ensure the health of forests and their role in climate mitigation.

Additionally, the increasing pressures on aquatic systems across Africa, such as wetlands and rivers, demand urgent attention. Investments should prioritize comprehensive action plans for areas threatened by human pollution, extending beyond basic afforestation and reforestation efforts to include more proactive sustainable land management practices and integrated conservation strategies. Cooperation policies should be designed to protect the rights of local communities, prevent ecological degradation, and promote long-term, mutually beneficial partnerships rather than short-term extraction.

Local innovations and evidence-based adaptation measures. Combining traditional knowledge in MENA and Africa with modern technologies is crucial for addressing climate change impacts. Interestingly, although low-tech methods produce lower crop yields, they might be the most effective in enhancing food security and supporting sustainable agriculture in Africa. Similarly, the MENA region has a long history of adapting to harsh climatic conditions, with some traditional practices still in use today, while others have been lost or deemed outdated due to modernization and technological advancements.

To develop region-specific adaptation strategies, a broader range of ecosystems—including often overlooked marine ecosystems, grasslands, coastal zones, and freshwater systems—should be integrated into nature-based solutions. This approach should also expand its focus

to address a wider array of climate-related challenges, ensuring that adaptation strategies receive equal attention as emissions mitigation. It is recommended that innovative financial incentive approaches be developed to simultaneously enhance both productive and environmental outcomes, as achieving this balance remains a significant challenge.

Moving beyond conventional emission reduction strategies offers promising alternatives for sustainable environmental management. For instance, the implementation of eco-innovative decentralized sanitation systems can significantly reduce freshwater demand while also mitigating the pollution of water resources and ecosystems. These systems, alongside other innovations, represent promising alternatives to traditional approaches, allowing for more resilient, adaptable and localized responses to climate change.

Conclusions

Given the climate knowledge production crisis in MENA and Africa, simply importing technologies and policies—developed and tested in different environments and lacking local social acceptance—falls short of capturing the regions' untapped opportunities, making it imperative to generate reliable, high-resolution data as the first step toward building effective, evidence-based policies.

In their study, titled "Compensation for Atmospheric Appropriation," researchers Andrew Fanning and Jason Hickel argue that the cumulative emissions of many African countries will not reach their fair share of emissions of 350 parts per million and even remain very far from reaching their fair share of the 1.5-degrees-Celsius target by 2050 under all scenarios. As a result, these nations are entitled to compensation from overshooting countries, including the GCC countries. Specifically, sub-Saharan Africa should receive an estimated $45 trillion in compensation, based on historical emissions from 1960 to 2019 and projections under a net-zero scenario from 2020 to 2050. These estimates far exceed any planned loss and damage funding or other available financial mechanisms.

There is a significant opportunity to preserve Africa's vast carbon sinks and ensure a just transition that guarantees a decent standard of living for Africans, which is easily achievable with current global resource and energy use. However, authoritarian regimes could prefer centralized control through large climate mitigation projects (such as renewable energy plants or reforestation programs) and thus avoid the societal empowerment that climate adaptation needs. This preference could partially explain the imbalance of adaptation to mitigation efforts in MENA and Africa.

Energy sovereignty, environmental justice, and inclusive development should be prioritized in renewable energy development in North Africa. Finally, overshooting countries in the MENA region should prioritize investing in threatened ecosystems in Africa, while ensuring

that these efforts also benefit the local populations. Investment in Africa, such as the extraction of materials required for renewable technologies or the installation of renewable energy infrastructure, should be strategically designed to mitigate, rather than exacerbate, conflicts over resources. Careful consideration of existing resource-related tensions is essential to ensure that such investments contribute to stability and sustainable development.

Acknowledgments

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05

Beyond the Green Transition: Governance and Climate Vulnerability in Morocco

Frederic Wehrey and Andrew Bonney

Stretching from the arid scrublands and dune seas of the Sahara to the forested coastlines of the Mediterranean and the high, snow-capped peaks of the Atlas Mountains, the Kingdom of Morocco presents a picture of striking contrasts—and a paradox regarding its progress on climate change mitigation and adaptation.

Despite suffering from severe exposure to climate change stresses such as rising temperatures, decreasing rainfall, and worsening droughts, Morocco is relatively well-equipped and well-prepared to meet the challenges of climate adaptation and the imperatives of the green energy transition. The Climate Change Performance Index, widely cited by the government in Rabat, places Morocco as the eighth most climate-prepared country in the world. According to the University of Notre Dame Global Adaptation Initiative's index, Morocco is the fifty-fifth most climate vulnerable country and the eighty-seventh most ready country, meaning that "while it faces adaptation challenges, it is well positioned to address them."

To be sure, there are grounds for these plaudits. To begin with, Morocco is endowed with resources that could make it a regional and even global leader in renewable energy: it has competitive wind speeds; generous reserves of battery materials; and vast swathes of sun-washed land ideal for solar power generation. Accordingly, multinational company Ernst & Young ranked Morocco as second globally in a 2023 normalized index of Renewable Energy Country Attractiveness. The neighboring states of the European Union, eager to wean themselves off fossil fuels and their dependence on Russian gas exports, are enthusiastically consuming renewable energy produced by their North African neighbor, and Morocco has

plans to expand this relationship with the construction of a high-voltage direct current cable between itself and Europe. Further afield, China relies on Morocco's phosphate exports to produce batteries essential to its electric vehicle strategy.

At home, meanwhile, the Morocco government has set forth an admirable and ambitious agenda to harness its renewable energy potential, to compensate for its severe lack of hydrocarbon reserves.[9] Moroccan policymakers were among the earliest and most committed supporters of global efforts to combat climate change, ratifying the 1995 UN Framework Convention on Climate Change, the 2002 Kyoto Protocol, and the 2016 Paris Climate Agreement.[10] Among the signatories of the latter pact, Morocco distinguished itself by setting the second-highest carbon reduction goal in its Nationally Determined Contribution of any country in the Middle East and North Africa. Outlined in the National Climate Plan 2020–2030, Morocco's energy transition plans include, among other initiatives, a Green Hydrogen Strategy and the goal of reducing emissions by over 40 percent by 2030. During COP 28, Morocco launched its National Low Carbon Strategy 2050, which aims for carbon neutrality by 2050 through the construction of wind and solar farms; electrifying transportation, buildings, and industry; bolstering recycling efforts; developing sustainable agriculture; and promoting a series of so-called intelligent cities. Already, the results of the transition to renewables have been impressive: in just eleven years, Morocco has seen a sixteen-fold increase in solar capacity and sixfold increase in wind capacity.[11]

And yet, behind this well-known narrative of Morocco's commitment to carbon reduction benchmarks and progress on the renewable energy front, there is another, less-known climate story.[12] It's the story of how global warming is already endangering the economic security, livelihoods, and physical well-being of millions of people in Morocco, especially its most vulnerable citizens, including rural inhabitants, smallholder farmers, and oasis dwellers and nomads. On top of this, the Moroccan government's much-touted initiatives on green energy technology are overshadowed by the fact that, despite all the fanfare, the country still relies heavily on fossil fuels—a dependence that has contributed to the doubling of its energy bills after the Russian invasion of Ukraine and its persistently high levels of greenhouse gas emissions.

While ultimately rooted in the country's severe aridity and shortage of replenishable water sources, Morocco's climate change vulnerabilities have been worsened by long-standing governance deficiencies, especially unsustainable agricultural policies centered on profitable, water-intensive crops that have historically benefited regime-connected landowners with narrow interests while excluding more vulnerable populations. Climate-friendly energy projects have often failed to reach their full potential because of mismanagement and poor interagency coordination, and some of Morocco's stated plans to mitigate climate problems run the risk of augmenting rather than ameliorating these vulnerabilities. For example, to diversify its energy sources, Morocco will use water to further its green hydrogen plans, but doing so will seriously strain an already scarce resource.[13] Additionally, climate-related stresses in Morocco are exacerbated by the long shadow of French colonialism in the water management and agricultural sectors, which bequeathed to the country what one Moroccan

scholar called an "irrigation myth" of cultivating water-intense crops in an arid environment that has left its smallholder farmers and other rural inhabitants acutely exposed to global warming.[14] And the government's ability to protect communities in remote areas from climate stresses has been hobbled by the obstacles confronting local civil society actors, which prevent them from representing vulnerable citizens and effectively mobilizing on climate adaptation.

Field interviews with Moroccan farmers, activists, crop specialists, and climate scientists point to the need for a better understanding of how worsening climate stresses and the kingdom's governance shortcomings on water management and agricultural policy—especially the absence of local-level empowerment—are inextricably linked. Most pressingly, they highlight that durable, effective climate adaptation requires a greater inclusion of independent grassroots actors in political discussions and decisionmaking to bolster and expand top-down, national-level efforts on the renewable energy front.

The Climate Vulnerability–Governance Nexus

There is no question that environmental factors in Morocco carry much of the blame for the injurious impacts of climate change on the country's vulnerable populations. Ninety-three percent of Morocco's land qualifies as arid or semi-arid. Desertification is steadily creeping northward, and droughts of increasing magnitude and frequency have worsened this phenomenon. Since 1980, Morocco has experienced twelve major droughts, with the current and longest drought having entered its seventh year in 2025. Heat waves have also increased, reducing harvest yields and igniting wildfires that deplete Morocco's tree cover. Adding to this situation is the current paucity of water: the World Resource Institute ranks Morocco among the countries with "high" water stress, meaning those that are using between 40 and 80 percent of their available water. Of the water that does exist, 80 percent of it is drawn from surface reservoirs, such as dams, making this essential resource acutely vulnerable to climate-induced dynamics of decreased precipitation and increased temperatures.[15]

Yet the impacts of these natural and environmental stresses related to climate change have been magnified and worsened by short-sighted government policies and entrenched socioeconomic inequalities, particularly in the agricultural and water management sector. The roots of these deficiencies, Moroccan activists and scientists say, can be partly found in the policies pursued by French colonial administrators during the first decades of the twentieth century. French colonizers drastically transformed Morocco's agricultural landscape and habits of water usage, as well as transferred to the country's independent rulers a deeply unequal system of resource extraction. This scheme of water- and land-usage clientelism endures to the present, impeding Morocco's progress on climate adaptation.

The template employed in this colonial strategy was deliberately and systematically borrowed from California. The French saw California as comparing favorably to Morocco in terms of its latitude, semi-arid climate zones, soil fertility, precipitation ranges, and availability of

cheap farming labor. In the case of California, the labor force included, at various times, Chinese, Japanese, Indigenous, Mexican, and Filipino workers, and, in the case of the North African protectorate, Arab and Amazigh peasants. Eager to exploit what they saw as Morocco's untapped potential as an export breadbasket, the French government dispatched teams of hydraulic engineers and agricultural specialists to California's Central Valley. There, the scientists studied how pipelines, aqueducts, and dams could maximally direct rainfall, rivers, and groundwater to large-scale irrigation for profitable but water-intensive citrus crops—oranges, tangerines, lemons, and grapefruits, among others—along with many other fruits and vegetables. By the 1930s, the California model had been fully embraced by the French in Morocco, and its legacy continued to be felt long after the country's independence in 1956, in the expansion of vast swathes of orchards and fields whose high-value output of fruits eventually comprised over a third of agricultural exports.

Today, citrus fruits, watermelons, avocados, sugar beets, and tomatoes grow bountifully in Morocco. Yet these heavily water-consuming crops are having an increasingly negative impact on the agrarian economies in key rural regions and their associated labor force, given the unsustainable pace of water extraction and declining rates of rainfall due to global warming. Exemplifying this dynamic, farmers in southern Morocco were recently compelled to destroy their citrus orchards because the trees required five times more water than is provided by rainfall.[16] Elsewhere, Morocco's dairy farms, another inheritance from the French's modeling of Morocco after California, are also suffering from climate-induced shortages of precipitation, since they too demand exorbitant amounts of water: producing one liter of milk in Morocco—where smallholder farms often produce both milk and meat simultaneously—usually requires 1,500 liters of water, and at the same time, one kilogram of beef requires 16,500 liters of water.[17] Taken in sum, these stresses point to a fundamental mismatch between Morocco's natural endowments of resources and the agricultural techniques imposed by the country's former colonial rulers, which, in the face of recent global warming, are now depleting Morocco's water supply faster than it can be replenished.

Deepened social inequalities in rural areas are another legacy of the colonial period. The growth of industrial-scale agriculture under the French pushed out smallholder farmers and oasis dwellers, forcing them to relocate to cities. The displaced persons included those who practiced more traditional—and sustainable—crop raising using the *khettara* system, which relies on gravity and underground pipes to harvest subterranean water for irrigation. Meanwhile, wealthy countryside elites emerged as especially big winners. Over a two-decade period, they received hundreds of thousands of hectares of agricultural land from the French colonialists, who still exercised legal control over these territories even after Morocco's formal declaration of sovereignty.

The inequities resulting from this policy persisted and worsened long after the French departed, as the country's new rulers and their allies consolidated their power. Starting in the 1960s, landowning elites received further privileges from King Hassan II, who saw them as a bulwark against an urban-based opposition movement fueled by the middle class. Most notably, the king used the construction of dams to further solidify the loyalty of these elites,

by increasing the crop yields of the farms they oversaw. The number of dams skyrocketed from thirteen at the time of independence to over 100 by the end of Hassan II's reign in 1999. To be sure, the dams addressed a real economic need, especially in the south, where precipitation was far less frequent and predictable than in the north. But in many instances, it was the pro-regime landowners who benefitted the most.[18]

For the vulnerable communities who have suffered from this cutoff, Morocco's dams stand as hulking concrete memorials to short-sighted water and agricultural policies that have privileged profits for the few over a more equitable distribution of resources and a more sustainable strategy. As Morocco has entered its sixth consecutive year of drought, its average dam filling rate has dropped over 8 percent compared to the last year, with total levels varying between fully replenished and near-empty—a status that any Moroccan with a mobile phone can track through Mor Dam, a mobile application provided by the Ministry of Equipment and Water. Despite the dams' depletion, the government has announced the construction of thirteen more. The dams containing water do provide some needed irrigation to farmlands, though their overall contribution is miniscule—roughly 750,000 of Morocco's 7.5 million hectares of agricultural surface are fed by dams (though this has shrunk dramatically since the current drought's onset), and salinity taints the nourishing value of this water. Moreover, access to what remains is unequal, with wealthy landowners and cities benefitting disproportionately. For example, dams alongside Wadi Shbooka, a valley in central Morocco, have enabled eight wealthy farmers to avoid the effects of drought, but less-powerful locals suffer from a consequential shortage of water for livestock, a depleted fish population, and general environmental ruin.

Lengthening droughts and an ever-shrinking water supply have spurred the government to supplement this long-standing dependency on dams with other sources of irrigation. However, the very same patterns of rural inequality have been perpetuated, with similarly deleterious results for sustainability and climate vulnerability. Most notably, a strategy for drip irrigation practices powered by groundwater wells—a shift that was prompted in part by the first of several droughts in the 1980s and refined in the 2008 agricultural plan known as Plan Maroc Vert—resulted in large landowners benefitting from sizeable subsidies for obtaining well-digging equipment. These elites exploited the government's poor oversight, illegally digging private wells to maintain their income from profitable crops and to circumvent a water crisis, which poorer Moroccans could not avoid. Today, roughly 90 percent of Morocco's 372,000 wells fall into this unauthorized category, resulting in unmonitored pumping and the further diminishment of aquifers' water levels. "Forty years of groundwater depletion has brought us to the point where there simply are no more solutions," noted Mohamed Taher Sraïri, a prominent agronomy specialist and university professor at the Hassan II Agronomy and Veterinary Institute in Rabat.[19]

More recently, this "hydraulic lobby" of government-connected landowners has attempted to steer Morocco's strategy on climate adaptation. According to one prominent critic of the government's agricultural policies, this lobby is influencing policies in government agencies, in parliament, and in local institutions. "For decades this lobby didn't care about

water questions; they acted like we are in Canada," noted Najib Akesbi, a leading Moroccan economist, who also teaches at the Hassan II institute. "But now, they can see that their choices are incompatible with the availability of water. And so, since around 2018 or 2019, they have started taking an interest in the climate file."[20]

Government Actions and Public Responses to Climate-Induced Water Scarcity

Faced with the looming crisis, the government has attempted to diversify Morocco's water sources and improve water accessibility for the population, though unsustainability and inequalities also blight these efforts. The Moroccan government has made significant progress in expanding the accessibility of potable water to its population. According to government officials, access to liquid sanitation services increased from 96.5 percent to over 97 percent between 2016 and 2019. In drought-afflicted rural areas, solar generators could spur greater pumping of aquifers for drinking and irrigation water, but this is a short-term fix with long-term consequences for the already stressed water table.[21] Additionally, expanding water access to more people does not equate to an increased quantity of this finite resource. In fact, quite the opposite has occurred. In the 1960s, Morocco's water per capita was 2,560 cubic meters, but today the water per capita ratio is shockingly just 606 cubic meters. Cleaning and cooling solar panels in the Noor Ouarzazate Solar Power Station has further depleted potable water stores.

The Moroccan government has looked to desalinization to partly alleviate its water shortages. Desalinated water currently meets 3 percent of Morocco's water needs, with eleven desalination plants already operational and nine more planned. By 2030, Morocco hopes that desalination facilities will produce 50 percent of Moroccans' drinking water. But here again, while desalination offers some respite from the current and looming shortfall, it is not the panacea it is made out to be. Brine discharge and the accidental intake of marine life during the desalination process create considerable harm for local ecosystems. Morocco's fisheries make up 58 percent of agro-food exports, so disruptions to marine life could have serious impacts on Morocco's labor force. And while desalinization makes sense for producing drinking water, its cost makes it less appropriate for agricultural use; producing one cubic meter of water costs an estimated 10–15 Moroccan dirhams (approximately $1 to $1.5). Because of desalinated water's high price, only the most lucrative crops such as avocado could use it without incurring net losses.[22]

In the legal realm, the privatization of water is perceived to be exacerbating this shortage. This policy has emerged as a contentious focal point of dissent and protest, especially since the enactment of Law 83.21 in 2023. Law 83.21 handed the provision of drinking water to regionally based, multiservice companies, acting in coordination with municipalities. An array of rights activists and farming advocates criticized the insufficient transparency and lack of substantive discussion that accompanied the passage of the bill, as well as the dire social consequences that could arise from its implementation during a period of sustained

water shortages and worsening climate shocks. Several interviewees involved in advocacy for climate-imperiled communities pointed to the law's commodification of a valuable public good that had hitherto been provided by the state and to the risk that the private interests of elites would, once again, take precedence over ordinary citizens' welfare. "Before we could negotiate with the state, but now we have to deal with private companies," noted one farmers' union representative. "Before water was a public service, now it is 'merchandized.'"[23]

The government has enacted patchy regulations to modulate demand in the face of water scarcity. But an effective response was late in coming. Only in 2017 did the Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests stop encouraging the cultivation of profitable, water-demanding crops. Watermelon production had constituted the primary income for many poor farmers in the town of Zagora, though persistent drought and the resultant depletion of water reservoirs were already cutting into their income. That year, protests erupted in the Zagora region over recurring household shortages of potable water due to the exorbitant extraction by nearby watermelon farms, resulting in arrests and prison sentences for some of the demonstrators.

Despite the events in Zagora and similar demonstrations in Beni Mellal in 2017, Talsint in 2018, and Imintanout in 2019, a formal shift in policy implementation did not occur until 2022. That year, the Ministry of Interior discontinued irrigation subsidies for watermelons, avocados, and citrus fruit and, a year later, drastically limited the production of watermelon in the area. In urban areas, meanwhile, the government implemented restrictive conservation measures, such as the closure of *hammams* (traditional public baths) and the shutdown of car washes for three-day stretches. Yet some climate specialists and activists argue that the overall effect of such measures is likely negligible due to the small share personal and industrial consumption takes in total water usage. In a further illustration of how the government's water conservation directives entrench socioeconomic disparities, critics of these policies also point out that water use at spas and swimming pools at upscale hotels are exempt from the restrictions.

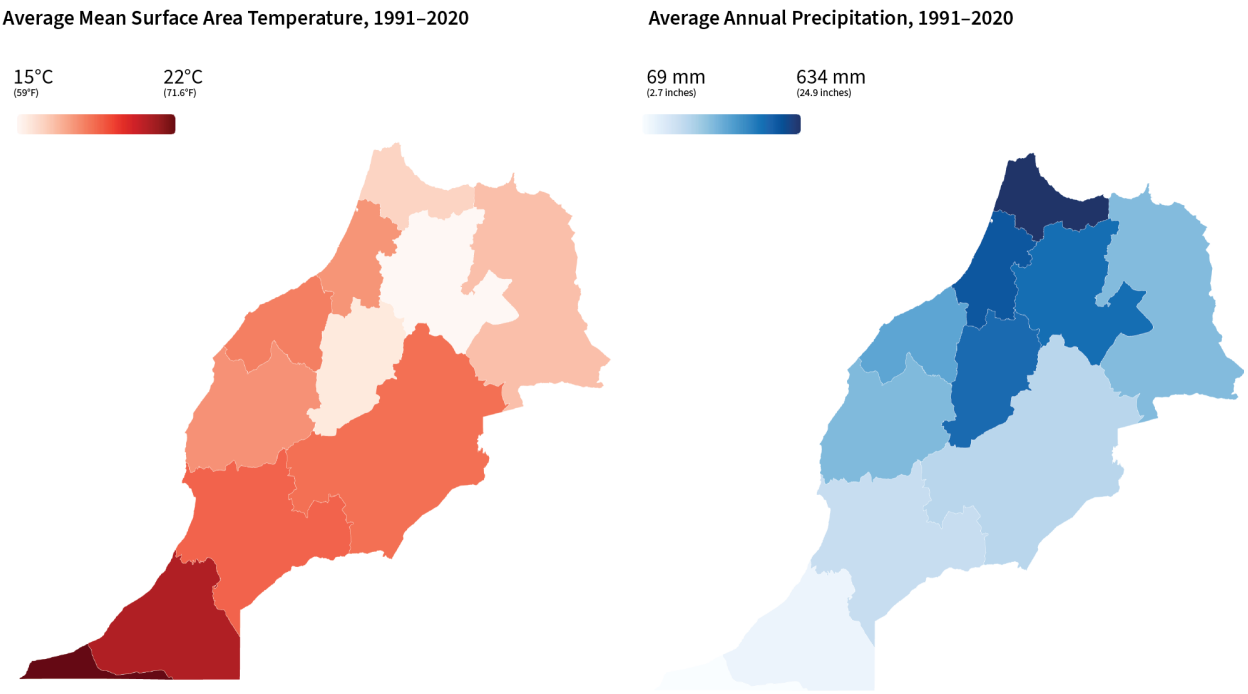
Elsewhere, misguided initiatives and wasteful implementation still stymie Morocco's climate adaptation and mitigation activities. Many green energy projects end up having inadvertent, adverse effects on sustainability. In 2014, King Mohammed VI rolled out plans to increase urban green spaces in Rabat, yet this initiative ended up sapping an already stressed water supply as armies of gardeners planted unsustainable shrubbery. Water bills more than tripled for Rabat residents, so the municipal government quickly shifted to irrigating the spaces with wastewater. Additionally, under the direction of the minister of interior, the gardeners replaced existing palm trees with an imported species, the *Washingtonia*, which failed to cool the city as much as their native counterpart.[24]

A lack of coordination further inhibits Morocco's climate progress. Weak collaboration between Morocco's Ministry of Environment and the Ministries of Interior and Finance preceded the creation of the Ministry of Energy Transition and Sustainable Development, which in writing has the widest purview for green energy projects.[25] In cities, the Ministry of Interior has the real power, but has minimal oversight or accountability. In more rural areas, the mayors of towns and villages have more authority than their counterparts in large cities, but they also have more problems to deal with and less money in their budgets. Appointed officials connected to the monarchy further complicate the effective delineation of funds, as they can rework budgets with minimal bureaucratic backlash. For example, the National Climate Change and Biodiversity Commission was created in April 2020 to promote coordination between different government entities, but there is still no definitive tool to monitor climate-related programs or spending. This disorganization is concerning, with one municipal official saying that he learned of the regime's climate initiatives not through official channels but by seeing project implementation on the street or reading notices for public works.[26] Furthermore, poor transparency makes many civil society actors unwilfully ignorant of the conditions attached to sizable international funding, such as the $1.3 billion combination of grants and loans issued by the International Monetary Fund in September 2023.[27]

Vulnerable Populations: Farmers, Nomads, and Oasis Dwellers

Climate change exacts an outsized toll on Morocco's rural population, with farmers, oasis dwellers, nomads, and Amazigh communities particularly at risk. Only about 10 percent of Morocco's GDP comes from agriculture, but around 30 percent of its population (approximately 11.4 million workers) are employed in this sector. In addition, hundreds of thousands of shopkeepers and tradespeople service the rural workforce that is engaged in farming and directly reliant upon crop yields. The Moroccan governments' lack of transparency in recordkeeping makes estimations difficult, but based on the most recent census, conducted in 1996, roughly 70 percent of the farms in Morocco are small family farms with cultivable areas of less than 5 hectares; thus, it is households that ultimately suffer the most from climate-induced droughts and water shortages, rather than large landowners and corporations. Ironically, many smallholder, family-owned farms are engaged in more sustainable crop raising, which does not require the inordinate and often nonrenewable groundwater that the corporations' and large landowners' higher-value export crops depend upon.[28] In the fertile northwest, these rain-fed crops include olives, grain, pulses, and alfalfa. To the south and east, rain vitalizes additional grain crops, grasses for grazing, and, in the southern slopes of the Atlas Mountains, dates.

Temperature and Rainfall Trends in Morocco



Source: World Bank, Climate Change Knowledge Portal, accessed February 10, 2025 https://climateknowledgeportal.worldbank.org/country/morocco/climate-data-historical

Yet climate-induced drought and water shortages—exacerbated by an ineffective government response—are taking their toll on these crops and the livelihoods of their cultivators. Interviews with Moroccans involved in agriculture underscore the severe economic, social, and mental health costs of this plight, which often involves families abandoning a way of life that had been practiced by generations of their ancestors. For many, there is the profound sense that while dry spells and bad harvests are an inevitable hazard of the farming vocation, there is something qualitatively different about the recent wave of heat and diminishing precipitation. "Many farmers are not talking about climate change per se," noted a unionist and farmer. "A 'drought is a drought' and 'a flood is a flood,'" in their view. But even the older ones say, "We have never seen anything like this."[29] Echoing this sentiment, Siham Rahmoune, a farmer and head of a women's cooperative from the city of El Jadida, pointed to the cumulative effects of climate stresses and government inaction:

> Speaking of my own experience, when the years of drought and high temperatures continued . . . despite all the fatigue and effort, I didn't get a crop. Of course, you can imagine this because all small farmers are suffering from this issue. . . . I live from my work . . . [and] I lost a lot. I was on the verge of bankruptcy. . . . I didn't get any help [from the government].[30]

Other interlocutors pointed to the far-reaching social effects of climate change on family cohesion and welfare. A labor union representative who works extensively with afflicted farmers pointed to the deleterious effects on children, with water shortages extending the time it takes to fetch water and herd livestock—tasks undertaken typically by school-age girls and boys, respectively.[31] Another farming advocate pointed to an increase in divorces in farming families due to declining incomes and the long periods of separation that arise when sustained droughts force male heads of households to relocate for work.[32]

More directly, natural environmental degradation harms the physical health of rural Moroccans. One survey described Morocco as the third least healthy environment in the world due to climate change, surpassed only by Iran and Equatorial New Guinea. As the water table decreases, so do Moroccans' access to clean drinking water. Suffering from the paucity of this vital resource and confronting declining prospects for work, many rural inhabitants have moved to urban centers, only to confront overcrowded conditions and, in some instances, poor access to water, thereby raising the risk of epidemics and increasing the prevalence of diseases such as tuberculosis.[33]

Livestock, an important supplemental source of income for many farmers, have also been affected by climate change and government inaction. Climate-induced water shortages have caused grass and alfalfa outputs to shrink, resulting in shortages of hay and other fodder that support the raising of sheep, cattle, and other animals.[34] As a result, farmers have been forced to sell their herds.[35]

The consequences of climate change on livestock have been even more severe for Morocco's already dwindling nomad population, who rely exclusively on animal husbandry for their survival. A 2014 census estimated Morocco's nomadic population at 25,000, a 60 percent decline from the previous decade, and many scholars project the current population to be as low as 12,000. The government-led process of sedentarization of these pastoralists has been further accelerated, as grazing areas for sheep, goats, and camels become ever sparser due to water shortages. Many desperate nomads have relocated to the outskirts of cities for menial work, such as selling cigarettes or carrying luggage, and are forced to reside in slums with substandard housing.[36] As in the case of settled farmers, climate change has also affected social mobility and welfare in these communities: when nomadic heads of household are no longer able to sustain their families, they often pull their children out of school to work and supplement the household's income.[37]

Social and religious practices have also been affected by dwindling livestock. According to several specialists, Morocco's sheep population has decreased to such a degree that many poorer families, in both rural and urban areas, are having to rely on imports for Eid feasts. The Moroccan government is subsidizing the sheep imports, but they remain extraordinarily expensive. "A patriarch will have to work for a month to earn enough money to purchase a sacrifice animal, which was unimaginable ten years ago," one scholar said.[38] Coming to the aid of afflicted nomads, the government is providing significant subsidies for food staples and animal feed and attempting to alleviate water shortages through the dispatch of mobile storage tanks or solar-powered wells. However, the problem of diminishing grasslands persists.

In the Western Sahara, climate-related stresses are inextricably linked with political tensions over the disputed status of this territory. Representatives of the Sahrawi ethnic group and their allies have criticized the Moroccan government for "greenwashing" its activities there, using the extraction of phosphate and expansion of wind farms to centralize and strengthen its control over the region, rather than simply advancing its sustainable energy plans. Sahrawis have also accused officials in Rabat of inflicting the brunt of the Western Sahara's power and water outages—which they consider intentional and politically motivated—on districts with higher proportions of Indigenous people compared to Arab-dominated cities. Added to this, rights organizations have charged the Moroccan regime with suppressing climate activism in the territory through a range of methods, including refusing to register Sahrawi-led NGOs and arresting and torturing these organizations' leaders. Strains between the two sides are further exacerbated by the fact that Sahrawi climate activists often couple their environmental work with the cause of self-determination, anathema to the government.

The inhabitants of Morocco's oases, roughly 2 million people found predominantly in the arid and semi-arid south, represent a uniquely vulnerable category of rural citizens. The climate risks to agriculture and tourism are magnified by the oases' distinctive and fragile ecosystems and, in some cases, remoteness from government services. Interviewees from such areas pointed to the long-standing ability of oasis farmers, whose crops historically included dates, olives, wheat, barley, maize, alfalfa, pulses, and henna, to adapt to harsh conditions through practices such as the *khettara* irrigation system. Yet, here again, this traditional

resilience is being threatened by the severity of recent climate stresses and by government policies. "The oasis population adapts to drought when it comes to traditional agriculture," noted Samira Mizbar, a socioeconomist and expert in development dynamics, particularly in oasis and semi-desert areas. When we move to modern intensive agriculture, the problems begin." [39] To its credit, the Moroccan government has worked to alleviate some of the stressors on those practicing sustainable agriculture through its Green Generation initiative, which has a special focus on youth and women in the agricultural sector. However, this program is pushing against trends driven by climate change and politics, as shown in Figuig and elsewhere.

In Figuig and other oases, farmers shifted from traditional farming to the water-intensive cultivation of dates. These practices began in the 1990s and were accelerated by the 2008 Plan Maroc Vert. These actions, combined with the climate-induced loss of rivers and the evaporation of dams, have caused date yields to fall, pushing greater numbers of Figuig's 11,000 residents, especially young people, to abandon a centuries-old lifestyle as they move to Moroccan cities or to Europe for work.[40] The resulting dislocation has been devastating for many, both financially and psychologically. As noted by one resident:

> The drought started over ten years ago. My family lost their land due to desertification about five years ago. . . . We used to grow dates. The palm trees which remained died. This land is my memory. I lived there, I ran there, I played there. I worked there. . . . All this has disappeared. . . . The youth are leaving. The number of inhabitants is diminishing, and the city could eventually disappear with our culture and traditions.[41]

The Figuig oasis has also emerged as a flashpoint for popular demonstrations against water management policies in Morocco. Starting in late 2023, thousands of residents marched through the town's streets to protest the municipality's plan to transition the provision of drinking water from public services to the regional, multiservice agency—a development legitimized by the unpopular Law 83.21. Despite government denials, many Figuig residents saw this transfer of services as a form of privatization that threatened access and affordability at a time of severe drought. Families in the town have been boycotting payment of their water bills since, and leaders of the movement have been drawing expressions of support from civil society groups in Rabat and from demonstrators in Oujda, another water-stressed city in eastern Morocco. Outrage flared further in the town when a leader of the protests was arrested and imprisoned for "contempt of a public official, incitement to misdemeanors and crimes without effect, and contributing to an unauthorised assembly."

In many respects, the mobilization in Figuig can be seen as an extension of earlier socially motivated protests inspired by the February 20 Movement—the nationwide protest movement born in the wake of the Arab Spring in 2011. According to activists, some of the very same slogans from that movement have been repurposed for water-based demands—underscoring how climate-related stresses can amplify long-standing grievances against misgovernance and poor service provision.[42]

Interviewees involved in these demonstrations acknowledge that the town is a "special case."[43] Together with water shortages and inadequate service delivery, Figuig has suffered from its geographic location on the Moroccan border with Algeria; for instance, in 1994, the Algerian government closed the border, hurting the livelihoods of farmers from Figuig who for decades had crossed over that frontier to harvest dates. And yet several scientists and activists interviewed for this study also see the town's mobilization as a potential precursor to future climate-based social movements, including in Morocco's bigger towns and cities. For now, however, protests in the Figuig oasis have "symbolic value," the agronomist Mohamed Taher Sraïri asserted, while also warning that "there could be other protests."[44] Echoing this sentiment, a longtime human rights activist who works on climate issues argued, "For the moment, [there are protests] only in Figuig but we could have a problem on a national scale."[45]

Finally, Morocco's Amazigh citizens constitute yet another at-risk population. Comprising an estimated 40 percent of the total population, the Amazigh's vulnerability as farmers, oasis inhabitants, and nomads is compounded by ethnolinguistic and regional marginalization. Government services to the Amazigh's historic homeland in the Atlas and Rif Mountains, as with other remote regions, are often uneven. The 2016 anti-government protests that erupted in the city of Al-Hoceïma were motivated in part by substandard services to the Rif region, which has a long history of Amazigh-led resistance and, consequently, more intense government repression than the Atlas Mountains. However, in the Atlas, limited physical access to Amazigh populations complicated Moroccan officials' efforts to help destroyed villages after the September 2023 earthquakes. That said, the Moroccan government has launched an ambitious reconstruction project for the High Atlas region that, while targeting earthquake-affected infrastructure, may simultaneously remedy some of the more persistent shortcomings.

On a cultural level, climate change threatens Amazigh traditions and livelihoods, with drought and heatwaves—and the government's massive irrigation schemes—threatening the Amazigh's sacred and sustainable irrigation system. Relatedly, deforestation has caused the decline of Argan trees and their oil, which is made into a profitable beauty product by Amazigh women. Furthermore, because many Amazigh are engaged in pastoralism, the Amazigh also suffer nomad-specific vulnerabilities, namely reduced groundwater and grass for livestock.

The Amazigh also suffer from government transfers of their land to public entities without prior notice. To construct the Noor Ouarzazate Solar Complex, Morocco's flagship green energy project, the government sold communal Amazigh land to the National Office of Electricity and Drinking Water, which directly transferred it to the publicly funded but privately owned Moroccan Agency for Sustainable Energy at a price far below market value ($0.10 USD per square meter versus $1–1.20 per square meter). Furthermore, the government promised compensation to afflicted persons via development projects jointly agreed upon by the government and locals, but these projects have not yet begun. Green hydrogen plants, wind farms, and solar farms demand sizeable tracts of land, making land transfers more likely and the consultation of locals all the more necessary as Morocco continues pursuing its National Energy Strategy.

The Amazigh's vulnerabilities vary by region. In Amazigh communities in the mountains near Marrakech, recent focus groups highlighted the far-reaching, disruptive effects of climate-induced water insecurity, including reduced access to schooling for young girls, sickness, poverty, and unemployment. In the northern Amazigh-majority Rif Mountains, climate-induced stresses are exacerbating lingering grievances related to economic and political marginalization and continued repression stemming from the protests known as the Hirak Rif or Rif Movement from 2016 to 2017. In particular, climate-induced deforestation in the Rif has contributed to soil erosion, increasing the propensity of destructive landslides.

Toward a More Inclusive Climate Adaptation

Morocco has rightly been lauded for its comparative progress in combating climate change and transitioning to renewable energy—the result of a combination of natural resource endowments, geographic location, and foresightful leadership. And yet the full potential of its climate ambitions remains circumscribed by endemic problems of governance, especially in the water management and agricultural sector. Addressing these problems is both a matter of will and capacity, requiring the careful application of technology, regulatory and bureaucratic reforms, and public awareness campaigns. In particular, water and agricultural specialists have underscored the need for a reconsideration and revision of how Morocco manages water. A more sustainable and equitable strategy, they argue, would loosen the grip of the so-called hydraulic lobby on water policies and focus on regulating water demand instead of increasing supply, especially by shifting to crops better suited to the country's available resources as well as by regulating use by consumers, farmers, and industries alike.46 But, by themselves, these top-down changes are incomplete. What's needed instead, according to the scientists, activists, and farmers interviewed for this paper, is a more inclusive, bottom-up strategy that directly empowers rural communities to tackle climate adaptation. This new framework would treat vulnerable peoples as partners and agents in that process, rather than victims and subjects; their local knowledge and traditional practices would serve as an adjunct to government policies.

On this front, the role of an independent civil society is paramount. In theory, the Moroccan constitution of 2011, namely Article 12, enshrines the ability of civil society groups in the country to operate freely. And to its credit, the government has encouraged many civil society organizations focused on conservation, awareness, and education, including the High Atlas Foundation, which has collaborated with regional and international partners in reforestation efforts, and Dar Si Hmad, which has introduced fog-catching devices into the Atlas Mountain communities to increase the water supply. Various farming unions are also able to serve as interlocutors between those in the agricultural sector and the government.

However, while Morocco allows for a variety of civil society organizations with climate focuses, the government regularly stifles truly independent voices, especially those with tones of advocacy. Civil society actors that have opposed or directly criticized government policies—especially those emanating from the Ministry of Agriculture, Maritime Fisheries,

Rural Development, Water and Forests—have found themselves "ostracized" through de-licensing and other bureaucratic barriers. "If you go their way, you don't have problems," noted one activist, "But for more independent groups, the government can make your life more difficult and complicated."47

Several rights-based climate change groups are perplexed by the government's confrontational tendencies. Their approach to the government is driven by a spirit of collaboration and cooperation, with a view toward alerting authorities to impending problems on the ground and toward proposing realistic solutions. "We try to anticipate," said one longtime human rights activist. "We must find answers to the immediate problems, but we are also interested in what could happen [over the long term], and we must alert the public authorities."48 Simultaneously, these activists are adamant that the protection of citizens' welfare and vulnerable people's unconstrained ability to press for better services in the face of climate stresses are inviolable rights, even if they threaten the long-entrenched interests of elites. For many, the threats posed by climate change are so formidable and encompassing—affecting nearly every aspect of citizens' livelihoods, health, and education—that they demand a similarly holistic response, one in which citizens and government work together as partners.

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06

Egypt's Challenges and Opportunities in Climate-Related Finance and Governance

Selma Khalil and Amr Hamzawy

Setting the Scene

Similar to other countries in the Middle East and North Africa (MENA) region, Egypt has been struggling to adapt to climate change impacts and mitigate its risks. The country's governance framework and economic and financial capabilities have also affected its ability to respond to green economy opportunities in the MENA region.

Since the 1970s, Egypt's governance framework has created a space for civil society organizations and the private sector to coexist alongside state institutions and publicly owned corporations. Yet, despite gradual expansion in the last several decades, civil society and private sector activities remain limited and vulnerable to systematic interference by the state and public sector. This has resulted in the exclusion of various political and economic interests and only marginal openings for representation, transparency, and accountability.

Additional limitations have emerged due to inconsistencies in the implementation of national economic and fiscal policies. Egypt has endeavored to level the playing field legally and politically between the public and private sectors and to gradually privatize state-owned corporations. However, the public and private sectors within the Egyptian economy have struggled to fully leverage opportunities for funding climate adaptation and mitigation efforts and for launching green projects, leaving the country's capacity for climate financing weak.

Egyptian economic capacities to respond to climate risks and embrace the MENA region's green transition have further suffered from the country's persistent and rising fiscal deficit. The government has relied on the domestic banking sector to finance this deficit, leading

to decreased available domestic credit for public and private green projects. At the same time, a combination of domestic, regional, and international factors have caused foreign direct investment (FDI) in Egypt to decline, while the remittances of Egyptians working abroad—the majority based in the Arab Gulf countries—have fluctuated dramatically amid turbulence in the MENA region since 2011. During the height of the Gaza war, the Egyptian treasury saw its revenues from the Suez Canal shrink massively—almost 70 percent of the canal's revenues have been lost.

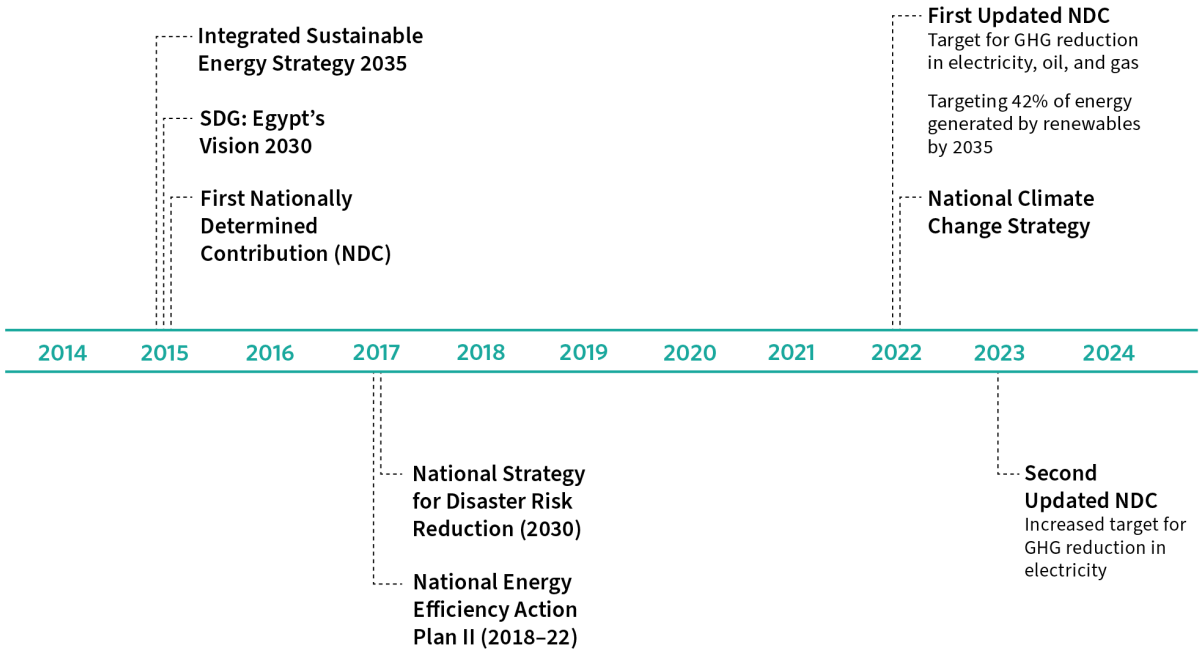
Egypt's increasingly tight investment and fiscal space is being further strained by the country's ambitious modernization project and consequently a sharp rise in government borrowing internationally. Egypt's foreign debt has skyrocketed to close to $160 billion. While some of this borrowing has been directed toward infrastructure and development projects, Egypt has faced significant challenges in securing sufficient investments for green energy and climate adaptation initiatives. The country's growing reliance on international loans has put additional pressure on its relations with key green energy investors and global stakeholders.

Thus, Egypt's vulnerability to climate change is being compounded by its economic struggles, creating a set of threat multipliers that make it difficult to adequately fund climate resilience and sustainability efforts. Egypt's freshwater resources from the Nile River have become dramatically scarce, whereas its coastal areas along the Mediterranean Sea and Red Sea have started to face severe risks of flooding. Rising temperatures, along with low rainfall and a combination of droughts and floods, have put humans, animals, and plants in stress and led to massive changes in the agricultural sector. In sum, climate change has induced greater vulnerability in the population and reduced economic and social productivity.

Egypt's National Plans and Priorities

In recent years, Egypt has expanded its climate strategy to be responsive to the country's unique challenges resulting from increased vulnerabilities and opportunities in the green economy. The government has harmonized its country-level Sustainable Development Goals (SDGs) and Nationally Determined Contributions (NDCs) with a clear target to expand public and private investment in the renewable energy sector and increase its share in Egypt's energy wallet. However, clear metrics to reach other climate targets—such as an overarching reduction of greenhouse gases (GHGs) by 2035, a green transition in industries, construction, tourism, and waste (a significant methane producer), and improvements in water preservation standards—have been lagging. Furthermore, the agricultural, land, and waste sectors have not been included in mitigation efforts. Finally, many of Egypt's NDC targets are conditional upon receiving international support, and the fluctuation of this support has been an ongoing challenge in the global climate space.

Figure 1. Timeline of Egypt's National Startegies and Key Priorities



Source: Author's analysis.

Beyond policy planning and other governance defects, two structural features have impeded Egypt's capacity to foster its green transition. First, the economy is reliant on hydrocarbons—as natural gas and petroleum products represent a primary export—and much of the country's electrical, transportation, industrial, and agricultural needs rely on fossil fuels. Second, climate-induced vulnerabilities, especially water scarcity, have challenged both the agricultural and industrial sectors, putting the country's economy at risk and thus depriving it of the capabilities needed to launch and deploy green projects.

Some of the announced targets of Egypt's second updated NDCs are tailored to improve the country's climate resilience across these environmentally and economically vulnerable sectors. For example, in the agricultural and food security sectors, the government is targeting a transition to modern surface irrigation of 4 million feddans to increase the efficiency of agricultural water use by 20 percent. The NDCs also aim to introduce more climate-tolerant crops and improve soil maintenance to avoid land degradation. Another declared target is preserving and expanding the biodiversity of strategic crops and livestock varieties through government-sponsored breeding programs. The goal is to maximize production efficiency under extreme climatic conditions, which are likely given rising temperatures, increased droughts and flooding, and the reduction in rainfall. Given the

possibilities of land degradation in areas affected by rising sea levels and flooding, the government has committed to reviewing existing and new land-use policies as well as its agricultural expansion program that includes the significant cultivation of desert land. In terms of addressing societal vulnerabilities, the government has adopted support schemes to enable small farmers to adapt to climate change through multistakeholder engagement, capacity building in land management, and the promotion of traditional knowledge and nature-based solutions.

NDC climate adaptation and mitigation targets also address water security concerns and flood risks. While Egypt's government and civil society continue to seek policy solutions for the Great Ethiopian Renaissance Dam dispute and its impacts on Egypt's Nile resources, moving beyond the country's unilateral dependency on the Nile's water has become a key policy concern. The government aims to rehabilitate 20,000 kilometers of irrigation canals to bolster agricultural climate resilience and avoid water waste. The government also plans to increase the amount of renewable water from desalination facilities to 4 million cubic meters daily and to expand the reuse of agricultural drainage water and treated wastewater through the construction of water treatment mega projects.

Regarding GHGs, Egypt plans to reduce emissions from the transportation sector by 7 percent by 2030, as transportation was the second-highest sector emitter in 2019–2020. This target is to be achieved by a nationwide development of low-emission mass transportation alternatives; for example, efforts include a transition to using public buses run on natural gas, the adoption of bus rapid transit systems, and the implementation of a plan to green the aviation sector. The government is also implementing a National Road Project, which is based on introducing large infrastructural modernizations to the country's transit system; the goal is to improve interconnections between urban centers and hence decrease commuting times and fuel consumption levels.

In the energy sector, Egypt's NDCs foresee promoting efficiency and resilience by reducing GHGs by 37 percent and increasing the contribution of renewable energy in the country's electricity mix by 42 percent by 2030. Currently, Egypt produces 79 percent of its electricity using natural gas, 8.2 percent with oil, and the remaining with a mix of wind and hydropower. There are plans to transition to smart grid technologies and upgrade energy transmission and distribution systems to better balance the diversifying energy sources and manage the load on the grid. Over the last several years and despite several infrastructure updates, grid disruptions created due to poor electricity infrastructure have plagued Egyptians during long heat waves. In the oil and gas sector, the national target is to reduce GHGs by 65 percent by 2030 through adopting a diverse set of strategies and tools—such as the recovery and utilization of associated gasses, the direction of clean fuel to households via the nationwide infrastructure scheme Haya Karima (or "Dignified Life"), an increase in the efficiency of natural gas and petroleum corporations, and investment in biofuels and bioethanol.

Finally, Egypt's NDCs aim to modernize both the industrial and construction sectors by seeking to increase energy efficiency, use renewable energy sources, and reduce GHGs. A case in point is waste management. In addition to implementing urban planning practices, the government has committed to a circular urban economy through better waste management measures. Most notably, public and private sector corporations are working to improve the efficiency of waste collection from the current rate of 55 percent to 95 percent and to increase recycling and energy recovery rates. The government has announced a plan to nationally increase the waste-to-energy contribution, targeting up to 20 percent of collected waste to provide an alternative fuel source for the gigantic cement sector and up to 20 percent of biofuels to generate electric power. Also planned is the expansion of municipal and industrial wastewater treatment infrastructure by rehabilitating and modernizing existing facilities and constructing more powerful plants to produce up to 7,250 thousand cubic meters daily by 2030.

The Planning and Financial Realities of Egypt's Green Projects

Like many other lower-middle-income countries, Egypt faces challenges that hinder advancements in national climate strategies, particularly limited access to financing. Several criteria determine a nation's ability to mobilize enough capital for climate purposes. Importantly, countries must have strong upstream markets with favorable macroeconomic conditions, as well as sufficient institutional capacity and robust sectoral policies and regulatory environments. Indeed, there is a notable correlation between policy strength and green financing. This poses a significant problem in the Egyptian context. While the country scores relatively well in its ease-of-doing-business scores, particularly in terms of starting a business, dealing with construction permits, and electricity access, its governance indicators remain lacking. Egypt has significant room to grow regarding its accountability mechanisms and regulatory quality, which can have compounded impacts on its green economy.

The government also needs to attain sufficient local technical expertise: beyond improving project implementation and alleviating bottlenecks due to lack of experience in project development, implementation, and scaling, adequate expertise ensures that developments in sustainable infrastructure are well absorbed by the local economy. To that end, technical assistance, capacity building, and early-stage financing to support growth are vital. Finally, a structured financial landscape must exist to mitigate risk and guarantee transparent, sizeable, and sufficiently liquid asset classes. Such a landscape requires establishing a platform to mobilize capital in the form of debt and equity guarantees, syndication, or blended financing and then catalyzing and iterating endeavors through refinancing opportunities and market growth.

Egypt has sought to implement many of these best practices and expand its green financing tools to more efficiently attract capital toward both mitigation and adaptation projects and to grow its sustainable economy. By outlining clear priorities through national road maps such as the National Climate Change Strategy (NCCS), Egypt has proliferated

climate financing initiatives across different levels of government. The National Investment Plan, drafted in collaboration with the global Green Climate Fund, builds on the NCCS and targets national-level ambitions, shifting the country away from a project-by-project model toward a systemic model for climate financing. More localized solutions, such as the National Initiative for Smart Green Projects, have also been created to build local capacity through workshops and trainings and to invest in governorate-level green projects.

At the national level, the country has set clear targets for investments, aiming for a growth in the share of public capital dedicated to green investments from 15 percent in FY2020–2021 to 50 percent in FY2024–2025. The Ministry of Planning and Economic Development has also set an ambitious target of 75 percent of its public investment to be directed toward green investments by 2030.

Egypt has thus built a regulatory infrastructure to mobilize capital for its climate goals, including through facilitating the participation of the local private sector in sustainable projects and tapping into international capital markets. It is also utilizing several fiscal tools—such as subsidy shifts, feed-in tariffs (a regulatory scheme by which utilities are mandated to purchase renewable energy at a fixed and above-market price over a fixed period of time, creating long-term visibility and accelerating investments), and tax credits—to promote clean energy projects, stimulate the green banking sector, and incentivize transparency and accountability. Finally, the country is deploying a variety of financial instruments to finance green projects: for example, debt swaps, green or sustainable bonds, concessional loans, and blended finance structures.

Debt Swaps

A debt swap is the cancellation of a portion of a country's foreign debt in exchange for local investment in a particular project or enterprise. Often, the debt canceled is converted into local currency and committed to approved projects that further developmental or environmental goals. Egypt has long used it as a tool to refinance its national debt and finance its investment priorities; its debt-for-development program with Italy dates to 2001 and has totaled $350 million in debt converted into local investments for food security, agriculture, civil society, and wastewater treatment. Over the past twenty years, these swaps with different countries have enabled Egypt to fund over 120 projects across development fields. One such project, dating back to 2014, is the reallocation of 70.5 million Egyptian pounds (close to $5 million based on 2014 exchange rates) worth of debt into a solid waste management plant in the Minya Governorate, improving the locality's sanitation and rates of methane emission.

The Minya Governorate is home to 4.9 million people living across nine main cities, fifty-seven villages, and 346 subvillages, producing 350,000 tons of household waste per year. The investment is directed at improving waste collection efficiency, which has reached only 60 percent due to a lack of experienced or trained staff and tight management systems. The 70.5

million Egyptian pounds were directed at the third phase of the waste management project's development, which includes the establishment of a modern recycling plant with a capacity to process 182,500 tons of municipal waste per year from Minya city. The financing will also cover a revision of the waste management plan, as well as implementation of a framework to monitor the community's National Solid Waste Management Program. The effort will include improving disposal and processing practices by revising and monitoring the execution of the municipal master plan, implementing public education programs to raise local awareness of waste practices, and involving the private sector in the locality's sanitation infrastructure. Given Egypt's high debt-to-GDP ratio—which reached 85.6 percent at the end of 2023—swaps can have substantial domestic impacts as they offer an opportunity to redirect scarce capital to support important environmental endeavors such as sustainable waste management and improved water access.

Notably, Egypt has similar debt-swap agreements with other countries—for example, one made with Germany in 2011 to redeem 240 million euros (close to $260 million) through the financing of development projects and one made with China in 2023 to redeem $220 million through the financing of climate adaptation projects.

Fiscal Incentives

Egypt has developed fiscal policies aimed at stimulating the green economy's development and removing barriers to entry in sustainable projects for both local and foreign actors. A blend of subsidies and tax incentives, for example, seeks to catalyze a domestic market for electric vehicles (EVs). Through Investment Law No. 72, the Ministry of Finance has written off the taxable net profit at 30 percent of the initial investment cost for renewable energy, electrification, and local car assembly and manufacturing projects. Law No. 72 similarly writes off up to 50 percent of the projects targeting geographic areas in most need of development and currently lacking in investments.

This type of fiscal stimulation has so far been successful in creating the building blocks for an Egyptian EV supply chain for both public and private transport. For example, the El-Nasr Automotive Manufacturing Company has been collaborating with Chinese car manufacturing companies to build Egyptian-made electric cars and has set an initial target of 25,000 cars manufactured a year, each with a constitution of local components at 58 percent. The agreement with China's Dongfeng Motor Industry Import and Export Company includes the rehabilitation of an old El-Nasr factory to accommodate its transition into electric vehicle production. Egypt also has a similar agreement with Germany's FEV Group to develop a local EV value chain.

There has also been a proliferation of demand-side partnerships and incentives within Egypt's EV market. For example, several large companies have issued agreements and contracts with El-Nasr to replace their transportation fleet with electric vehicles, including Danone Egypt, Mylerz Egypt, and the Hassan Allam Holding Company. The private

sector has also implemented measures to support the growth of consumer demand: Abdul Latif Jameel Finance Egypt, a local branch of an international financing firm, issued a loan program with flexible repayment schemes to support the purchase of EVs.

In addition to creating subsidies and tax incentives to grow the market for green technologies, Egypt has sought to encourage divestments from carbon-intensive energy sources by progressively removing subsidies and other fiscal benefits directed at fossil fuel consumption, thus supporting national emissions reduction goals by curbing demand. Indeed, Egypt's NDCs seek to decrease energy subsidies between 2014 and 2018 to curb consumption rates. In FY2012–2013, energy subsidies constituted 22 percent of the total government expenditure and 6 percent of the country's GDP. By FY2017–2018 and 2019–2020, Egypt had drastically cut these subsidies, dropping them to 3.4 percent of total expenditure and 0.3 percent of the GDP. This has freed up public capital, allowing Egypt to allocate capital to other national priorities; between FY2012–2013 and FY2019–2020, the percentage of total government expenditure aimed at food subsidies and investments grew from approximately 5 and 7.5 percent, respectively, to almost 6 and 14 percent. This subsidy shift, which was supported by the World Bank/International Monetary Fund's homegrown reform program, is credited with a 14 percent reduction in the number of cars on Cairo's roads between 2016 and 2019, substantially decreasing air pollution levels. This trend away from individual, private vehicles will likely continue to grow as a supply of low-carbon transportation alternatives increases as well.

A third type of fiscal tool leveraged by Egypt is the feed-in tariff aimed at the renewable energy sector. The 2014 Renewable Energy Law and similar legislation such as Decree No. 1947/2014 establish several investment incentives, including a feed-in tariff granted for both solar and wind projects that extend from twenty to twenty-five years, respectively. This likely supported the proliferation of renewable energy sources across the country. In FY2019–2020, for example, a total of 3,016 megawatts powered by wind and solar plants were installed, a 340 percent increase from the 887 megawatts in FY2015–2016. The 5,848 megawatts currently powered by renewable energy sources are generated through a collection of large plants spread across the country, including the Benban (1,465 megawatts) and Kom Ombo (26 megawatts) solar plants, the Gabal El-Zeid wind plant (580 megawatts), and the Assuit hydropower plant (32 megawatts). The Benban Solar Park is a significant contributor to Egypt's electricity production and consists of a complex of more than forty-one plants spread over 30 miles (37 kilometers), the largest project in Africa and one of the largest in the world. By producing enough power for approximately 420,000 households through the national grid, the Farm avoids an equivalent of 423,000 tons of carbon dioxide annually.

The Benban Solar Park exemplifies the use of fiscal tools to mitigate some of the risks involved in utilities and infrastructure financing. Setting a feed-in tariff creates valuable visibility in terms of future costs and potential revenue, which in turn facilitates market creation and attracts private sector participation. While subsidies, such as fuel provisions, can create possible market distortions and are costly to governments, potentially exacerbating debt distress for countries such as Egypt, these tariffs seem to have a positive

impact on the country's economic development. Importantly, the distortive effect of clean energy subsidies remains, and feed-in-tariffs include a clear end date after which market prices would apply. Additionally, the pricing stability and added competitiveness of renewables has spurred significant investments in the country's green energy projects.

Other notable elements have promoted the Benban project's success as well. Multilateral and development finance organizations have made significant contributions, even facilitating loan agreements. The International Finance Corporation, for example, led a $653 million transaction through a consortium of eighteen developers to support the park's sponsorship and grow the market for renewables. Additionally, Benban and other large construction projects have benefited from a streamlined regulatory environment created through collaboration between the Egyptian government and the World Bank.

Loans

Egypt leverages various debt instruments to finance its green projects. In terms of issuance, for example, the Central Bank of Egypt released in 2021 guiding principles for the country's sustainable finance infrastructure, establishing a general framework for the launch and implementation of sustainable finance initiatives and mechanisms with a focus on environmental and climate goals. Among the mechanisms are the country's Sovereign Green Bonds, issued to provide sustainable funds for eco-friendly projects, particularly energy efficiency, renewable energy projects, or other projects meeting sustainable development goals.

Egypt's Ministry of Finance can thus issue green bonds to target an SDG goal, whereby an amount equal to the net proceeds of any sustainable debt instrument will be allocated to finance expenditures qualifying under the government's eligibility criteria, as determined by the Sustainable Finance Working Group. Sovereign green bonds are listed in the London Stock Exchange, valued at $750 million with a portfolio that ranges across Egypt's sustainability targets, including water management and wastewater treatment, pollution reduction, and renewable energy. Egypt has also listed the bonds on the Chinese market at $500 million with a 3.5 percent annual rate and a three-year maturity, as well as on the Japanese market, valued at 75 billion yen (close to $510 million) with a 1.5 percent annual interest rate and a five-year maturity. Notably, multilateral and development banks remain involved in these financial instruments: the Asian Infrastructure Investment Bank and African Development Bank, for example, back the bonds listed on the Chinese market with credit guarantees.

Importantly, green and sustainable bonds have enabled the establishment of several developmental projects, particularly related to water. In 2021, a significant percentage of projects eligible for green bonds—53.8 percent—were directed at water management, a priority in Egypt's national strategy. The El Dabaa Desalination Plant highlights the impact of sustainable bonds on local adaptation endeavors; that year, about $67.6 million were allocated to the project through this financing instrument, fully funding its costs. Located

in the Matrouh Governorate of northern Egypt, El Dabaa increases water resources for both domestic and agricultural use by growing the desalination plant's capacity by 40,000 cubic meters per day so that it can serve 57,260 per capita per day. Similarly, 68.5 percent of El Dabaa Treatment Plant—which will satisfy the needs of 18,155 people—was financed through sustainable bonds.

Concessional loans, commonly issued by development banks at below-market interest rates, are another debt instrument successfully used to promote green projects in Egypt. At least two large-scale transit projects are funded through loans from the World Bank: the Monorail and the Bus Rapid Transit Project. In 2022, the World Bank issued a $400 million loan to improve the railway connection between Alexandria and Greater Cairo by extending and upgrading the tracks to create a new bypass around the Greater Cairo Area, diminishing congestion around the capital. As part of its Greater Cairo Air Pollution Management and Climate Change Project, the World Bank is also financing the deployment of electric buses as part of Cairo's public transportation fleet, further contributing to the electrification and modernization of the city's mass transit system.

The financing of Cairo's public transit system is part of a greater agreement with the World Bank, which approved a Country Partnership Framework (FY2023–2027) aimed at tackling goals such as enhancing resilience to shocks through better macroeconomic management and climate change adaptation. This agreement includes a budget of $1 billion through the World Bank and $2 billion through the International Finance Corporation. Egypt also has notable agreements with other development institutions globally: the European Bank for Reconstruction and Development granted Banque Misr, a commercial bank, a loan of $100 million in 2022 to stimulate green financing and lending to local small and medium-sized enterprises.

Blended Finance Schemes

Haya Karima, which began in 2019 and is set to be completed in the next few years, stands out as a project that successfully leverages blended finance—the use of development finance to additional, including private, financing—to create a wide-scale social and developmental impact. It is a countrywide initiative that covers 60 percent of the total population and seeks to bolster governorate-level services to bridge rural-urban gaps, with a total estimated cost of $45 billion across the implementation period.

In line with Egypt's Vision 2030, Haya Karima involves several different stakeholders from multilateral agencies such as the United Nations and World Bank to civil society organizations and the local private sector. Indeed, several Egyptian state-owned and private companies are involved in the financing or construction and operational management of the infrastructural project implemented through Haya Karima. Targeted villages are selected based on specific criteria, such as low education rates or healthcare access, using information from the Central Agency for Public Mobilization and Statistics. The projects under this

greater umbrella span both direct and indirect interventions, including in the areas of housing, water and sanitation, training and employment, and food accessibility. Notably, water access and management accounts for the bulk of the spending: for example, 36 percent of Haya Karima's phase I budget was spent on sewage and sanitation systems.

Regarding its financing structure, Haya Karima pools from a mix of local and international donations, *al-sukuk* (financial certificates similar to bonds), public investments, and green bonds and is driven by several public-private partnerships. Companies such as Orascom Construction, Borouge, Hassan Allam Holding, and Egypt-Kuwait Holding are contracted to implement the infrastructure projects. Mid-term reports issued by the Ministry of Planning and Economic Development highlight the impacts of Haya Karima and estimate that it has improved the rate of health services coverage by 24 percent, educational coverage by 12 percent, and sanitation by 46 percent. The ministry also reported that 71,000 jobs were generated across eight governorates, 11,600 houses were improved, 100 miles (160 kilometers) of roads were paved, and twenty-one youth centers and playgrounds were established. The scale of Haya Karima and its commensurate impact was likely made possible by the significant quantities of capital leveraged, a result of blended financing and the project's ability to pool across different financing instruments and stakeholders.

Modernized Legal Frameworks

Streamlined and clear national strategies can have a significant impact on the efficacy of mobilizing capital for green projects, a situation best illustrated by Egypt's green hydrogen ambitions. Heralded by the International Monetary Fund as an exemplary model to attract FDI, Egypt adopted a single law for green hydrogen production, streamlining legal processes and facilitating both foreign and local private-public partnerships by creating a centralized and simplified regulatory environment for the new energy source.

Although the country's green hydrogen strategy was only recently made public in mid-2023, the government has signed several memoranda of understanding, attracting up to $40 billion in investments toward the establishment of a green hydrogen value chain. Several green hydrogen plants are currently underway: the Suez Canal Economic Zone (SCZone) will host a green-hydrogen-to-ammonia facility that will harness 778 megawatts of renewable energy to produce 50,000 tons of green hydrogen and 250,000 tons of green ammonia annually. This project, slated to be complete by 2029, is the result of collaboration between South Korea's SK Ecoplant and China State Construction Engineering Corporation. The Emirati AMEA Power company also has plans to develop a green hydrogen plant in the SCZone primarily aimed at exporting to European markets. The Egyptian town of Ain Sokhna will see the construction of a plant using 270 megawatts of solar and wind energy. The project consists of a partnership between private groups, such as Scatec and Orascom Construction; public entities, including Egypt's Sovereign Fund and Electricity Transmission Company; as well as development entities, such as the PtX and KfW development funds, the European

Investment Bank, and the European Bank for Reconstruction and Development. A 7-billion-euro (close to $7.6 billion) agreement with France's EDF Renewables and Zero Waste Technologies has also spurred the development of a green hydrogen and ammonia facility in the Egyptian town of Ras Shuqair. The energy company BP will be leading this project's development and operation in collaboration with a mix of local and foreign organizations, including Hassan Allam Holding, Masdar, and Infinity Power.

Egypt's streamlined regulatory environment has clearly led to a rapid proliferation of green hydrogen projects that leverage domestic and foreign groups and involve a range of private, developmental, and public organizations. Egypt has created regulations to clearly define institutional and national processes beyond green hydrogen, including concerning waste management (Law 202/2022); environmental, social, and governance disclosures (Financial Regulatory Authority Decrees 107 and 108/2021); and the streamlining of approvals regarding the establishment, operation, and management of renewable energy projects (Investment Law No. 72/2017, Article 11).

The Case for Inclusive Governance and Localization of Egypt's Green Energy Transition

Egypt's different green funding tools and policy schemes have facilitated the deployment of mitigation projects tailored to curbing demand for fossil fuel and water resources as well as to creating viable sustainable alternatives for citizens, industries, and agricultural businesses.

Most notably, improvements have been made in the transportation sector through the construction of low-carbon, mass-transit options in urban areas and across the Egyptian geography. This increase in the supply of transportation alternatives is important, as fuel subsidies are being scaled back across the country. As discussed throughout, the government has paired these rollbacks with investments in low-carbon transportation alternatives and the deployment of social protection programs such as Haya Karima and Takaful. These concerted efforts indicate some recognition of the importance of supporting lower-income communities because prices might increase due to these subsidy shifts. However, this fiscal consolidation is still having a significant impact on average Egyptians, many of whom are faced with the difficult reality of soaring prices.

The systematic reduction of energy subsidies, on the one hand, and the efficiency initiatives in the electricity consumption domain, on the other hand, have created important economic incentives that encourage a shift away from fossil fuels. But Egypt's transportation sector remains fossil-fuel intensive despite the government's big push toward a renewable energy transition, and load shedding—designed power outages to prevent overloading the grid—in the electricity sector continues to be high despite modernization efforts. This is testimony to the challenges the country has been facing as well as to the limitations of its policy tools.

Additionally, while Egypt has directed a notable proportion of funds for green projects toward water management and established several desalination and wastewater treatment plants to improve access, certain planning constraints have emerged in recent years concerning optimizing the use of water resources and its fair distribution among different communities and regions. For example, Egypt has improved its capabilities to use recycled water in the agricultural sector, but access to drinkable water in impoverished and rural areas has not increased. Similarly, the distribution of renewable energy projects across different communities is not uniform. While large-scale projects such as the Benban Solar Park have been developed, there is limited information on the extent to which these projects benefit rural or underserved communities.

Relatedly, the country's allocations of funds between mitigation and adaptation projects suggest a preference for the former: for example, the NCCS outlines that Egypt aims to cover 27 percent of the estimated budget for mitigation projects compared to 16 percent for adaptation projects. Although a greater focus on institutionalized mitigation plans is not unique to Egypt, by prioritizing mitigation over adaptation, Egypt's climate policies overlook the immediate and long-term needs of vulnerable communities who are more prone to larger-scale, extreme weather events and rising sea levels that require systemic adaptation solutions. This structural weakness is further compounded by the lack of detailed and long-term adaptation plans in all relevant sectors and domains, as well as limited government responsiveness to local community needs.

At the national level, regarding responding to the governance needs of local communities and improving standards of transparency and accountability, Egypt has achieved mixed results. Greater attempts at including local communities in decisionmaking processes pertaining to adaptation and mitigation efforts have been noted in recent years—as seen in urban planning, for example—to the extent that a trilateral framework including the government, civil society organizations representing local communities, and the private sector has become nationally relevant. Yet transparency and accountability in planning, implementing, and evaluating policy tools have been largely missing. In light of the fiscal constraints facing the government and limitations in mobilizing funds for the green transition, foreign actors—including private companies and developmental organizations—as well as the local banking sector and private investors have become essential to funding green economy projects. However, the lack of transparency and accountability regarding Egypt's domestic and foreign debt has left all actors unclear on the resources needed to service the debt, therefore likely depriving the green economy of badly needed capital.

The limits of Egypt's economic and fiscal constraints have compelled the country to prioritize its national developmental goals, including mitigation and adaptation priorities, within a limited budget. For example, government-funded and capital-intensive projects—including the New Administrative Capital City, satellite new cities, and grand housing projects in impoverished urban areas and rural regions—have reduced available funds for modernizing the industrial and agricultural sectors. While these large-scale projects have advanced to become an integral component in decarbonization efforts in urban spaces,

lower-cost policy initiatives can significantly support national climate strategies while alleviating the trade-off between national targets. For instance, in the transportation sector, less capital-intensive efforts to remove high-emitting or inefficient vehicles from the streets of Egyptian cities can effectively reduce carbon emissions. Indeed, renewal and scraping schemes have been implemented in other MENA countries that share similar economic and social outlooks, such as Morocco and Jordan.

Another area that could be further improved is the expansion of local value chains that service green projects in the industrial sector. Although the government has utilized various funding schemes to invest in large-scale energy deployment and develop its manufacturing capacity, local industries have continued to face sustainability issues. These issues stem from exposure to environmentally harmful conditions and the economic costs associated with inefficient production processes. Sustainability concerns with manufacturing processes and long-term economic viability can be seen, for example, with the government's national plan to localize automotive manufacturing for domestic consumption—including the revival of the legendary government-owned El-Nasr company.

Import-substitution strategies, which aim to replace imports with locally produced goods, have had a limited success track record in the MENA region. On the other hand, export-centric industrialization policies have demonstrated greater success in integrating global value chains and fostering long-term sustainability. Furthermore, as part of Egypt's plan is to invest in electric vehicle manufacturing, the government faces concerns about the ability of local infrastructures and ecosystems to produce market-competitive EV batteries. Prior to expanding local value chains, the government could first prioritize modernizing the electricity sector to limit waste and ensure that the local infrastructure can absorb an electrified transit system—this includes grid improvements, the modernization of power plants, and the implementation of smart-grid and other backend information technologies that can support EV charging systems.

Finally, Egypt has enormous potential for green energy development and for that development to then stimulate the local labor market across the value chain. This is, however, not happening sufficiently. There is much room for Egypt to grow by increasing local capacity and facilitating the entry of Egyptians into green jobs. To that end, regulatory environments can be improved by instituting quotas for local workers and training opportunities to service a sustainable economy. Law No. 2 of 2024 on green hydrogen stipulates that 20 percent of the projects must be derived from local materials and that the project companies can only employ foreign workers up to 30 percent of the total workforce for the first ten years. This scheme for incentivizing local participation should be extended across green projects. The government has realized the significance of skill enhancement in the local workforce and has since embarked for several decades on this path using different policy tools—the Mubarak-Kohl Initiative as a case in point. However, much more needs to be done in this regard to ensure that industrial developments are well absorbed domestically and that Egyptians can truly benefit from the country's transition to a clean economy. Indeed, Egypt's regulatory sphere can mandate the inclusion of a local workforce across

all levels of a project's management and implementation. But, despite a growing educated population, the country still struggles with un- and under-employment. Green projects could provide opportunities to increase high-skilled local capacity and could be a part of national efforts to address Egyptian labor issues.

Egypt's Green Financing in the Greater Global Context

Egypt has been progressively building its financial and regulatory ecosystem to grow its green economy, offering a helpful case study on how lower-middle-income countries can use various tools and local resources to drive forward a climate strategy while furthering economic development. An overview of Egypt's advancement vis-à-vis best practices for national climate financing highlights that while the country has significant challenges ahead and areas for improvement, it has nonetheless made important progress in growing its green economy.

As national plans and road maps have begun to outline the country's climate goals, government institutions such as the Ministry of Finance and the Central Bank have begun to align Egypt's financial aims to its climate strategy. This effort has included scaling up activities that advance climate targets—such as establishing tax credits and feed-in-tariffs for renewable energy projects—and redirecting finance away from activities that undermine climate resilience goals, as exemplified by the decrease in subsidies for fossil fuels.

To be sure, Egypt still faces significant fiscal constraints and is thus reliant on both development agencies and foreign agreements to harness enough capital to drive its green projects. Generally, however, implementing expenditure-generating policies (for example, subsidies and feed-in-tariffs) and nonregulatory, budget-neutral policies (for example, strategic planning and target setting) can remove barriers for FDI inflows and stimulate the deployment of foreign capital. These steps can subsequently be paired with revenue-generating policies to further buoy the country's green economy. When benchmarked against these best practices, Egypt is on the right trajectory. For example, the country has set a goal to produce 42 percent of its electricity through renewables, which it is anticipated to exceed given the scale of solar farms being built. Furthermore, Egypt's clear national strategy around hydrogen has drawn substantial FDI: effective diplomacy led Egypt to become one of the biggest global beneficiaries of FDI for green hydrogen projects.

Yet notable areas of improvement remain in terms of setting clear targets in other segments of the national strategy. Egypt's climate strategies, for example, should set clear overall emissions reduction targets over the short and long term. The country, for instance, does not set clear targets for the electrification of the transport sector, the preservation of forestry, or the overall reduction of methane in its NDCs or NCCS. Creating clear benchmarks across sectors could direct green projects more strategically and improve the overall implementation of Egypt's climate strategy. Egypt should also pair its hydrogen ambitions, which are being successfully financed, with clear ambitions and targets to move beyond oil and gas.

In addition to pursuing alignment across strategies and national government institutions, coordination across levels of government and sectors could spur co-benefits driven by climate policy and limit loopholes or discrepancies in local or cross-sectoral regulations that could dilute the efficacy of climate policy. While the Haya Karima project is an example of this kind of coordination, there is an opportunity to better mobilize local institutions to advance the country's climate goals. Policies that can improve the alignment of finance with climate goals include mandatory disclosure requirements applicable across jurisdictions, progress assessments with clear and transparent methodologies, and continuous revisions of policy incentives that drive investments in projects that exacerbate the climate crisis.

Carbon markets could further support Egypt's climate financing, whereby carbon is priced, translated into credits earned from an action to reduce or remove emissions of greenhouse gasses, and subsequently traded. Egypt has developed a carbon certificate market for issuing and trading carbon, catalyzing the creation of a voluntary carbon market. While implementation of this pricing mechanism remains uneven, Egypt is refining its regulatory environment to standardize its voluntary carbon market. Although voluntary carbon markets can significantly impact climate financing, a transparent and compulsory carbon pricing system can redress market failures that fuel dependence on hydrocarbon and stimulate viable alternatives through the financing of low-carbon solutions.

Egypt has successfully deployed fiscal incentives to promote the growth of green projects. Additional policies could similarly create compounded impacts for managing demand for scarce or polluting resources. Although divesting from fossil fuel subsidies has already curbed demand for the use of private internal combustion vehicles, implementing a carbon tax could accelerate the decreasing demand for fossil fuels.

07

Climate Activism and Civil Society Organizations in the MENA Region

Neeshad Shafi

The Middle East and North Africa (MENA) region has become a hot spot for worsening extreme heat, drought, and aridity conditions. Moreover, according to recent research, its climate is changing more rapidly and dramatically than ever before. As a result, the region is facing increasing dire habitability challenges such as water scarcity, food insecurity, and ecosystem disruptions, threatening the livelihoods of millions of people. While the discovery of oil in the twentieth century brought wealth, development, and modernization to the area, the rapid progress also generated ecologically unsustainable conditions. From 1850 to 2019, the region only contributed about 2 percent of global cumulative carbon emissions, the lowest such regional contribution. In contrast, emission contributions from North America and Europe for that same period were 23 percent and 16 percent, respectively. Today, oil- and gas-exporting countries in the MENA and Gulf states account for some of the highest levels of per capita greenhouse gas emissions in the world.

The MENA region is one of the most climate vulnerable and impacted regions, given its arid and semi-arid climate. It is estimated to have the highest average temperature increases of any region and with an increasing number of extreme weather events. The region has already experienced record-breaking heatwaves. For instance, in July 2023, temperatures soared to 51 degrees Celsius in Algeria, 49 degrees in Tunisia, and 46 degrees in Jordan, leading to wildfires, widespread power outages, health crises, and even fatalities. The region will be exposed to recurring super- and ultra-extreme heatwaves, which will feature air temperatures up to 56 degrees Celsius and higher lasting for several weeks at a time, in the second half of this century.

At the same time, even though the aridity in the MENA region has significantly increased in recent decades, extreme rainfall events may become more impactful in a warming world. In Jeddah, on the western coast of Saudi Arabia, precipitation events are becoming less frequent but more intense. In April 2024, Dhofar, Oman, and parts of the United Arab Emirates (UAE) and Bahrain experienced severe flooding due to extreme precipitation, resulting in at least twenty-four fatalities and significant infrastructure damage. These kinds of events exacerbate the drought and water scarcity threats that the region already suffers from.

In sum, rising and impactful climate-related threats—combined with a rapidly growing population that adds stress to the already scarce and overexploited resources, high unemployment rates, and uneven regional wealth distribution—puts the region and its communities in a critical situation where immediate, strong actions are needed to mitigate the intensifying threats and alleviate the effects.

Because of the number of countries experiencing severe climate change repercussions, civic activism focused on environmental and climate issues has gained momentum across the region in recent years. Thus, activism is crucial because it empowers communities to address environmental challenges and advocate for sustainable solutions that can mitigate the impacts of climate change. This article examines the landscape of climate-focused civic activism in the MENA region, exploring the strategies employed by activists, the challenges they face in operating within restrictive political environments, and the potential for civil society to drive meaningful environmental action.

The Rise of Environmental Activism in the MENA Region

Environmental activism in the MENA region has grown significantly over the past few decades. The Arab Youth Survey conducted in 2023 found that nearly three-quarters (71%) of respondents said global warming is already impacting their lives, with this percentage rising to 76% in North Africa and 74% in the Gulf Cooperation Council (GCC) states. This growth is due to many factors, including expanding educational opportunities, urbanization, new communication technologies, and increasing awareness of environmental issues affecting public health and livelihoods. This section reviews the rise of environmental activism in the MENA region.

Historical Context

The origins of contemporary environmental activism in the MENA region can be traced back to the 1992 Earth Summit in Rio de Janeiro, Brazil, which triggered global interest in climate change and environmental issues. However, it was the Arab Spring in 2011, followed by the 2012 United Nations Climate Change Conference (COP18) in Doha, Qatar, that catalyzed a more intense focus on environmental concerns, leading some scholars to describe it as a "green spring." The uprisings brought not only political issues to the forefront but also

environmental ones, as people began to organize at grassroots levels to enforce their political, social, economic, and environmental rights.

The Arab uprisings brought about scholarly interest in developing a better understanding of the dynamics of civic protest in the MENA region. In Egypt, environmental issues were among the many grievances expressed during the 2011 Middle East revolutions. More recently, in 2020, widespread protests erupted in Lebanon due to severe pollution and mismanagement of natural resources. But while environmental activism has been intensifying in the region over the past few decades, it remains an understudied element in the broader landscape of popular mobilization. This diffusion of environmental activism reflects changing opportunities for activists as well as long-term structural changes in the region's political economy, including population growth, urbanization, education, and migration.

Not surprisingly, the expansion of environmental contestation has been most evident in countries with semi-competitive political systems and long histories of collective action, such as Algeria, Egypt, Iran, Israel, Lebanon, and Tunisia. Although environmental activism has also emerged to a lesser degree in authoritarian states considered inhospitable to activism, such as those in the Persian Gulf, routine forms of civic engagement have become almost impossible in war-torn Libya, Syria, and Yemen.

The understudying of environmental activism also stems from the media's tendency to focus predominantly on the Global North's climate movement. And consequently, underrepresentation of activists from the MENA region is hindering their opportunities. This selectivity perpetuates a distorted narrative that overlooks climate activists' unique challenges and successes in regions that face significant environmental and socioeconomic threats.

Factors Contributing to Growth in Environmental Activism

Historically there has been little space for meaningful participation of civil society actors beyond the government-sponsored frameworks. In the MENA region, states have traditionally been largely suspicious of civil society and citizen political participation. This includes participation in environmental politics, understood broadly as political engagement with environmental issues, such as climate change, environmental degradation, pollution, waste management, and water scarcity.

This securitization of environmental issues has long curtailed grassroots and bottom-up environmental activism. It, in turn, has profoundly shaped the modalities of mobilization, focus areas, and the discourses and strategies deployed by MENA environmental activists. Nevertheless, civil society has become increasingly vocal on environmental issues, even in contexts with limited space and opportunities for contestation and political participation, such as in the Gulf Cooperation Council (GCC) states. The Stockholm International Peace

Research Institute (SIPRI) notes that the recent shift toward embracing the green and energy transitions, particularly in GCC states, has created more favorable conditions for environmental activists, although many challenges and restrictions remain.

Several key factors have contributed to the growth of environmental activism in the MENA region.

Generational change and the expansion of educational opportunities. A significant generational change in the region, now including about 140 million young people ages 10–24 years, combined with an expansion in educational opportunities and stagnant growth in formal employment, have been important factors in diffusing modes of activism. The Education for Sustainable Development (ESD) framework is now integrated into early childhood care and education in Kuwait and Oman, and Kuwait also reports a full integration of ESD in government education programming. Promising progress has also been reported in Jordan, Lebanon, Egypt, Qatar, and Oman. Beyond enhancing the level of scientific knowledge, it serves as a catalyzer for participation and positive action. In parallel, strong public mobilization around environmental issues in Lebanon and Tunisia at the local and national levels exemplifies the crucial role that the new generation of active and educated citizens played in the broader quest for environmental justice. In Lebanon, the 2015 "You Stink" movement marked a historic moment, as it united a diverse range of activists and citizens outraged about the environmental and health hazards caused by waste mismanagement.

Urbanization. Urbanization has been a double-edged sword for the MENA region. On the one hand, it has driven economic growth and modernization, and on the other, it has exacerbated environmental challenges. Rapid urbanization has led to increased pollution, more severe waste management issues, and a lack of green spaces. For example, the Arab Barometer Wave V report from 2018–2019 revealed that 70 percent of respondents in the MENA region consider water pollution a very serious threat, and 66 percent view waste management as a significant issue. The region's urban population is projected to grow from 56 percent in 2010 to 68 percent by 2050, further straining already fragile ecosystems. This urban growth has also been linked to political unrest, as seen in the Syrian crisis, where environmental pressures contributed to the migration of rural populations to urban centers.

New communication technologies. The advent of social media and digital platforms has revolutionized environmental activism in the MENA region. For instance, the 2023 Arab Youth Survey found that 77 percent of young people in the region are active online, spending over 3.5 hours daily on social media. This shift is driving significant social and political changes, as seen during the Arab Spring, where youth-led protests played a crucial role. These technologies have provided activists with tools for organizing, mobilizing, and disseminating information quickly and effectively. For instance, the Euromed Survey of Experts and Actors from 2012 highlighted that civil society organizations in the MENA region increasingly used digital platforms to advocate for environmental rights and engage

in international environmental campaigns. The use of hashtags, online petitions, and virtual protests has enabled activists to reach a broader audience and garner international support for their causes.

Increased awareness of environmental issues. The growing awareness of environmental issues in the MENA region is driven by the tangible, visible impacts of climate change, such as water shortages and pollution, on public health and livelihoods. Studies have shown that environmental degradation in the region has led to increased respiratory diseases, waterborne illnesses, and food insecurity. The Arab Barometer survey found that 44 percent of respondents consider air quality a serious threat to their health. This heightened awareness has spurred grassroots movements and formal environmental organizations to push for policy changes and sustainable practices.

Civil Society Participation in Environmental Activism

Environmental activism in the MENA region takes various forms, identified as small-scale, informal, and localized action, including community-level initiatives to demand access to natural resources and environmental services. The number of NGOs, both legally registered and informal, has grown rapidly in countries such as Egypt, Jordan, Lebanon, Morocco, and Palestine. Also, the number of coordinated popular campaigns, media outreach, and lobbying efforts has also grown.

These efforts are reflected in notable examples from countries like Egypt, Lebanon, Palestine, the UAE, Bahrain, Oman, and Qatar. Each country presents unique challenges and success stories in their journey toward environmental sustainability. Below are some notable examples of active NGOs and the obstacles they face, illustrating the diverse approaches and challenges in promoting environmental sustainability in the region:

Egypt. The Arab Network for Environment and Development (RAED) was established in November 1990 during the Arab Consultative Conference for Non-Governmental Organizations held in Cairo. RAED has faced several challenges, including securing consistent funding, navigating political complexities, and coordinating efforts across diverse member organizations. Despite these difficulties, the network continues to play a crucial role in promoting environmental sustainability and development in the MENA region. Since the 2011 political upheaval in Egypt, the landscape of civil society activism has witnessed fundamental transformations. The country is now home to a rich and expansive number of registered NGOs. But numerous barriers to meaningful engagement remain, such as organizational inefficiencies, fragmentation, and prohibitive political circumstances. A large number of Egyptian NGOs have lacked domestic constituencies that support their missions; operated under an overall environment of restriction; and invariably depended on foreign funding, which repeatedly has exposed them to government attacks aiming to discredit them domestically.

Lebanon. IndyACT (the Independent Youth Climate Change Movement) is an NGO established in 2006 during Lebanon's July War, initially formed to address the environmental disaster caused by the Jiyeh power plant oil spill. IndyACT focuses on promoting environmental advocacy, climate justice, and sustainable development through nonviolent and innovative campaigns. The NGO has successfully campaigned against several environmental threats, including a proposed coal power plant in Lebanon, and has played a significant role in pushing for Lebanon's participation in international climate cooperation efforts such as the Paris Agreement. Their awareness campaigns have mobilized thousands of young activists across the region. Despite these successes, however, IndyACT faces significant challenges, such as securing continuous funding for their projects, overcoming political obstacles in a region marked by instability, and raising public awareness in a society where environmental issues may often take a backseat to economic and political concerns. The political climate and limited resources continue to pose obstacles to their sustained environmental activism.

Palestine. In Palestine, the Al Ofoq organization exemplifies youth-led environmental activism. It was formed by young activists from various areas of the West Bank to promote environmental awareness and advocate sustainable practices. The NGO has successfully organized community cleanup campaigns and tree-planting initiatives, significantly raising awareness about environmental issues among local communities. However, due to the ongoing conflict with Israel, their efforts face major challenges, including limited access to resources and support and few safe spaces for activism. They are currently unable to scale up initiatives to achieve long-term impacts. Nevertheless, Al Ofoq continues to mobilize local communities and foster a sense of responsibility toward nature.

The United Arab Emirates. Established in 2001, Emirates Nature in association with the World Wildlife Fund (Emirates Nature-WWF) is a prominent NGO in the UAE dedicated to environmental conservation and climate action. Emirates Nature-WWF plays a crucial role in engaging nonstate actors and youth in the Gulf region, particularly in their home country. The organization receives funding from various sources, including corporate partnerships, government grants, individual donations, and membership fees. They have tried a multifaced approach to working in the UAE, looking especially into research and science to develop evidence-based solutions to various environmental challenges. They have also engaged with policymakers to advocate stronger environmental regulations and sustainable practices. Beyond a few known NGOs, many struggle with securing consistent funding to support their initiatives and navigating the political landscape. Additionally, the lack of professionalization among environmental NGOs serves as a barrier to active participation beyond volunteerism.

Bahrain. The Bahrain Women Association for Human Development, established in July 2001, focuses on empowering women and their advancement and promoting sustainable development. The NGO has launched initiatives to raise awareness among women about climate change and encourage them to adopt eco-friendly practices in their daily lives. The

organization relies on annual fees from members to support its activities, as well as donations from individuals and other organizations. Yet they still have limited capacity for advocacy around environmental and climate policy.

Oman. Established in 2004, the Environment Society of Oman (ESO) is a leading environmental NGO focused on conservation, research, and education in Oman. ESO has conducted studies on the impacts of climate change in Oman and launched campaigns to raise awareness about the issue. The organization offers various membership levels with corresponding fees and also accepts donations from individuals, corporations, and philanthropic foundations interested in environmental conservation. Further, ESO has made progress in receiving support from the Omani authorities, but faces challenges which include securing long-term funding from international agencies and the approval of various projects that align with national environmental goals.

Qatar. The Arab Youth Climate Movement Qatar (AYCM Qatar), established in 2019, is the first youth-led association in Qatar that advocates climate action and empowers young people to become climate leaders. It was, in fact, the first of its kind, youth-led climate advocacy NGO, formed informally in 2015 and registered in 2019. The association organizes workshops, events, and online campaigns to engage youth and the community in climate discussions. Most of its operations are financed through project-based funding from government agencies, private foundations, and membership fees. AYCM Qatar is involved in climate and environmental policy and advocacy at the local, regional, and global levels, but faces similar obstacles as elsewhere in the region like limited access to funding, the need for policy support and capacity building, and overcoming societal apathy toward environmental issues beyond a few beach clean-up groups and workshop attendance. The lack of professionalization undermines longer-term capacity-building efforts and stymies their ability to engage in technical and policy-oriented discussions.

While these examples spotlight some prominent nonstate actors, there are numerous other nonstate actors in the MENA region working on climate and sustainability, often without visibility or funding. Their grassroots efforts are vital for fostering change and a sustainable future. As awareness and policies around climate change grow, the involvement of, and innovations from, these nonstate actors are likely to expand.

Main Challenges to Progress to the Civil Society Participation in Environmental Activism

Civil society's involvement in the region is often overlooked in favor of institutional actors or purposely minimized by those who perceive civil society as a threat. In most MENA countries, especially GCC countries, state-society relations have long been guided by an implicit social contract in which rents from natural resources, particularly substantial oil and gas revenues, are redistributed to citizens in the form of generous welfare packages

and socioeconomic services in exchange for loyalty and limited political rights. While this implicit social contract has recently undergone some change, it continues to shape political and civic participation. The space given to civil society thus remains very restricted, and the freedom of assembly and association is significantly curtailed. Whatever space is allowed is tightly controlled.

Restrictive Political Environments

Restrictive political environments in the MENA region pose significant challenges for NGOs and activism. Governments have implemented laws and regulations that severely limit the ability of civil society organizations to operate freely. These restrictions include arbitrary arrests, travel bans, bureaucratic red tape, and constraints on foreign funding. Many countries have introduced vaguely worded laws that allow for selective implementation, enabling authorities to target organizations perceived as threats. The result is a climate of fear and uncertainty, in which activists must carefully navigate unclear boundaries and potential repercussions. This environment has led to self-censorship, fragmentation of civil society, and reduced effectiveness in addressing social and environmental issues. NGOs often operate in hostile terrain, with limited opportunities for mobilization and collaboration. The overall impact is a weakened civil society sector, struggling to influence policymaking and effect meaningful change in the face of authoritarian control and repression.

Limited Resources and Funding

Environmental civil society actors in the MENA region face significant funding challenges. Licensing and registration obstacles further limit their access to support. As a result, many environmental activists operate primarily as volunteers or through social media campaigns, dedicating their personal time and resources to climate and environmental initiatives. NGOs recognized by the state as key stakeholders have had better luck securing funding. But, typically, governmental funding and private sector financing align with the donors' priorities and not necessarily the organizations' agendas. The resources therefore sometimes support initiatives that are more like image builders or gimmicks—such as beach cleanups or other similar government-initiated events—rather than projects focused on serious environmental or climate projects. Although these resources have enabled some groups to bolster their actions and broaden their reach, project-based financial support has not always been designed to ensure long-term sustainability. Occasionally, funding comes from foreign embassies and diplomatic missions, but it remains limited due to strict regulations on foreign contributions.

Fragmentation and Lack of Coordination

Fragmentation and lack of coordination pose significant challenges for NGOs and activism in the MENA region, hindering the effectiveness and impact of initiatives. The civil society landscape is often characterized by a multitude of small, isolated organizations operating with limited resources and divergent ideologies. This fragmentation leads to duplication of efforts, inefficient use of resources, and reduced overall impact. The absence of effective networking and collaboration among NGOs working on similar issues results in missed opportunities for knowledge sharing and weakened bargaining power with governments and donors. Restrictive political environments, resource constraints, and geographical barriers further exacerbate these issues. Consequently, civil society in the MENA region struggles to address complex systemic problems, resist government restrictions, and influence policymaking effectively. Despite these challenges, some initiatives are emerging to improve coordination, such as building global networks and creating platforms for collaboration on specific issues. Overcoming fragmentation will require concerted efforts from civil society actors, supportive government policies, and flexible, long-term support from international donors.

Limited Access to Decisionmaking Processes

Over the past decade, environmental activists in GCC states have seen increasing official openness to, and interest in, their work. However, this tends to vary depending on the strategic priority that respective governments bestow on climate and environmental issues. Despite noticeable progress, a key obstacle for civil society actors is the enduring sense of exclusion from significant decisionmaking processes. There is a lack of official and transparent policy processes and inclusive, participatory frameworks that would enable civil society actors to engage with governments and state authorities.

Conclusion

Civic activism for climate change in the MENA region is a growing force driven largely by youth and grassroots organizations. The recent strategic commitment to sustainability and the green and energy transitions has created an opening for civil society to contribute to climate and environmental action in the region. To be sure, the participation of MENA civil society actors in environmental politics has not yet reached its full potential, and many obstacles, such as restrictive political environments and limited resources, continue to prevent them from playing a more substantial and effective role in shaping environmental policy in their respective countries. But, despite the challenges, these activists are making important contributions to addressing environmental issues. Their efforts span various sectors, from water conservation and waste management to renewable energy advocacy and women and youth in climate action and education.

The future effectiveness of climate activism in the MENA region will depend on several factors, including the ability of NGOs to build stronger networks, access sustainable funding, and getting political support. International support and locally driven initiatives will be crucial in empowering these activists to drive meaningful change in the face of escalating environmental crises. As the region continues to grapple with climate change impacts, civic activism will become increasingly important in shaping policies, raising awareness, and implementing community-level solutions. By addressing the challenges facing civil society and fostering an enabling environment for activism, MENA countries can harness the power of civic engagement to build more resilient and sustainable futures.

08

Engaging Egypt's Landscape Architects to Combat Climate Change

Amir Gohar

Egypt is characterized by diverse geological features and landforms, ranging from extensive arid deserts, mountainous ranges, and coastal areas to the fertile Nile Valley and Nile Delta. The valley and delta, which represent around 4 percent of the country's total area, are home to more than 90 percent of Egypt's total population.[49] As one of the most climate-vulnerable nations globally, this heavy reliance on a limited and fragile geographical region amplifies the nation's vulnerability to climate change impacts, including heatwaves, rising sea levels, flooding, and biodiversity loss. The climate disruptions place enormous strain on Egypt's natural resources, infrastructure, and vulnerable communities.[50] They threaten the environmental, economic, and social stability of the country across national, regional, and local levels. This instability in turn further affects critical sectors such as agriculture, industry, and tourism. Egypt's persistent climate challenges urgently require a holistic, knowledge-based approach to design and planning on various scales.

As part of this approach, landscape architecture—often marginalized and confined to questions of aesthetics—should be leveraged to address the complexities of environmental and social challenges in Egypt. Landscape architects focus on the interactions between natural and cultural ecosystems as well as the built environment.[51] Given the field's multidisciplinary nature, they can integrate aesthetics with scientific reasoning while designing and planning landscapes at various scales to enhance environmental quality and public health.[52] Further, the ability of landscape architects to lead and collaborate with various actors makes them well-positioned to tackle climate change adaptation and socioeconomic development and thereby contribute toward long-term socially and economically resilient communities.

This paper examines climate risks across the national, regional, and local levels, with a particular focus on the vulnerabilities Egypt is currently facing without the integrated engagement of landscape architects. It discusses the current state of the landscape architecture profession in Egypt, as well as the existing gaps and missed opportunities of recognizing landscape architects as critical actors in climate change adaptation and sustainable development efforts. Landscape architecture lies at the nexus of planning, policymaking, and implementation; thus, it can have a transformative impact in building climate-resilient communities and sustainable landscapes across Egypt.

Climate Risks in Egypt Across Levels

While the climate crisis is a singular reality, the risks it poses are not all the same at the national, regional, and local levels, requiring targeted interventions, policies, and stakeholder engagements tailored to each level. The following discussion unpacks these multiscalar risks, highlighting their interconnected yet distinct challenges.

National Level

Nationally, Egypt grapples with major climate change risks to its water and energy supply systems and labor force, which have significant implications for food security. Water shortages reduce both agricultural production and access to clean drinking water. And increasing temperatures strain public health systems and energy infrastructure. Addressing these risks at the national scale is crucial, as they are directly connected to the economic stability and welfare of Egypt's rapidly growing population.

National Water Supply: Water Scarcity

Water scarcity is considered Egypt's most critical climate-related challenge, affecting agricultural production and public health. Egypt's water supply is strained due to the continuous population growth, which accounts for around 2 percent per year.[53] This growing population intensifies the demand on the country's restricted water resources and increases its food security risk.[54] As the primary freshwater resource, the Nile River supplies approximately 55.5 billion cubic meters (BCM) annually, as per international agreements. Other supplementary water sources include nonrenewable groundwater aquifers, precipitation, and desalination operations, bringing the total annual water availability to 59.25 BCM. Nevertheless, the annual national water needs amount to about 114 BCM, which indicates a huge annual deficit of more than 54 BCM.[55] This deficit simply exacerbates competition for water and reveals weak points in the national governance of water systems, infrastructure planning, and resource distribution practices.

Agricultural activities use about 80–85 percent of Egypt's fresh water; therefore, the scarcity of water seriously affects the overall agricultural production and supply chains for food,[56] which leads to conflicts with other sectors, such as the food industry and tourism. These

threats also affect the nation's public health, as waterborne diseases become more prevalent due to the restrained access to clean water and proper sanitation facilities, particularly among marginalized communities.[57] Many small villages in the cities of Minya and Sohag, located on the west bank of the Nile River, do not have adequate access to potable water. Approximately 10 percent of the families living in these villages illegally connect their homes to the water grid, resulting in leaks and significant water waste. While the water company is responsible for supplying water through the main infrastructure, households are expected to cover the cost of connecting pipes from their homes to the main, which they cannot afford. Thus, families sometimes send their children to neighboring villages to get water or let them extract untreated water directly from the ground, exposing themselves to substantial health risks.[58]

National Energy and Labor Supply: Heatwaves

Heatwaves in Egypt are increasing in frequency and ferocity, causing significant threats to energy infrastructure, public health, and the economy. Nearly 90 percent of Egyptian-generated electricity comes from fossil fuels (oil and natural gas), which contribute significantly to climate change.[59] Fossil fuels release large amounts of carbon dioxide, a greenhouse gas, trapping heat in the atmosphere, causing increased temperatures in Egypt's major cities.[60] Extreme temperatures lead to a higher demand for electricity to operate air conditioning systems and other cooling systems.[61] Such strain on energy infrastructure eventually culminates in power cuts and a shortage of energy supply to the population, which, in turn, disrupts important healthcare facility services and water pumping systems.

Exposure to prolonged heat can cause heat-related illnesses, including heat strokes and dehydration, and can aggravate existing breathing and heart problems. Children, the elderly, and low-income populations are more susceptible to such risks.[62] High temperatures also worsen air pollution by increasing levels of ground-level ozone, which damages air quality and exacerbates health problems.[63] They also have adverse impacts on agriculture, such as reduced crop yields, increased evaporation of water from irrigated lands, and higher mortality among livestock.[64]

Additionally, due to the danger posed by exposure, heatwaves in Egypt ultimately lead to lower labor productivity and income. In 2022, an estimated 2.8 billion potential labor hours were lost due to extreme heat, which led to a loss of approximately $3.4 billion in income. Specifically, agricultural workers lost 50.7 percent of their income that year.[65]

Regional Level

Mapping regional climate challenges is key to understanding the nature and manifestation of risks across diverse landscapes. Egypt's main regional challenges—including sea-level rise, flooding, and water scarcity and soil salinity—vary across coastal zones, mountain ranges, and agricultural areas. Coastal zones in the Nile Delta and the Mediterranean experience the effects of sea-level rise, saline intrusion, and coastal erosion, leading to land loss and habitat destruction. The Red Sea Mountain range grapples with periodic flooding, damaging

the infrastructure of local communities. And agricultural areas in the Nile Valley and Nile Delta deal with erratic rainfall, water scarcity, and soil salinity, jeopardizing agricultural productivity and food security.

Coastal Zones: Sea-Level Rise

All coastal cities are currently experiencing sea-level rise in the Mediterranean. As a result, they face significant challenges, such as loss of property, displacement of people, loss of lake areas and biodiversity, direct inundation in terms of the salinization of groundwater through saltwater intrusion, rising water tables, and reduction in soil drainage and soil quality. Sea-level rise across the Mediterranean could displace 6 million citizens in the northern part of the Nile Delta by 2030 due to the expected loss of agricultural lands,[66] as illustrated in Figure 1. The Nile Delta is currently suffering from a land subsidence (the settling of the Earth's surface) at a rate of 3–9 millimeters per year, varying across different areas. By 2100, it is expected that 2,660 kilometers (13.3 percent of the total delta area) in the northern Nile Delta will be submerged.[67]

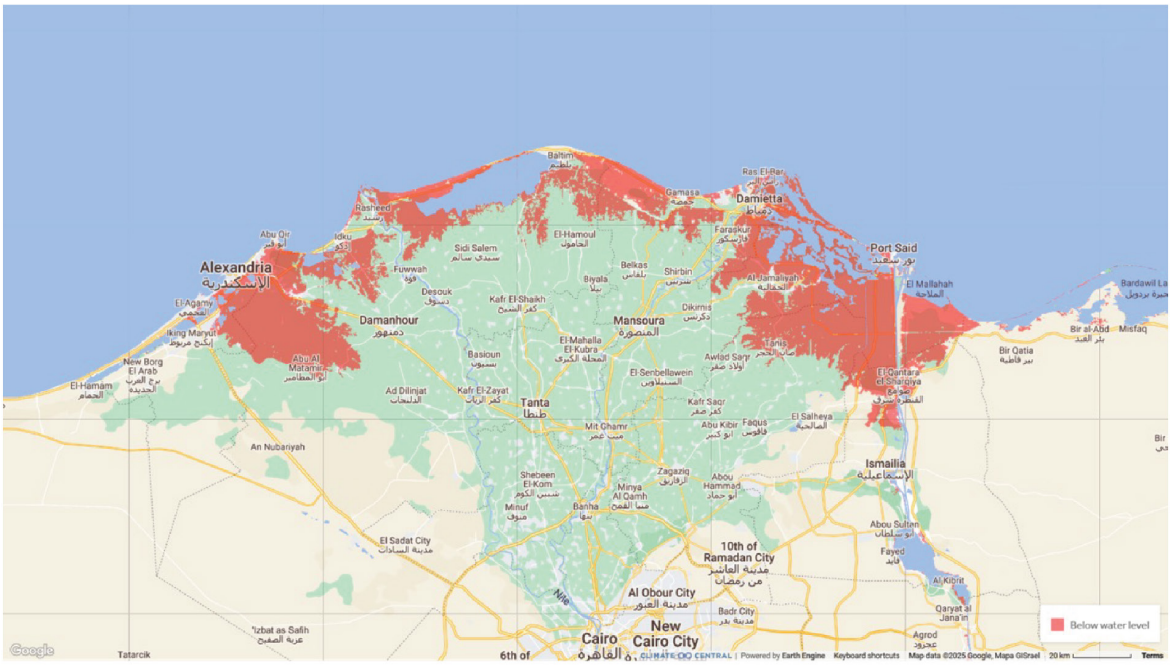
Among all Egyptian coastal zones, the coastal zone from Alexandria to Port Said is considered the most vulnerable coast.[68] According to the Intergovernmental Panel on Climate Change's 2024 assessment report on sea-level projections, the sea level in Alexandria is expected to rise by about 0.12 meters by 2030, 0.26 meters by 2050, and 0.74 meters by 2100. The city could lose 30 percent of its landmass, leading to a displacement of 1.5 million inhabitants by 2050.[69]

The Nile Delta's cities are particularly prone to soil salinization and waterlogging, endangering agricultural productivity and soil fertility.[70] By 2100, the delta could lose 1,800 square kilometers (695 square miles) of area, 3.5 million residents could be displaced, and 39 percent of jobs linked to agriculture could be lost.[71] Agricultural production is projected to decrease by 47 percent, and livestock numbers are projected to drop by 40 percent by 2060 due to saltwater intrusion into groundwater.[72]

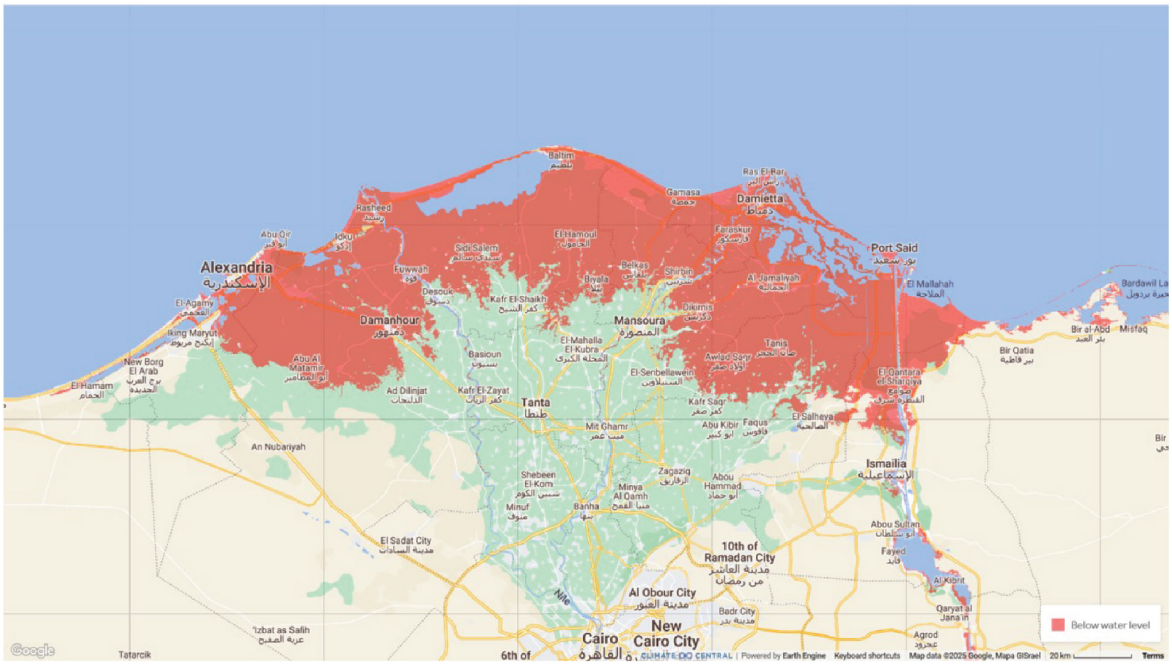
As illustrated in Figure 2, along the northwestern coast of Egypt, coastal erosion in the port town of Marsa Matruh has also been observed, at about 3.5 meters per year between 2005 and 2015, because of hydrodynamic forces and urban expansion.[73] On the northeastern coast, spanning from the city of Port Said to the city of Rafah, an analysis of the shoreline changes along the Sinai coast demonstrated erosion and accretion patterns. More than 63 percent of the area is subject to erosion, while less than 10 percent is stable.[74] Egypt's North Coast is particularly vulnerable to flooding due to intense rainstorms and its topography. Parts of the coastal plain are bordered to the south by the mountain range, with altitude reaching approximately 600 meters above sea level. During heavy rainfall, water flows northward from these elevations through wadis (dry channels or valleys except during rainy seasons), directing water toward lower-lying coastal areas.

Figure 1. Projections for Sea Level Rise in Northern Egypt

Mild scenario with a 1-meter rise

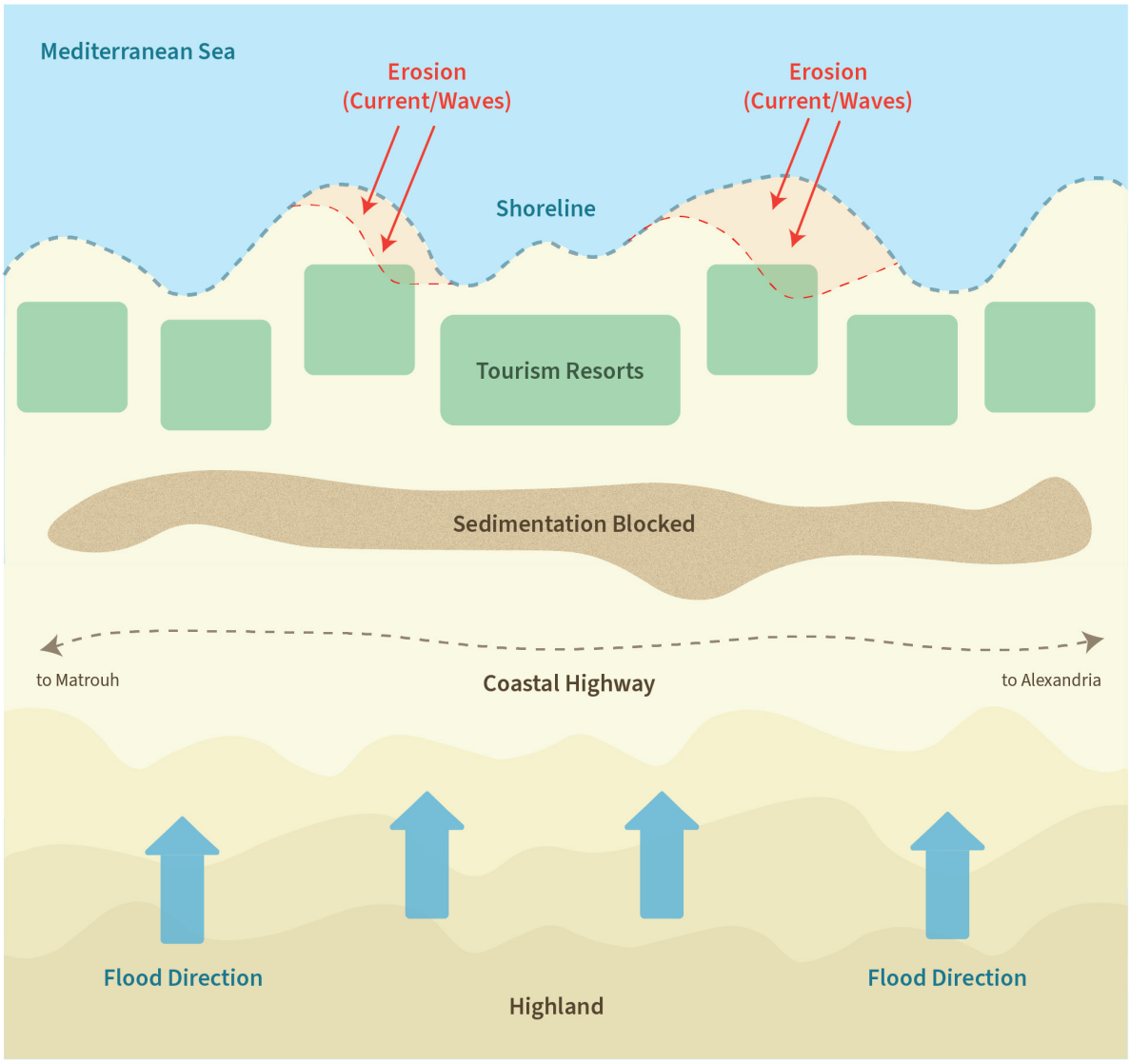


Extreme scenario with a 3-meter rise



Source: Climate Central, Coastal Risk Screening Tool, https://coastal.climatecentral.org/map/8/100.6166/13.2746/?theme=water_level&map_type=water_level_above_mhhw&basemap=roadmap&contiguous=true&elevation_model=best_available&refresh=true&water_level=1.0&water_unit=m.

Figure 2. How Development on Egypt's North Coast Interferes with Natural Processes



Source: Author's research.

Sea-level rise and coastal erosion are significantly impacting Egypt's fish populations and the livelihoods of fishermen. They have affected fish habitats, leading to a decline in fish populations and, consequently, a reduction in fish catches. For example, the fish stock in Bardawil Lake decreased from 5,392 tons in 2008 to 2,330 tons in 2018. And during this same period, there was a decrease in the number of fishermen by 9.2 percent.[75]

Red Sea Mountain Range: Flash Floods

Flash floods are among the most critical climate hazards in Egypt, especially in the Red Sea Mountain range (extending across the southern Red Sea and Sinai Peninsula) and the wadi floors in the Eastern Desert. These areas are home to many local tribes such as the Ababda, Bisharin, Beja, and Ma'aza.[76] Flash floods in these vulnerable desert environments may occur only once every decade or two in each wadi. But when they do occur, the geographical characteristics of the wadis—which have narrow valleys, poor natural drainage, little vegetation cover, and permeable soil—enhance the rapid flow of water, which causes severe damage to roads, small settlements, and structures (homes, wells, and tribal trails).[77] High surface runoff increases the speed and magnitude of the flash floods.[78] Around 17 percent of the Sinai Peninsula is classified as extremely vulnerable to flooding. The range along the Sinai Peninsula is the most susceptible to severe flooding. Other regions of high flood sensitivity are located along the external peripheries of these mountains, within certain sub-basins of Wadi al-Arish.[79]

Flash floods often disrupt the lives of small communities and isolated settlements that are located on or near wadi floors. Flood-prone areas with rapid population growth often undergo urbanization in the time between floods. During this time, local tribes make use of the flat land of wadi floors, consisting of sandy sediments, and construct settlements to live in, which expose them to flood risks.[80] The impacts include the loss of lives, destruction of homes, and the relocation of local tribes to areas less occupied by urbanized municipal towns. Flood risks also extend to residents of municipal cities and villages along the shoreline. While flash floods represent a threat to developers of mega projects, local tribes sometimes regard them as blessings due to their urgent water needs.

The flooding events provide temporary water sources, replenishing underground water aquifers and natural reservoirs. This encourages the growth of seasonal vegetation required for grazing among livestock. Thus, flash floods become the principal source of water supply for such communities, sustaining life in areas that otherwise have scarce water resources. The wadis sometimes become fertile spots following a flood, leading communities around them to perform small-scale agricultural activity and creating the potential for local food production.[81] However, these benefits of flash floods are often short-lived and unequally distributed. Some wadi floors retain water for long periods, thereby supporting agricultural and pastoral activities; others quickly drain, offering short-term benefits.

Agricultural Areas: Erratic Rainfall, Water Scarcity, and Soil Salinity

Agriculture is the cornerstone of Egypt's economy and food security, contributing 11.3 percent of the country's GDP.[82] However, farming in the fertile Nile Valley and Nile Delta is becoming increasingly vulnerable to the impacts of climate change. Climate issues such as rising sea levels, the salinity of groundwater, heatwaves, and flooding are all playing a collective role in reducing crop yields and spreading plant diseases and pests.[83] Projections indicate that climate impacts could significantly reduce crop production for key staples such as wheat, rice, barley, corn, rice, and soybeans.[84] As a result of temperature increases, rice

and soybean production could decrease by 11 percent and 28 percent, respectively, by 2050. The manifested risk is a projected reduction in per capita food consumption (kilocalories per capita per day) by around 1.7 percent (in 2030) and -3.8 percent (in 2050).[85]

Climate change is already compelling farmers to alter traditional cropping patterns in response to shifting environmental conditions. For example, farmers have replaced tomato farming with rice cultivation because tomatoes are not growing well due to salinization of the soil, while rice plants can take on more salinity. Lastly, farmers are also resorting to using more chemicals to control pests and diseases, risking a failure to meet the food safety standards of EU and other international markets.

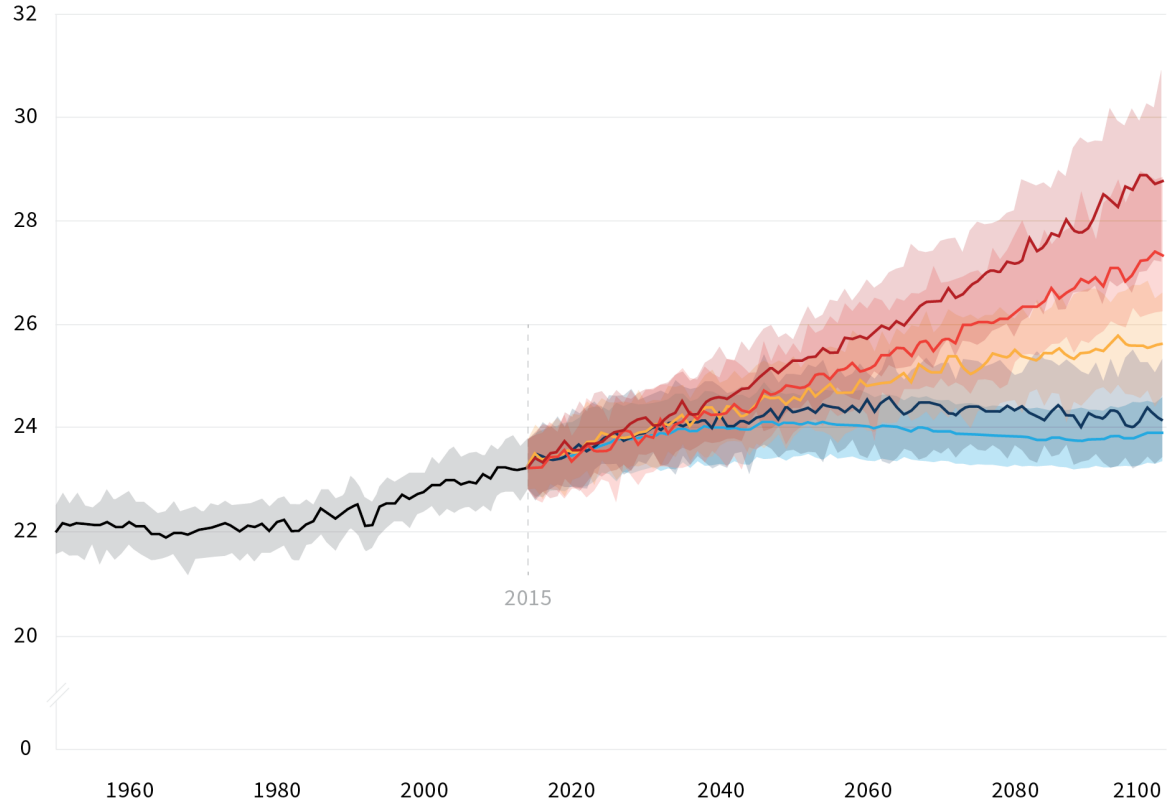
Local Level

Local, site-specific climate challenges directly impact communities, infrastructure, and ecosystems. Rapid urbanization, poor governance, and resource-intensive design and construction practices are among the main factors increasing climate risks locally. Urban centers face urban heat island effects (where populated urban cities suffer from high temperatures relative to their surroundings), inefficient water management systems, and a loss of biodiversity. These impacts in turn pose significant risks to public health, as well as social and economic systems. The expansive plans of mega-urban development contribute to the aggravation of such risks, as such development strains local ecosystems by disregarding the integration of green infrastructure and ecologically sensitive planning approaches.

Urban Heat Islands: Heat Stress

Rapid urbanization, the utilization of heat-absorbing surfaces such as asphalt and concrete, reduced green spaces, and inadequate vegetation cover can all exacerbate the urban heat island (UHI) phenomenon.[86] In addition, increased cooling demand for buildings releases heat to the external environment, leading to both increased heat and increased perception of heat in urban areas.[87] Urban areas, such as Alexandria, Aswan, and Cairo, show a higher vulnerability to UHI effects. For example, Greater Cairo's mean land surface temperature has significantly increased over time, from 31.3 degrees Celsius in 1986 to 36.0 degrees Celsius in 2017. It is expected to be 37.9 degrees Celsius in 2030.[88] By the year 2100, the temperature is expected to rise by approximately 1.5°C to 6.5°C, depending on the emission scenario, as shown in Figure 3.[89] Between 1990 and 2016, the rapid urban sprawl, along with the massive infrastructural constructions in Greater Cairo, has caused the loss of 7.7 percent of vegetation cover and has converted 8.7 percent of the bare sand area to developed land.[90] The scarcity of public green spaces and green urban corridors contributes to heat stress, where urban dwellers face heat-related health risks. According to the Ministry of Environment, the average per capita share of green space in Egypt was recorded to be only 1.2 square meters (12.9 square feet) in 2023, which is lower than the recommended share of 9 square meters (96.8 square feet) by the World Health Organization.[91]

Figure 3. Average Surface Air Temperature in Egypt Under Different Climate Scenarios, 1950–2100



Source: "Climate Change Knowledge Portal," World Bank, accessed March 13, 2025.

Urban Water Distribution: Water Scarcity

The unequal distribution of water resources is affecting water security in Egypt. In urban settings, there is a discrepancy in the supply of water within high-end urban communities as opposed to underprivileged areas. These high-end communities feature fountains, golf courses, and swimming pools, which consume substantial amounts of water, placing additional strain on the country's already limited water resources. By 2027, the water demand for eight of the new urban communities located around the Greater Cairo region is expected to be 1.2 million cubic meters per day. This number represents 20 percent of the Greater Cairo region's domestic water consumption.[92] Egypt has over twenty golf courses, spanning across major cities such as Cairo, Hurghada, and Sharm el-Sheikh. One of the largest is the Madinat Makadi Golf Resort in Hurghada, which spreads over 1.4 million square meters (0.54 square miles). A golf course that extends around 400,000 square meters (0.15 square miles) can consume around 1 million cubic meters of water annually, which is the same amount as the annual water consumption of a city of 12,000 residents.[93]

In contrast, marginalized areas, in rural regions and urban slums, frequently suffer from inadequate access to clean drinking water and water systems, which causes conflicts over access to water. Some key data points include the following:

- About 7.3 million people lack access to safe water, of which 5.8 million reside in rural areas and 1.5 million in urban areas.
- Approximately 4 percent of all urban residents lack access to water supply, especially in urban slums and poor informal settlements.
- Only 77 percent of the urban slum households have piped water coming into their homes, which is not necessarily done legally.[94]

Urban Development: Loss of Local Biodiversity

Egypt's rapid urbanization and climate change are resulting in the loss and fragmentation of habitats. An example of habitat loss is the decline of natural pollinator populations across agricultural lands. Natural pollination of crops is essential in maintaining ecosystems and food security. This disruption of bees' habitats reduces agricultural production and affects the Egyptian honey industry because of the shifts in harvesting seasons and decline in honey production.[95] Studies conducted in South Sinai have shown the negative impact of introducing nonnative honeybees, which, in turn, had led to a further decline in the native bee species.[96] The loss of biodiversity is also happening in marine habitats because of climate change, overfishing, and habitat degradation. Currently, the Red Sea is experiencing coral reef degradation, which threatens the marine life that depends on these ecosystems.[97] In the Mediterranean Sea, overfishing has led to a decline in fish populations, disrupting the ecological balance and affecting species diversity.

Egypt's Current Policy Endeavors

Governments, international organizations, nongovernmental organizations, and local communities have been trying, through various initiatives and strategies, to reduce climate risks. These joint efforts are significant steps toward addressing national, regional, and local vulnerabilities. This section reports on the ongoing efforts of key actors and presents their contributions to climate change adaptation and sustainable development.

Government-Led Initiatives

The Government of Egypt started incorporating climate change into its policies in 1994, demonstrating a commitment (on some level) to combatting climate change and participating in relevant international efforts. And this commitment clearly continues today; in November 2024, Egypt hosted the Twelfth Session of the World Urban Forum (WUF12), which focused on localizing sustainable development goals to address myriad challenges such as climate change.

Examples of current government initiatives include projects focused on protecting the North Coast; combating flash floods; managing water desalination; making water management sustainable; fighting poverty (such as Haya Karima initiative);[98] and investing in and greening urban, infrastructure, and rural development projects. The government is also attempting to diversify its energy profiler, and it has made noticeable progress in growing wind and solar energy, reaching 5 percent of the country's electricity in 2023.[99]

Over time, through these initiatives, the government slowly started to move from primarily observing and discussing the climate change issue to engaging and acting on it. And due mainly to external forces, the government started to participate in international climate initiatives.[100]

1994: Joined the United Nations Framework Convention on Climate Change

Egypt ratified the United Nations Framework Convention on Climate Change (UNFCCC). The Intergovernmental Panel on Climate Change, in its third assessment report, identified Egypt's Mediterranean coast and the Nile Delta as vulnerable regions to rising sea levels.

2007: Formed the National Climate Change Committee

The Egyptian prime minister issued decree No 272 that reformed the National Climate Change Committee (NCCC) that was established in 1997.[101] The minister of state for environmental affairs chaired the NCCC, which included members representing a wide range of governmental and nongovernmental representatives.

2010: Declared vulnerable sectors to the UNFCCC

Egypt submitted its Second National Communication report to the UNFCCC.[102] According to its Initial National Communication and Second National Communication, Egypt's coastal, water, and agricultural sectors are most vulnerable to climate change.

2015: Established two ministerial committees

Egypt established two ministerial climate change committees within the Ministry of Agriculture and Land Reclamation and the Ministry of Irrigation and Water Resources.

2015: Established the National Council for Climate Change

To facilitate cooperation among ministries, the prime minister established a new National Council for Climate Change under Decree No. 1912.[103] The council, chaired by the minister of environment, is composed of diverse representatives from government, including the Ministries of Defense, Interior, Planning, Finance, Agriculture, Industry, Water Resources, and Foreign Affairs and a representative of the General Union of Associations of civil society. The council aims to bring together all relevant authorities to update the national strategy for climate change and sustainable development.

2018: Egypt hosted the UN Biodiversity Conference

The conference addressed the mainstreaming of biodiversity issues in crucial economic sectors, such as energy and mining, infrastructure, manufacturing, and processing, as well as health.[104] Delegates recharged their ambition to scale and accelerate efforts to make progress on the twenty global Aichi Biodiversity Targets by 2020. Participants also set the path to develop the post-2020 global biodiversity framework.

2019: Restructuring of National Council for Climate Change

The NCCC was restructured to be under the leadership of the prime minister, with members representing various sector ministries, national experts (scientists, practitioners, and researchers), civil society (including NGOs and union representatives), and the private sector. This restructuring aimed to centralize climate change policymaking, ensuring coordinated efforts in developing and reviewing the national climate strategy.[105]

2022: Egypt hosted the UN Climate Change Conference

The 2022 UN Climate Change Conference (COP27) agreed on an overarching cover decision, the Sharm el-Sheikh Implementation Plan.[106] It reaffirmed the urgency of limiting global temperature rise to 1.5 degrees Celsius and emphasized the need to phase down fossil fuel use, building on commitments established in the Glasgow Climate Pact agreed to during the previous year's conference. Egypt discussed food security risks, climate tipping points, and the need for financial system reform. The main COP27 deliverable was the loss and damage fund which aims to respond to losses and damages in vulnerable, developing countries impacted by the adverse effects of climate change.[107] A transitional committee was set up to develop recommendations at the 2023 conference for operationalizing the loss and damage fund, with an emphasis on finding new and innovative funding arrangements. COP27 also finalized a climate mitigation work program focused on pooling ideas to accelerate mitigation action through the planning of global dialogues and investment-focused events.

2024: Established the Environmental and Climate Policy Committee and hosted the WUF12

Egypt formed the Environmental and Climate Policy Committee under the leadership of the Ministry of Environment. It became an interministerial committee across the Ministries of Foreign Affairs, Planning and Economic Development, International Cooperation, Finance, Local Development, Investment, Electricity and Energy, Petroleum, and Industry. It aims to develop a unified strategy for sustainability and to monitor reform strategies in the political, economic, and social realms.

Egypt hosted the WUF12 in Cairo. The event, organized by UN-Habitat and the Egyptian government, is a significant milestone to Egypt since it is the first African country to host the event in over two decades. The forum underlined the fact that cities are significant contributors to, as well as mitigators of, climate change and require inclusive, community-led strategies that integrate urban realities into national and global climate policies.

International Initiatives

The World Bank is currently implementing projects focus on addressing air quality and climate change in Cairo ($200 million); using organic pollutants ($8.1 million) (just completed); supporting local development efforts in Upper Egypt; and supporting the government in conducting research and collecting data related to climate change to inform decisionmaking processes.[108]

In addition, the United Nations Development Programme (UNDP), in collaboration with Egypt's Ministry of Water Resources and Irrigation, is leading the implementation of "Enhancing Climate Change Adaptation in the North Coast and Nile Delta in Egypt" project. The project aims to protect densely populated, low-lying lands of the Nile Delta from the impacts of climate change including sea-level rise and extreme weather events. It is supported by a $31.4 million grant from the Green Climate Fund (GCF), and spans seven years from 2019 to 2026.[109]

Also relevant is the UN World Food Programme's (WFP) grant of $431 million to support the country's food security.[110] In 2024, with support from the Central Bank of Egypt, the WFP has launched the second phase of the Transforming the Livelihoods of Smallholder Farmers project, which aims to support the livelihoods of smallholder farmers in fifty villages across Upper Egypt.[111]

Lastly, the United Nations Children's Fund has been actively addressing water scarcity in Egypt by implementing a revolving fund mechanism that provides interest-free loans to vulnerable families. This effort enables families to gain access to drinkable water and to connect their homes to the water infrastructure. The initiative has successfully supplied safe water to approximately 90,000 people in rural areas of governorates such as Assiut, Sohag, Fayoum, Minya, and Qena.[112]

NGO and Start-Up Initiatives

The following are some examples of the organized initiatives with clear ethos and objectives:

- **VeryNile:** An initiative that works to collect plastic from the Nile River and then recycle it to make household bags and other products. It also focuses on providing job opportunities and training for the women of Al-Qursaya Island.

- **Banan Art:** An initiative in Upper Egypt that focuses on recycling banana waste to make bags and office accessories. It also offers training and empowerment programs to the women of Sohag.

- **ReNile:** A start-up that offers a wide range of environmental services such as establishing and providing support for hydroponics and aquaponics. It also helps provide fish farming management and monitoring tools to local farmers.

- **Mozare3:** A start-up that allows farmers to invest in new technologies and innovations to directly contribute to a more efficient and sustainable agriculture industry.

- **Cotton Town:** A start-up that acts as a platform for trading cotton from farm to fashion. By using market connections, best practices, and branding strategies, it aims to improve the value chain of cotton.

- **NoorNation:** A renewable energy start-up that provides decentralized infrastructure solutions for less-served areas in Egypt and sub-Saharan Africa.

- **Banlastic:** A social enterprise located in Alexandria that tackles the plastic pollution problem. It aims to ban single-use plastic in Egypt by offering alternative products, as well as spreads awareness among customers through delivering workshops, training, beach cleanups, and various environmental events.

- **Rabbit Mobility:** A micro-mobility sharing platform that offers short-distance transportation using environmentally friendly vehicles. Their fleet includes standing electric scooters and electric bikes. They offer two models: the Unlock and Go model and the Day Rentals model, where users can request a vehicle to rent for a minimum of two days.

Grassroots Community Practices

Different grassroots community practices have emerged organically in response to climate change impacts, without formal leadership or institutional backing. These locally driven initiatives remain under-recognized, though they prove to be effective, reflecting community-based knowledge.

In terms of farming practices, most farmers in the Nile Delta are shifting to planting crops that have a high tolerance to salinity, such as cotton, beet, and rice. For instance, some farmers have shifted from growing tomatoes—which is a rewarding crop but does not grow well in high salinity conditions—to cultivating rice, confirming that this is the best they can do given salinity levels. However, farmers cannot cultivate rice on all available land because there are designated specific areas for rice farming. Farmers planting outside of the allocated zones face penalties, including fines or imprisonment.[113] In addition to changing crops, farmers are starting to use new approaches to agriculture and irrigation, such as intercropping (the growth of two or more crop species simultaneously in the same field) to optimize existing environmental resources, including space, light, and nutrients, while enhancing both the yield and quality of crops.[114]

Regarding household practices, initiatives like the Green Pan Initiative have been established to promote the recycling of used cooking oil.[115] This initiative offers citizens the opportunity to exchange their used cooking oil for products such as soaps and detergents, thereby encouraging proper disposal and recycling practices. Households, in urban and rural areas, have become particularly judicious when consuming water, using electricity, creating food waste, and undertaking any other consumption activities in the home. They have also adopted, for example, the practice of recycling plastic, clothes, and paper. Moreover, several households are now using roof-planting methods to grow tomatoes, mint, arugula, and fruits.[116] Lastly, many households have given up on using plastic bags and are now more consistently reusing cloth bags for groceries and cooperating with small and medium-sized businesses that make local kitchen tools from wood and straw rather than plastic.

The Case for Landscape Architects

Around the world, landscape architects are well prepared to address the social, ecological, and functional aspects of both natural and built environments. Yet, in Egypt, landscape architects remain underutilized in efforts to combat climate change at the national, regional, and local levels, as landscape architecture is often overlooked in both policy frameworks and urban development projects. There is a misconception that landscape architects focus mostly on the beautification of landscapes, thereby disregarding their critical contribution to addressing climate resilience and environmental sustainability.[117] This narrow conception has caused significant gaps within planning, policy, implementation, and governance processes related to tackling the pressing climate issues of water scarcity, heatwaves, biodiversity loss, sea-level rise, and flash floods.

In September 2024, the International Federation of Landscape Architects (IFLA) issued a "Code Red for Earth" declaration.[118] It accentuates the need for immediate collective measures against environmental crises. The declaration highlights the role of landscape architecture in responding to climate change and driving sustainable development. Although it has not yet begun integrating such measures, the IFLA's national association in Egypt, the Egyptian Society of Landscape Architects (ESLA), incorporated in October 2023, aims to encourage, advocate, and broaden the role of landscape architects, in recognition that they can address multifaceted climate challenges during their planning, design, policymaking, and implementation efforts while integrating social science concepts, environmental design, and urban planning.[119] Landscape architects operate at multiple scales, from national or regional strategies down to site-specific projects; their work involves translating environmental, economic, and social considerations into resilient designs. The American Society of Landscape Architects recognizes the profession as "one of the most diversified of the design professions."[120] It would be wise for Egypt to shift its perspective and to treat landscape architects as key, transformative participants in planning and mitigation efforts.[121] The ESLA should begin slowly integrating the recommendations outlined in the IFLA's Code Red for Earth declaration.

Addressing Climate Across Levels Through a Landscape Architecture Lens

Given its multiscalar and complex nature, combatting climate change requires tailored interventions that address different environmental, social, and economic factors across different levels and contexts. Given this requirement, landscape architecture should, and can, play a much bigger role, as it provides an integrated, site-sensitive, and interdisciplinary approach in designing resilient and adaptive spaces to respond to and mitigate climate risks. Landscape architects' proposed solutions attend to wide-scale environmental systems as well as localized community needs. This section discusses how landscape architects can work effectively at the national, regional, and local levels, highlighting their potential to connect policy and design while embedding sustainability principles into spatial practices.

National Level

At the national level, landscape architects can contribute to strategic planning and policymaking, extending their role beyond site-level design. Environmentalists, urban planners, and policymakers can set holistic national strategies to develop resilient systems against climate change.

Integrating Water Management Strategies

On a national scale, landscape architects play a strategic role in addressing land-use policy and management. They can contribute to urban planning frameworks by integrating green infrastructure into citywide water management strategies. For instance, the implementation of integrated water-resource management (IWRM) can be incorporated into national urban development plans to store, filter, and redistribute water resources efficiently.[122] Landscape architects can design water-sensitive landscapes to manage rainwater harvesting, as well as efficient irrigation systems that support agriculture.[123] Additionally, landscape architects can advocate policy reforms that instigate sustainable water management and ecological conservation. They can engage in public awareness programs to educate communities, farmers, and urban planners on water conservation practices, ensuring behavioral shifts toward sustainable water use.

Prioritizing Green Infrastructure and Cooling Systems

Prioritizing planning for public spaces, green corridors, green belts, and urban parks helps reduce UHI effects and enhance thermal comfort.[124] Landscape architects can employ climate-responsive land-use planning in city design processes to allocate enough green spaces, tree-lined streets, and shaded pedestrian zones; these kinds of areas become natural cooling systems and help lower surface and air temperatures.[125] Landscape architects could consistently design compact urban forms, while optimizing green building regulations that improve airflow and prevent heat pockets. Through long-term planning and nature-based solutions, landscape architecture can contribute to policy frameworks and urban design

guidelines that integrate green infrastructure. Green urban development will facilitate the reduction of urban heat stress and thereby improve public health, social equity, and livability in Egypt's growing cities.[126]

Regional Level

Egypt's diverse landscapes have varying environmental challenges that require tailored landscape architecture strategies. Regional interventions focus on managing large-scale ecological systems to enhance climate resilience in vulnerable regions such as coastal zones, flood-prone areas, and agricultural lands.

Coastal Zones: Managing Erosion and Sedimentation

Coastal erosion is driven by rising sea levels and human interventions. It eats away valuable land and threatens urban settlements. Sediment buildup in coastal zones disrupts coastal ecosystems. Different nature-based solutions have been implemented to absorb wave energy: the planting of mangroves, salt marshes, dune stabilization, and artificial reef systems.[127] Without such integrated approaches, traditional hard infrastructure (for example, seawalls) often exacerbates erosion in adjacent areas and disrupts natural coastal processes.[128] In Egypt's vulnerable areas such as Alexandria and Port Said, landscape architects can introduce living shorelines, combining vegetation, rocks, and other natural elements to protect coastal infrastructure while maintaining ecological functions. Strategically, landscape architects can contribute to regional land-use master plans for vulnerable coastlines, restrict high-risk developments, and promote sustainable zoning regulations.[129] Landscape architects should work with local governments, coastal engineers, and community participants to promote longer-term coastal management policies that embody resilience-oriented urban design and community-based adaptation planning.

Red Sea Mountain Range: Enhancing Flood Management and Community Resilience

In the region of the Red Sea Mountain range, wadi floors become channels for destructive floodwaters during sudden rainfall events. Landscape architecture designs can integrate watershed management systems that balance floodwater retention and infiltration. Check dams and terracing (the creation of sloped landscapes) can slow water flow, reduce erosion, and allow gradual groundwater recharge.[130] Landscape architecture techniques can integrate retention basins into wadi landscapes to act as natural floodwater storage zones.[131] Additionally, through vegetation-based strategies, such as planting native drought-tolerant species along wadi edges, these techniques can further stabilize soils and enhance the landscape's ability to absorb excess water. By conducting regional flood risk assessments and developing land-use zoning guidelines, landscape architects can assess the projected flood risks to help prevent the construction of settlements in wadi floors. They can incorporate community knowledge into flood management plans to achieve culturally appropriate and socially inclusive designs.[132]

Agricultural Areas: Combating Saline Intrusion and Agricultural Resilience

Agricultural lands in the Nile Delta suffer from intensified soil salinization and waterlogging.[133] In collaboration with farmers and local authorities, landscape architects can propose sustainable system solutions for water management and soil salinity mitigation in agricultural areas. The restoration of coastal buffer zones is important for creating natural barriers against saline water intrusion and for stabilizing shorelines.[134] A primary approach employed in other countries involves coordination between landscape architects and farmers to apply precision irrigation systems, such as drip and sprinkler systems, as well as to introduce salt-resistant crops.[135] Landscape architects can also integrate agroforestry systems to regulate water and sediment flows, further enhancing soil fertility and reducing flood and pest control.[136]

Local Level

Landscape architects can also implement site-sensitive, context-specific strategies to mitigate climate risks. Local interventions generally have a direct and immediate effect on both communities and infrastructure and are therefore capable of bolstering social resilience and economic feasibility. The interventions can vary in scale and context and often focus on private developments, public spaces, coastal resorts, urban parks, streetscapes, community gardens, and infrastructural landscapes.

Mitigating Urban Heat Islands Through Green Infrastructure

In collaboration with engineers, landscape architects can play a leading role in implementing green infrastructure in cities and communities to provide a cooling effect during extreme heat events. Green infrastructure alleviates UHI risks by introducing more vegetation in streetscapes, roofs, and facades.[137] Urban trees and green roofs not only provide shade and cooling through evapotranspiration but also filter harmful airborne particles such as carbon dioxide. The design of green infrastructure helps create wind corridors that improve airflow and disperse trapped heat. Landscape architects work with various policymakers and urban planners to design public parks and gardens for the overall well-being of communities. They also shape local mandates and guidelines that encourage the implementation of tree canopies, pocket parks (a small urban green space, often on unused land), and building retrofits that mitigate heat.[138]

Setting Up Alternative Water Systems

Landscape architects can help rectify the disparity in water access through IWRM frameworks.[139] For example, landscape architects can design local water distribution hubs and water collection points to provide underserved neighborhoods consistent and reliable access to clean water. They also can retrofit aging water infrastructure in vulnerable areas to reduce losses because of leakages.[140] Other strategies include designing appropriate rainwater harvesting systems in public spaces and on rooftops to enable communities to collect and

store rainwater for domestic and agricultural purposes. Alternatively, landscape architects can design unconventional solutions for more resource-efficient recreation landscapes. One such solution includes implementing desert-adapted systems in golf courses for reduced water consumption, such as precision irrigation systems that deliver water directly to crops in precise amounts and times. Other solutions involve the introduction of native, drought-tolerant vegetation and the installation of gray water treatment plants to repurpose treated water in irrigation.[141]

Introducing Native Plant Species

To combat the loss of biodiversity, landscape architects can utilize ecosystem-based design strategies that integrate biodiversity conservation into restorative planning. For instance, they could help restore coastal buffer zones within marine environments by planting mangroves and salt-tolerant vegetation. Such strategies could stabilize shorelines and reduce coastal erosion.[142] Within agricultural landscapes, they could establish agroforestry systems to mitigate runoff and reduce the loss of natural habitats. Landscape architects could also interplant native and pollinator-friendly plants with crops to create habitats for pollinators and beneficial insects. Further interventions include the planting of riparian buffer zones along agricultural fields to filter runoff, prevent pollutants from entering water systems, and ultimately protect aquatic habitats.[143]

Recommendations

The growing climate crisis places greater demands on landscape architects to create adaptive, resilient, and sustainable environments. Multidisciplinary responses to the growing climate risks among natural and built landscapes require strategies that range from preservation and protection to transformative design. These recommendations identify specific ways forward to emphasize the protection of natural landscapes and changes to built ones, for landscape architecture to be fully operating within the frameworks of climate resilience, policymaking, and urban planning. Effective uptake of the recommendations and approaches will require governments, institutions, educators, and practitioners to work in closer collaboration.

Preserve and Protect Existing Natural Landscapes

The conservation and protection of natural landscapes is fundamental to limiting biodiversity losses, achieving ecological balance, and increasing climate resilience. Landscape architects should emphasize the restoration of degraded ecosystems, protection of vulnerable habitats, and inclusion of nature-based solutions during the large-scale planning of environments. Key strategies should involve mangrove and wetland restoration, afforestation projects, and the creation of biodiversity corridors to connect habitats. Water-sensitive design and soil conservation practices are also critical aspects in natural resource protection. Landscape architects must support establishing sufficient environmental controls and

collaborate with ecologists, urban planners, and policymakers to preserve natural systems in urban and rural areas. Public awareness and participation campaigns will then be needed to ensure that these preservation strategies find acceptance and continue at the local level.

Change Practitioners' Approaches to Landscape Design

Transforming built landscapes is also a necessity to alleviate climate risks, including UHI effects, water access issues, energy disruptions, and biodiversity loss in burgeoning cities and concrete jungles. By integrating green infrastructure and climate-adaptive design in existing infrastructures, landscape architects can help reduce ambient temperatures and improve air quality in densely populated cities. Permeable pavements and rainwater harvesting systems should be commonly installed within urban developments for better water management. Additionally, resilient shoreline designs should be integrated into coastal city and resort development plans to stabilize dunes and reduce the impacts of sea-level rise and coastal erosion. In support of these efforts, the government should implement policy reforms to ensure that principles of climate-sensitive design are included in building regulations, urban master plans, and public infrastructure projects.

Conclusion

Climate change poses multiscalar risks that impact all environmental, social, and economic systems in Egypt. Though Egypt has become more active and engaged in the global dialogue on climate change, its international commitments are not entirely mirrored by local actions and policy reform. Domestic efforts have mostly been limited to forming climate committees that are not fully empowered to alter or influence existing government plans and policies. Thus, the country remains vulnerable to extreme climate hazards. Within institutional efforts, a more interdisciplinary framework needs to be applied to engage additional stakeholders capable of providing valuable contributions, including landscape architects.

Beyond mere design, landscape architecture encompasses policy advocacy, ecological restoration, resource management, and community outreach. Nationally, landscape architects could promote integrated frameworks for water resource management, green infrastructure, and sustainable agricultural practices. Regionally, they could help address coastal erosion, the flooding of wadi floors, and soil salinization and waterlogging in agricultural areas through employing ecosystem-based design strategies along with spatial planning interventions. And locally, they could use public green spaces, water-sensitive urban designs, and biodiversity conservation to increase climate resilience in cities.

Despite their capacity, however, landscape architects remain underutilized; their role is often sidelined in policymaking, institutional planning, and educational systems. Acknowledging the critical role of landscape architects within education systems, institutional frameworks,

and policy agendas is necessary, not only recommended. There is also a pressing need to integrate landscape architecture more comprehensively into climate governance frameworks and adaptation plans. The ESLA is currently expanding the role of landscape architecture beyond aesthetics. It emphasizes its impact on climate change, policy, and environmental planning. The ESLA collaborates with IFLA Europe's Mediterranean Network (MedNet), IFLA Middle East, and IFLA Africa to produce accessible academic and professional publications, including academic papers, professional booklets, and visual brochures, to raise awareness about the role of landscape architects in addressing climate change. ESLA has also redefined its membership criteria to formally recognize landscape planning as an integral part of the profession. The field of landscape architecture in Egypt is largely limited to aesthetic design for public spaces, and private compounds. Now, new members are required to understand and integrate landscape planning principles. This accentuates a more holistic approach to the profession. In addition, ESLA has been actively engaging with government stakeholders like the Ministries of Housing, Environment, and Tourism. Discussions are underway to formally incorporate landscape architects into government consultancies. This will allow Egypt to implement environmentally responsible planning at the national level. Finally, ESLA is collaborating with NGOs focused on climate change and environmental protection. It is currently advocating for the protection of Egypt's Mediterranean and Red Sea coastlines from mass tourism and destructive land modifications that prioritize resort development over ecological preservation.

09

Energy Transition in the Gulf: Best Practices and Limitations

Aisha Al-Sarihi

The global momentum to transition away from fossil fuels presents both unique challenges and opportunities for Gulf states. Oil and gas wealth has propelled Gulf economies to become some of the wealthiest worldwide, while also enabling these highly climate-vulnerable countries to withstand severe climate impacts such as rising temperature, water scarcity and food insecurity. The transition away from fossil fuels therefore poses an existential threat for Gulf nations—potentially eroding their primary sources of income and diminishing their capacity to cope with escalating climate challenges. At the same time, however, the transition offers vast economic opportunities that align with their diversification ambitions, as well as supports global efforts to mitigate the severe climate change effects that could imperil their future economies. With this in mind, it is useful to examine Gulf countries' various approaches to the energy transition, while highlighting key climate initiatives and limitations that may aid or hinder progress across the region.

Seeing the Energy Transition Through a Dual Lens

The final agreement of the 2023 United Nations Climate Change Conference (COP28)—which emphasized a "transition away from fossil fuels"—underscores that long-term dependence on oil and gas is unsustainable and raises concerns about the future of Gulf economies. Yet Gulf nations have long been aware of the need to diversify their economies to reduce their heavy reliance on fossil fuels. This recognition stems from historical exposure to oil price fluctuations caused by various factors, including geopolitical conflicts, market demand shifts, and shocks such as the COVID-19 pandemic.

In this context, Gulf governments are viewing the energy transition through a dual lens of challenges and opportunities. On the one hand, the transition is proving difficult because decoupling economic growth from hydrocarbon revenues threatens the countries' core economic structure. On the other hand, the need for diversification—further reinforced by energy security concerns—is driving Gulf nations to develop strategies that enhance economic resilience and reduce hydrocarbon dependency. Decarbonization, therefore, becomes a complementary goal, as Gulf countries seek new strategies to secure a competitive edge in an evolving energy landscape. For example, both the United Arab Emirates (UAE) and Saudi Arabia have announced net-zero emissions targets and national climate strategies to support these targets, such as the UAE's Net Zero 2050 Strategy and Saudi Arabia's Circular Carbon Economy. Notably, however, they have also announced plans to continue production and export of oil, albeit with variant timelines.

Gulf nations face the complex task of balancing the costs of an energy transition with the need to maintain governmental revenues, economic growth, and resilience capacity against climate impacts. This task is then compounded by challenges in ensuring that the policies, regulatory frameworks, and human capacity needed to operationalize the energy transition are in place, as well as by technical hurdles associated with adopting clean energy technologies.

Balancing Transition Costs with Economic Growth Concerns

Natural limitations, related to Gulf states' arid and semi-arid climates, are major challenges to the region's transition away from fossil fuels. The Gulf is one of the world's most water-stressed regions, and oil and gas export revenues have enabled its countries to both import and operate the desalination technology needed to produce potable water. The region accounts for nearly 40 percent of the world's desalination capacity. Additionally, the Gulf has high food insecurity, and fossil fuel revenues have enabled countries to import nearly 50–90 percent of their food: Qatar, Bahrain, and the UAE import 80–90 percent of their food; Oman approximately 50 percent; and Kuwait and Saudi Arabia sometimes up to 70 percent. Meanwhile, oil and gas revenues have helped Gulf nations to meet increasing cooling technology demands, especially during summer heatwaves. Numerous countries have experienced heat records in recent years: Kuwait (63 degrees Celsius in 2019), Saudi Arabia (55 degrees Celsius in 2019), and the UAE (50 degrees Celsius in 2023). Studies show that air conditioning makes up 70 percent of the Gulf's peak electricity consumption, and the number of cooling units is expected to increase even further over time due to population growth and rising temperatures.

Given this reality, it is clear that rolling out clean energy policies and regulations presents major socioeconomic challenges to Gulf states. But equally apparent is the shrinking shelf life of the Gulf's hydrocarbon dependence. As countries around the world implement their current and updated Paris Agreement action plans, fossil fuel–producing countries will be greatly affected. Measures including the scaling up of clean technologies, carbon

taxes, carbon border tax adjustments, carbon standards and labelling, and cap-and-trade schemes and related offsets will all have an impact on trade and economies. As commodity-dependent economies, Gulf countries will potentially face the prospect of significant revenue losses as countries reduce their reliance on fossil fuels and impose restrictions. And these revenue losses will not only affect those working in the oil and gas industry, but also many people working in the public sector. One way Gulf governments distribute hydrocarbon revenues to their people is through large and well-paid public sectors, wherein more than half of employed citizens work in the public sector.

Socioeconomic consequences may also arise from the implementation of climate-related policies. One way to reduce dependence on fossil fuels and financially support an energy transition is to reduce or remove subsidies. Although not primarily driven by environmental concerns, Gulf governments have introduced various reforms to long-standing fossil fuel subsidies, particularly following the decline in crude oil prices in 2014. In 2015, the UAE cut back on its subsidies for fossil fuels, eventually eliminating them entirely by 2018. At that point, a 5 percent VAT was introduced on petrol and diesel. This did not apply to crude oil and natural gas. Similarly, Oman has reduced subsidies on petrol and diesel while implementing price caps to protect low-income groups. In Saudi Arabia, as part of its economic diversification strategy called Vision 2030, the government increased domestic gasoline prices in January 2018, linking domestic gasoline prices with international prices while also introducing the Citizens' Account to protect lower-income households from such reforms. Mild protests by low-income groups took place in light of these subsidy reforms asking to cap fuel prices. Similar socioeconomic consequences may arise should Gulf governments fail to balance fiscal spending and maintain the fiscal stability necessary for ensuring affordable access to goods and services.

Introducing higher prices or taxes on fossil fuels may result in unintended consequences as well. Carbon pricing, for instance, assigns a cost to the carbon content of fossil fuels and serves as a tool to reduce emissions. By placing a financial burden on carbon-intensive industries, carbon pricing incentivizes them to either absorb the cost of emissions or transition toward more sustainable options. None of the six Gulf states have implemented carbon prices so far. A major concern for Gulf countries about setting a price on carbon is that it would discourage foreign direct investment and suppress expansion in the oil sector.

Gulf Energy Transition Strategies

Most Gulf countries have adopted a dual energy transition approach that maximizes the value of hydrocarbons while expanding investments in clean energy resources. Such an approach allows them to maintain their competitive edge, long established through decades of expertise in the hydrocarbon sector, while simultaneously building clean energy leadership amid ongoing uncertainties associated with clean energy. But the countries are using different strategies to implement this approach. While the UAE aspires to exploit reservoirs for hydrocarbons as quickly as possible, Saudi Arabia seeks to extend the production and

export of hydrocarbons as long as possible. Qatar, the only Gulf country not to commit to net-zero emissions goals, views liquefied natural gas, its major export, as a bridging fuel in the transition away phase. And while Oman—left with not sizeable oil and gas resources compared to its neighbors—is taking a leap of faith in clean energy, Kuwait continues to reaffirm its reluctance to transition away from fossil fuels and Bahrain remains on the fence.

Maximizing the Added Value of Hydrocarbons

For decades, the Gulf's competitive advantage has revolved around hydrocarbon production and exports. The region has been central to maintaining the stability of global economies, given that it is home to about 30 percent of global oil reserves and 21 percent of natural gas reserves and it controls around 23 percent of global oil production and 28 percent of oil exports.

In having low-cost, low-carbon content fuels, Gulf nations aim to maintain their market share in climate-constrained energy markets. While they reached a deal at COP28 to transition away from fossil fuels, replacing these fuels will be a daunting task, especially since alternative energy sources such as renewables have yet to reach the needed level of maturity and reliability. In fact, energy outlooks designed to unlock climate-compatible futures show that fossil fuels will need to continue to meet future energy needs but in limited sectors compared to today's share. For instance, even though, as the International Energy Agency suggests, oil and gas supply will decline by more than 80 percent by 2050 if the global community meets net-zero emissions targets, this means that a proportion of the world's energy will still come from hydrocarbons even after 2050. Thus, with their long-standing comparative advantage, Gulf nations are likely to maintain a share in the future hydrocarbon market beyond 2050. Under the assumption that fossil fuels will continue to play a role in decarbonized, net-zero emission transition pathways, Gulf nations are pursuing pathways that will maximize the value of hydrocarbon resources with the lowest emissions possible.

Meanwhile, given the ongoing decarbonization trends and increasing global demand for refined and petrochemical products, Gulf countries are expanding in downstream industries both locally and globally. Gulf total refining capacity dramatically increased from more than 5.7 million barrels per day in 2019 to 6.5 million barrels per day at the beginning of 2023. Four new refining projects were completed in 2024, including three in the Gulf: Al-Zour in Kuwait, Duqm in Oman, and Jizan in Saudi Arabia. According to the International Energy Agency, petrochemicals are expected to account for over a third of the growth in oil demand to 2030 and nearly half to 2050.

With shrinking fossil fuel markets, Gulf countries are securing long-term markets for their hydrocarbon exports. Gulf countries have bought stakes in multiple refineries overseas. Saudi Aramco has bought stakes in refineries in China, South Korea, the United States, and Malaysia, and may join a new mega refinery in India. Similarly, the Kuwait Petroleum Company has purchased a 35 percent ownership and operational stake in a refinery in

Vietnam, the UAE's Abu Dhabi National Oil Company (ADNOC) has acquired a 30 percent equity stake in Azerbaijan's Absheron Gas Field, and Mubadala Petroleum is the second-largest producer of crude oil in Thailand.

Most overseas investments are concentrated in Asia, which is expected to be the center of energy demand in the future, but Gulf nations are also investing in both renewable and nonrenewable sectors in less stable, hydrocarbon-rich areas like Iraq and Lebanon, as well as emerging energy economies such as Azerbaijan. Of course, these investments do not come with economic guarantees; they are largely being driven by domestic energy security issues related to growing energy demands, population growth, industrial expansion, and mounting ambitions to diversify economies.

Investing in Clean Energy Sources

Gulf countries are simultaneously investing in clean energy sources and balancing hydrocarbon expansion ambitions with essential steps toward a diversified economy and energy mix. Gulf governments recognize that making advancements in clean energy, such as through investments in green and blue hydrogen, is essential to remaining competitive in rapidly changing energy markets.

Almost all Gulf governments have committed to achieving net-zero emissions by or around 2050. National oil companies are also stepping up to contribute to the journey of green transformation: the UAE's ADNOC moved its net-zero target from 2050 to 2045, Saudi Aramco set an ambitious target to reach net-zero by 2050 (ahead of the state target), and Petroleum Development Oman plans to become a net-zero company by 2050.

But to fulfil their commitments, Gulf countries are adopting different national energy transition strategies aimed at scaling up investments in alternative clean energy resources. These strategies include Oman's National Strategy for an Orderly Transition to Net Zero, Qatar's National Environment and Climate Change Strategy, Saudi Arabia's cross-sectoral Circular Carbon Economy approach, and the UAE's Green Growth Strategy.

Renewable energy, energy efficiency, hydrogen, and carbon capture and storage (CCS) are central to these energy transition strategies. Renewable energy resources, especially solar and wind, are available in abundance across the Gulf states. Having set targets for renewable energy expansion and rolled out policies and regulations to support their expansion, Gulf renewable energy installed capacity has increased from less than 500 megawatts in 2017 to nearly 4,000 megawatts in 2022.

Nuclear energy is also a part of the mix. Last year, the UAE completed the fourth stage of its nuclear power plant, with the aim to meet 25 percent of its electricity needs from nuclear energy. Saudi Arabia is also exploring civil nuclear activity to meet increasing domestic energy needs and meet its net-zero emission commitment.

Additionally, Gulf Arab states are investing huge resources to tap into hydrogen potential. In 2023, Saudi Arabia invested $8.4 billion in a green hydrogen plant to be built in its developing region called NEOM (which means "new future"). The UAE, meanwhile, showcased its first operational plant at Expo 2020 Dubai. Oman established a national hydrogen company, Hydrom, in 2022, and designated locations for hydrogen production that are ready for foreign direct investments. The Gulf region is home to fourteen hydrogen projects that are scheduled to go online by the end of this decade.

Given the region's ambitions to both expand hydrocarbon sectors and simultaneously cut greenhouse gas emissions, investing in CCS facilities is a top priority for Gulf countries. There are currently three major CCS facilities in the Gulf, accounting for 10 percent of global capture capacity: two in Saudi Arabia (Aramco's Uthmaniyah Carbon Dioxide Enhanced Oil Recovery Demonstration Project and the Saudi Basic Industries Corporation's Jubail carbon dioxide to chemicals plant) and a third in the UAE (the al-Reyadah project). At COP27 in 2022, Saudi Aramco is set to build one of the world's largest CCS hubs in Jubail Industrial City, with operations beginning in 2027. In its first phase, the facility will capture and store 9 million mtpa of CO_2, contributing to Saudi Arabia's goal of managing 44 million mtpa by 2035.

Supporting Homegrown Climate Innovations

Gulf countries also realize that without endorsing homegrown innovations and innovators (in other words, a knowledge-based economy), their oil-dependent economies will not be resilient or sustainable in the long run. To this end, Gulf states have made the transformation to a knowledge-based economy a main component of their economic diversification visions. Almost all Gulf governments have established non-hydrocarbon economic sectors in areas such as energy, water, agriculture, digital economy, health, and education. For example, in aiming to promote a culture of innovation, the UAE established a National Innovation Strategy in 2014; Oman renamed the Ministry of Higher Education to the Ministry of Higher Education, Scientific Research and Innovation in 2020; and Saudi Arabia established the Research, Development and Innovation Authority in 2021.

Water desalination, agriculture, food security, clean energy, and electric vehicles are some of the top areas that Gulf countries have prioritized for mitigating and adapting to climate change and building economic competitiveness beyond oil. In Oman, scientists are making biodiesel from dates that are abundant in the country. In a step to enhance homegrown food security, a UAE-based company has been growing mushrooms in chambers with high air pressure.

Local manufacturing of clean energy technology is also gaining momentum. For instance, Saudi Arabia is home to solar panel manufacturers such as Masdar Solar by Bin Omairah Renewable, with an annual production capacity of 1200 megawatts, and Desert

Technologies, with an annual production capacity of 5000 megawatts. In October 2024, Oman signed an agreement with China-based Drinda to build a major solar photovoltaic panel manufacturing project in the Sohar Freezone.

Additionally, Gulf countries are accelerating their local electric vehicle (EV) manufacturing. In March 2024, Oman unveiled its first electric SUV prototype, Mays Alive, with plans for a road debut later this year. Saudi Arabia also launched its first local EV manufacturer, Ceer, in partnership with Taiwan's Foxconn, targeting the production of various EV models by 2025 with an annual output of 150,000 vehicles. In 2023, Saudi Arabia's Public Investment Fund, in collaboration with Lucid Motors, established an international manufacturing facility in Jeddah. In 2022, Dubai's M Glory Holding Group launched its first EV manufacturing plant, aiming for 55,000 cars per year, while the UAE introduced its local Rabdan One SUV at ADIPEC 2023.

Energy Transition Strategies Beyond the Energy Sector

Carbon Markets and Nature-Based Solutions

To meet their net-zero emissions commitments, Gulf countries are also considering nonengineered low-carbon solutions such as carbon trading (or carbon markets). Carbon trading has been gaining momentum in recent years, with voluntary carbon exchange platforms being created across the region.

Qatar has been hosting the Global Carbon Council since 2016. In 2021, the Abu Dhabi Global Market, an international financial center, teamed up with the Singapore-based company AirCarbon Exchange to create a carbon trading exchange and clearing house, while the Kuwait Finance House teamed up with Kuwait's Sidra Initiative and Green Dream Team to create a carbon offset platform. In 2022, Saudi Arabia's Public Investment Fund and the Saudi Tadawul Group Holding Company created the Regional Voluntary Carbon Market initiative. And, in 2023, Bahrain's sovereign wealth fund Mumtalakat established a voluntary carbon offsetting platform called Safa. The next year, Oman established a national Green Alliance and a general policy framework for carbon markets to promote afforestation and unlock economic opportunities for carbon credits.

Gulf countries are expanding nature-based solutions as well. In late October 2021, Saudi Arabia launched two initiatives: the Saudi Arabia Green Initiative Forum and the Middle East Green Initiative Summit. The former aims to rehabilitate over 74 million hectares of land and restore Saudi Arabia's natural greenery by planting 10 billion trees across the kingdom. The latter aims to restore 200 million hectares of land by planting 50 billion trees across the Middle East.

Climate Science Education

Gulf countries recognize the importance of integrating climate change awareness and sustainable practices into educational curricula. In the UAE, the Ministry of Education has established a Green Education Partnership with the United Nations Children's Fund in order to train teachers and provide them with the climate education necessary to raise awareness and sustainable practices among students. At COP28, the UAE established the Greening Education Hub as the first of its kind in the history of COPs. In Oman, to equip students with essential knowledge and concepts related to the environment, its Environmental Authority announced in August 2024 that it would add environmental sciences to the school curriculum, starting with Grade 11 in the 2024–2025 academic year and expanding to Grade 12 in 2025–2026. Due to extreme weather events such as floods and cyclones, Oman's government and others in the region have also begun to integrate disaster risk management into educational policymaking.

Moreover, Gulf countries have adopted strategies to cope with the physical implications of extreme weather events, which have become more frequent and intense over the last few years. In April 2024, at least twenty-one deaths were recorded in Oman following the severe rainstorms and floods that swamped numerous Gulf countries, including Bahrain, Qatar, Saudi Arabia, and the UAE. Gulf countries—lacking the resilience and infrastructure readiness to cope with heavy rainstorms—are prioritizing efforts to build drainage infrastructure: following recent floods that engulfed the region, the UAE's government approved a $21.8 billion massive sewerage system plan.

Still, school closures and remote learning are becoming common practices during extreme weather events. And in response, online learning and digital infrastructures have advanced significantly, especially since the COVID-19 pandemic hit the world in 2020. Education technology (EdTech) platforms have been developed and integrated into most Gulf educational systems, offering personalized learning tools that cater to diverse student needs and create an inclusive learning environment.[144]

Energy Transition Limitations

Despite ongoing efforts to advance clean energy development in the Gulf, several challenges and constraints continue to hinder progress, including, to varying degrees, financing gaps, lack of clear implementation frameworks, and insufficient human capital readiness. Expanding the clean energy sector domestically necessitates structural transformations that may entail significant trade-offs, potentially affecting political stability.

Clean energy efforts are highly capital-intensive, requiring substantial financial commitments. To encourage private sector participation and attract foreign direct investment—both key components of the region's economic diversification strategies—governmental financial support is crucial. For super-rentier states such as Qatar, Saudi

Arabia, and the UAE, which benefit from sizeable sovereign wealth funds, financing green projects poses relatively minimal challenges. However, for smaller Gulf states, such as Bahrain and Oman, securing adequate government funding for clean energy initiatives remains a significant hurdle.

In other cases, while financial constraints may be less pressing, such as in Kuwait and Qatar, a lack of political will and the absence of a clear strategic framework impede progress toward energy transition goals. This can be largely explained by the abundance of oil and gas resources and limited confidence regarding the future comparative economic gains of alternative energy sources.

Human capital readiness is another issue that Gulf countries need to address in their pursuit of an energy transition. Unlike with the oil and gas industry, the scale of alternative energy investments is proportional to the size of the investment capital that may only last for a few years. This uncertainty may make job seekers reluctant to join the green energy sector and prefer instead the traditional energy or public sectors, which may provide more long-term job security. In addition, green energy jobs, except at the managerial level, pay less compared to jobs in the traditional energy market. Furthermore, Gulf nations still need to bridge the gap between education outcomes and green energy market needs. The lack of policymaking confidence in the long-term sustainability of green energy investments leads to reluctance in integrating green energy education into the education sector. Note, however, that progress is being made in this area. Gulf nations have opened doors for green energy and sustainability education and training through offering overseas scholarships for their nationals, many of whom have completed their degrees and aspire to participate in newly emerging green energy markets. This practice has thus put some pressure on policymakers to accelerate efforts in attracting green energy investments and to absorb the returning graduates specialized in green energy.

Yet, even in countries where financial resources, governance structures, and human capital do not present major obstacles—such as in the UAE—policymaking hesitancy persists. This reluctance stems from concerns over the commercial viability and technological maturity of clean energy solutions. Given that Gulf nations are not among the world's largest greenhouse gas emitters and that returns on clean energy investments may not match those of conventional energy projects, policymakers remain cautious about committing to large-scale clean energy investments.

Against this backdrop, Gulf governments are in a delicate position to optimize today's spending in order to achieve the national priorities of economic diversification, decarbonization, and climate resilience, while also maintaining the long-term fiscal stability crucial to avoiding any future political instability.

From a geopolitical perspective, as Gulf nations seek to maximize the value of hydrocarbons while expanding investments in clean, alternative energy resources, they are likely to compete in an anticipated volatile and shrinking energy market. Assuming that fossil fuels

will retain a role in net-zero transition pathways, Gulf countries are liable to compete in securing long-term contracts and partnership with importers. And this competition will intensify should oil markets face declining demand and oversupply while countries and companies around the world shift away from fossil fuels. Gulf nations will increasingly compete to secure buyers for both hydrocarbons and clean energy such as hydrogen and ammonia. Indeed, Gulf governments have already forged bilateral deals and agreements with governments and companies in clean energy, and they already show more variance in their international hydrogen alliances than similarity. In hydrogen partnership, for example, Oman, has bilateral deals with Belgium, Germany, the Netherlands, and the United States. Meanwhile, Saudi Arabia has a bilateral trade agreement with Japan and in March 2021 it signed a memorandum of understanding to enhance bilateral cooperation on hydrogen with Germany.

Signs of competition are already present between major Gulf countries such as Qatar, Saudi Arabia, and the UAE. In the race to attract foreign investments, Saudi Arabia recently required multinational companies to move their regional headquarters to Riyadh. The UAE hosted Expo 2020 in Dubai, as a means of using soft power to attract investments, and in response, Saudi Arabia secured the hosting of Expo 2030. Meanwhile, competition is clearly evident in other areas of diversification. After Qatar successfully hosted the 2022 FIFA World Cup soccer tournament, Saudi Arabia will host the 2034 FIFA World Cup and has increased its investment in sports, attracting top soccer players. Similar trends are being seen in tourism and entertainment: Royal Diriyah Opera House, Jeddah Opera House, and MDLBEAST are recent entertainment developments in Saudi Arabia that aim to attract 150 million tourists by 2030—almost four times the UAE's target of 40 million. Competition is also heating up in transportation: Qatar Airways and soon Saudi Arabia's Riyadh Air will be in constant competition with the UAE's Emirates airline. And Saudi Arabia's Port of NEOM and Jeddah Islamic Port are challenging the UAE's dominance as an air and sea transportation hub. In sum, the energy transition appears set to intensify the competitiveness already in full swing among Gulf countries in other areas of economic diversification.

In sum, Gulf nations face the complex challenge of balancing the costs of energy transition with the urgent need to diversify their economies and strengthen resilience against climate impacts. Despite efforts to reduce reliance on fossil fuels, oil and gas remain central to their economies and play a critical role in mitigating climate vulnerabilities. The region's arid climate imposes natural constraints on a full transition away from hydrocarbons, making a nuanced approach essential. It emerges that Gulf governments must carefully allocate resources to advance economic diversification, decarbonization, and climate resilience—while ensuring long-term fiscal stability to safeguard against future political instability.

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Notes

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5 Based on author interviews with Egyptian youth in December 2023 in Dubai.

6 Based on author interview with AFCD Foundation in January 2024 in Rabat.

7 Author interview with Wafa Hmadi in December 2023 in Dubai.

8 A slum household is defined as a group of individuals living under the same roof who lack one or more of the following essential conditions: access to improved water, access to improved sanitation, sufficient living space, durable housing, and security of tenure. This definition was established under Millennium Development Goal Target 7, which focuses on improving the lives of slum dwellers by addressing basic living conditions. This definition was adopted by the World Bank.

9 In contrast to petroleum-rich Libya and Algeria, Morocco is highly dependent on energy imports—particularly U.S. coal—to meet its power generation needs and, by one estimation, would deplete its fossil fuel reserves in little more than three days, given its current rate of consumption.

10 In tandem, Morocco collaborates with regional and international partners on its green energy projects through forums such as Emerge Green Africa and the African Coalition for Sustainable Energy and Access, thereby facilitating the dissemination and enrichment of Morocco's green energy innovation research.

11 This remarkable achievement is largely due to the construction of Morocco's Noor Ouarzazate Solar Complex, one of the largest concentrated solar farms in the world. Other relevant accomplishments include nationally funded public-private partnerships, especially the Research Institute for Solar Energy and New Energies, which has published hundreds of academic papers on climate adaptation and is creating green technology parks for green energy innovation labs. In addition to debt financing, Morocco's Central Bank has proactively funded these and other projects through energy taxation and investments in foreign exchange reserves. The UN-managed Green Climate Fund also furthers Morocco's green finance strategy.

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18 Interview with Najib Akesbi, Rabat, Morocco, April 24, 2024.

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