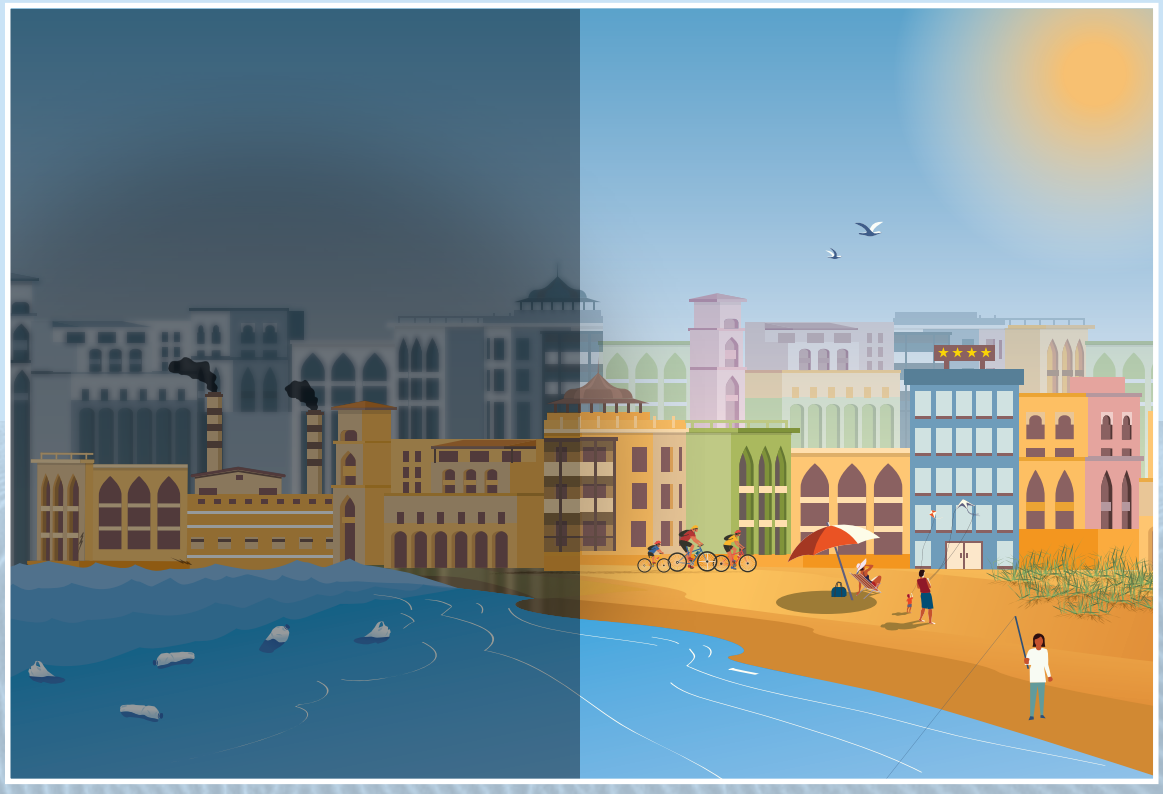
OVERVIEW

MIDDLE EAST AND NORTH AFRICA
DEVELOPMENT REPORT

Blue Skies, Blue Seas

Air Pollution, Marine Plastics, and Coastal Erosion in the Middle East and North Africa



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MENA DEVELOPMENT REPORT

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Overview

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Contents

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Executive Summary

INTRODUCTION

The economies of the Middle East and North Africa[1] have been hit hard by the COVID-19 pandemic, but the recovery brings with it an opportunity—to embark on new development paths that are greener, more resilient, and more inclusive. One crucial lesson from the COVID-19 crisis is that prevention is by far superior to any cure. As the Middle East and North Africa moves from the relief phase (where the focus rightly has been on public health and social protection) to the recovery phase, expansionary fiscal investments will play a critical role. Fiscal stimuli are crucial to kick-start economic growth (Hepburn et al. 2020). Given scarce fiscal resources, it is critical that the region seizes this window of opportunity to shed the old "brown" growth models and switch to a green, resilient, and inclusive development (GRID) path to help prevent the next crisis brought about by unsustainable economic growth.[2] A GRID growth path would have fewer emissions, less environmental degradation, and stronger ecosystems, while at the same time boosting resilience and inclusion, if managed properly (World Bank and IMF 2021).

To commit to a green recovery from the current pandemic crisis would help stem another advancing crisis—that of environmental degradation and climate change. Growing back greener and more resilient is the key to getting countries out of recessions and preparing them for the new normal, as opposed to the world of yesterday that locked them into their traditional growth paths. Whether the region's economies make the right type of investments now and in the coming years will determine their trajectories—economically, environmentally, and socially—for decades to come.

Building Back Greener: Returns and Trade-Offs

A green recovery will bring more jobs and growth than a brown recovery, especially in the long term. Besides avoiding the costs of environmental degradation, a green fiscal stimulus will create more jobs and deliver higher short-term returns per US dollar spent than a brown fiscal stimulus. A recent International Monetary Fund analysis showed that the returns of green investments in spurring gross domestic product (GDP) growth are indeed two to three times greater than the returns on comparable brown investments (Batini et al. 2021). Similarly, in a recent survey of more than 200 experts from finance ministries, central banks, and academia from around the world, the collective suggestion was that a green recovery from COVID-19 would be better not only for the environment but also for the economy (Hepburn et al. 2020). The fiscal experts argued that a green recovery strategy has higher economic multipliers, and they highlighted a number of priority investments, including in natural capital for terrestrial, marine, and coastal ecosystem resilience; restoration of carbon-rich habitats; clean mobility; resource efficiency; integrated land management systems; sustainable agriculture; and clean energy production.

Although the positive effects of such efforts are apparent, a green transition also comes with some trade-offs, at least temporarily. The decline of traditional brown industries implies that some people will lose their old jobs and that communities may face a temporary shortfall in tax revenue. Following the principles of a just transition, social protection schemes are important during the transition period to a green growth path, as are training and upskilling opportunities as well as support and active promotion of emerging green industries.

Human, Physical, and Natural Capital: Gains and Losses

In the Middle East and North Africa, residents' living standards (incomes, human capital, and infrastructure) have improved over the past three decades. Despite variations across economies, on average, real incomes have increased by around 40 percent,[3] and the region's people now live longer and are healthier and better educated than 30 years ago (as detailed in chapter 2). They have better access to water, sanitation, electricity, heating and cooling, transportation infrastructure, the internet, and telecommunications.

Not everyone has benefited, however. In countries affected by conflict—such as Libya, the Syrian Arab Republic, and the Republic of Yemen—residents have suffered not only displacement and the tragic loss of family and friends but also a collapse in living standards. Furthermore, challenges to inclusion persist: Youth unemployment is high. For many,

work is precarious and informal. And because women in some Middle East and North Africa economies, despite gains in education, lack the same opportunities as men, relatively few women are working outside the home.

Although the region's human and physical capital have improved overall, its natural capital has deteriorated in recent decades. This report reviews the performance of the region's economies on many environmental indicators, most of which show deterioration over the past couple of decades. Emissions increased, terrestrial and marine ecosystems deteriorated, natural habitat was destroyed, marine pollution and ocean acidification increased, and unsustainable water management increased water stress. Some economies and cities have shown positive developments in recent years, but to restore the region's degraded natural capital on a broader scale, more ambitious steps are necessary.

Among other environmental shortfalls, the Middle East and North Africa has been the world's slowest region in decoupling economic growth from air pollutants, and it has yet to decouple economic growth from carbon emissions). It is the only region in the world that has not decoupled economic growth from GHGs, and although the region has decoupled economic growth from some related air pollutants, it did so more slowly than any other region (as discussed extensively in chapter 2). This adverse trend is driven mainly by the region's oil exporting economies; however, non-oil exporting economies are also decoupling rather slowly.

The economic structure of oil exporters is heavily skewed toward the exploitation, processing, and exportation of their natural resources, resulting in high carbon and air pollutant emissions. Past efforts toward economic diversification often targeted sectors whose adverse effects are similar to those of the oil and gas sector (such as metal extraction and processing) or sectors that depend directly on it (such as the petrochemical sector).[4] The abundance of fossil fuels and their subsidized provision (for final consumption as well as feedstock and energy sources for industries) disincentivizes their economical use and impedes the spread of more-sustainable alternatives—for example, public transportation versus personal combustion vehicles or renewable energy sources versus thermal power plants burning fossil fuels—driving up emissions of carbon as well as air pollutants.

"Blue Capital": Threats to Skies and Seas

This report focuses on the Middle East and North Africa's "blue" natural assets—its skies and seas—which are under severe threat. Specifically, it addresses three of the most significant threats to blue natural capital:

- *Air pollution levels* in the region's cities are second only to those in South Asia. The average urban resident in the Middle East and North Africa breathes in air that exceeds by more than 10 times the level of pollutants considered safe (figure ES.1, panel a).
- *Marine-plastic pollution* is a severe and growing problem in the Middle East and North Africa. While there are regions that produce and leak more plastics in total into the seas, such as South and East Asia, MENA has the highest per capita footprint of plastics used and leaking into the region's seas and oceans. The Mediterranean is among the world's most plastic-polluted seas, with as much plastic

FIGURE ES.1

Urban Air Pollution, Marine-Plastic Pollution, and Net Coastal Erosion, by Region

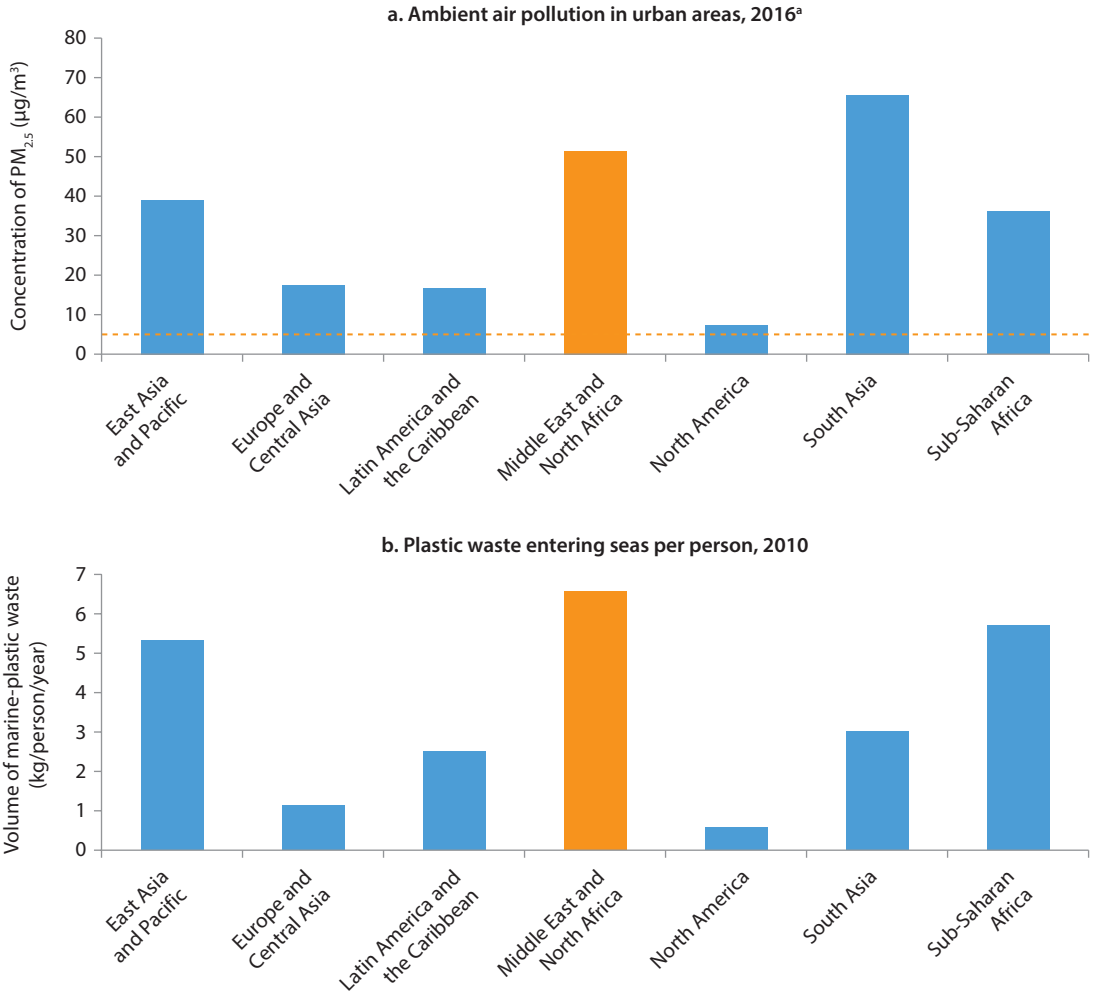

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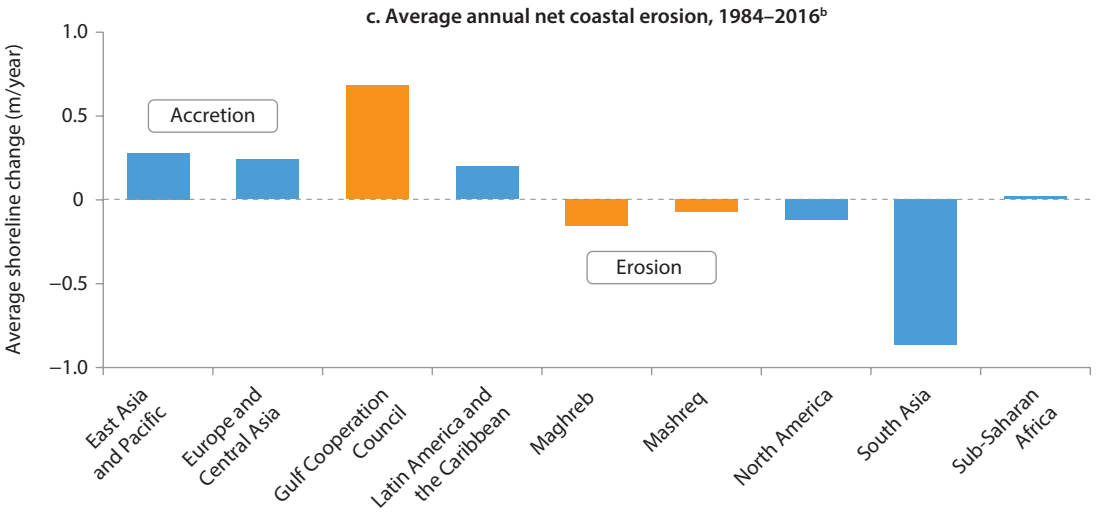
FIGURE ES.1

Urban Air Pollution, Marine-Plastic Pollution, and Net Coastal Erosion, by Region (*continued*)



Sources: Based on Jambeck et al. 2015; Luijendijk et al. 2018; and 2016 data from the World Health Organization's Global Health Observatory (https://apps.who.int/gho/data/view.main).
Note: "North America" includes Bermuda, Canada, and the United States. Orange bars designate the Middle East and North Africa region or its subregions.
a. Particulate matter (PM) is made up of solid or liquid matter associated with Earth's atmosphere and suspended as atmospheric aerosol (the particulate/air mixture). $PM_{2.5}$ is a fine particle of 2.5 micrometers. The orange line denotes the World Health Organization (WHO) $PM_{2.5}$ threshold of 5 µg/m³ (micrograms per cubic meter of air).
b. In panel c, positive values represent net coastal accretion, and negative values, net coastal erosion. Middle East and North Africa subregions are as follows: (a) Maghreb, including Algeria, Libya, Malta, Morocco, and Tunisia; (b) Mashreq, including Djibouti, the Arab Republic of Egypt, the Islamic Republic of Iran, Iraq, Jordan, Lebanon, the Syrian Arab Republic, West Bank and Gaza, and the Republic of Yemen; and (c) Gulf Cooperation Council, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

flowing into it each year as the volume of fish taken out from the two most commonly caught species.[5]

- *Coastal erosion* rates of the Maghreb's coasts are among the fastest in the world—second, again, only to South Asian coasts (figure ES.1, panel c). Coastal erosion rates in some Middle East and North Africa economies exceed the global average (7 millimeters per year) by almost 10 times.

WHAT IS AT STAKE?

Health and Livelihood

The depletion of blue assets has reversed some of the region's improvements in human and economic development, threatening lives and livelihoods. In the Middle East and North Africa, ambient

air pollution (AAP) costs the average resident at least 60 days of illness over their lifespan and caused 270,000 premature deaths in 2019. And the exposure of pregnant women to periods of elevated AAP has been shown to increase the risk of stunted growth in children. (The health effects of air and water pollution are further detailed in chapters 3 and 4.) In the Mediterranean, one of the world's most marine-plastic-polluted seas, plastic debris damages marine life (plants and animals) as well as human life, since microplastics (very small fragments of plastics) have been found in several human organs and are suspected to lead to significant health problems.[6]

Coastal erosion meanwhile relentlessly threatens to devour entire beaches and thereby the livelihoods of millions of people dependent on coastal tourism, fisheries, and related activities. The tourism industry and its connected value chains are a major source of employment and account for 10 percent or more of GDP in several of the region's economies, for example, in Morocco and Tunisia (as discussed in chapter 5).

Economic Growth

The environmental degradation of skies and seas is estimated to cost more than 3 percent of GDP in some of the region's economies. A review in this report (chapter 3) shows that the annual cost of AAP in Middle East and North Africa economies averages 2 percent of GDP—ranging from around 0.4 percent of GDP in Qatar to more than 3 percent in the Arab Republic of Egypt, Lebanon, and the Republic of Yemen. Productivity falls if residents cannot work after they or their family members fall ill from air pollution, and health care costs can be a substantial burden on both individuals and governments. In addition, coastal erosion destroys sectors such as tourism and fishing that rely on intact beaches and clean seas. The average annual costs of coastal erosion are estimated to be 0.6 percent of GDP in the Maghreb (the subregion most afflicted by coastal erosion), ranging from 0.2 percent of GDP in Algeria to 2.8 percent in Tunisia (see chapter 5). Finally, the annual costs of marine-plastic pollution amount to around 0.8 percent of GDP on average, reaching more than 2 percent of GDP in countries such as Djibouti, Tunisia, and the Republic of Yemen (see chapter 4).

Polluted air, marine spaces full of plastics, and changing coastal landscapes all decrease the efficiency of important economic sectors and make the region less attractive. AAP has been shown to decrease the energy yields of photovoltaic solar panels (for which the region holds great prospects) and also decreases agricultural yields, both by reducing workers' productivity and, through its impact on radiation, by affecting

temperature or precipitation. Air pollution can also decrease a city's attractiveness to tourists and its competitiveness by hemming its growth in population and value added. Marine-plastic pollution reduces fishery yields; damages ships and their equipment, increasing operational delays; and contributes to blocked drainages, thus increasing inundation risks and, potentially, disease outbreaks. Changes in the coastal landscape—mainly in the form of erosion but also accretion—impair the functioning of coastal infrastructure (for example, by damaging or blocking navigation paths near ports), and their impacts on biodiversity also have repercussions on coastal activities. The gradual disappearance, and the ever-higher pollution, of the region's beaches reduces their attractiveness, lowers tourism revenues, and decreases the competitiveness of coastal cities.

Trade and Competitiveness

In a world striving for net-zero emissions and phasing out fossil fuels, banking on green investments is critical for the Middle East and North Africa. It would allow the region to transition gradually to the "new normal" climate economy of the future instead of being stuck in the unsustainable economy of the past. Major economies like China, the European Union (EU), and the United States are pushing for substantial cuts in carbon emissions all along their value chains, with the EU and the US striving to be carbon neutral by 2050 and China by 2060. Overreliance on carbon-intensive fossil fuel industries is in direct contrast to global efforts toward phasing out fossil fuels and achieving net-zero emissions growth and can hence restrain the future economic performance of the Middle East and North Africa's economies. Even among the region's oil exporting countries—some of which are more exposed than others to the direct effects of trade measures such as carbon border adjustment mechanisms, as envisaged in the European Green Deal—the indirect effects of decreasing oil prices resulting from lower global demand can be substantial. Green growth is hence imperative, not only to reduce the current social and economic costs of burning fossil fuels—costs that air pollution is already imposing—but also to prepare the region's economies for the future.

Sticking to the traditional "brown growth" paths will leave the Middle East and North Africa at risk to end up with stranded assets and outdated business models. Where fiscal space allows it, countries globally are ramping up investments as stimulus to overcome the economic crisis caused by the COVID-19 pandemic. The Middle East and North Africa is no exception. The investments made now and in the coming years in response to this crisis will shape the trajectories of the region's economies for decades in terms of both economic advancement and environmental sustainability. Directing these investments

toward sectors that will likely be at odds with global decarbonization trends is not prudent. The EU's recovery program plans to allocate 37 percent of its €800 billion stimulus for climate-friendly investments (IMF 2021). Similarly, the United States plans for large green-infrastructure investments as a response to the pandemic.[7] With the global push to decarbonize value chains and trade—for example, through the European Commission's proposed introduction of a carbon border adjustment mechanism—it becomes ever more important for Middle East and North Africa economies to increase efforts to avoid ending up with stranded assets and outdated business models. This is especially true for the economies strongly relying on fossil fuel exports, considering that large shares of fossil fuels must remain unextracted to meet the 2015 Paris Agreement targets for limiting global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius (Welsby et al. 2021).

Tackling air pollution, marine-plastic pollution, and coastal erosion will deliver considerable benefits, whether from an environmental, social, or economic perspective. Given the costs that these issues impose and the fact that climate change will exacerbate many of their adverse effects, setting changes in motion toward more sustainable management of blue assets is paramount. The restoration of the region's skies and seas will bring benefits on many fronts but also require strong policy responses to the various factors driving their degradation. Therefore, it is necessary to identify those factors and formulate appropriate strategies to get a grip on them.

WHY ARE THE REGION'S BLUE ASSETS DETERIORATING?

The Middle East and North Africa's blue natural capital is deteriorating for numerous reasons, many of which necessitate a collective answer from public authorities. Among these reasons, the region's economies lag in a range of areas when benchmarked against international best practices. Problematic areas include sending the wrong price signals by subsidizing polluting behavior; setting weak rules for limiting polluting activities as well as for enforcement of those rules; and lacking comprehensive management plans, whether for waste treatment or coastal development. These weaknesses both perpetuate and exacerbate the degradation of the region's blue assets.

Low environmental standards in the transportation and industry sectors as well as inefficient use of resources and burning of waste contribute to the continued pollution of the region's air. Outdated vehicle fleets, often lenient emission standards,[8] low-quality fuel that is often heavily subsidized and the cheapest globally, and inadequate

public transportation all increase the transportation sector's contribution to lower air quality. Industrial emissions are often not well regulated, with the region's economies lagging in air quality laws and regulations (UNEP 2017).[9] The Middle East and North Africa uses a large amount of energy, of which more than 95 percent is derived from fossil fuels (Menichetti et al. 2019), to produce a given amount of economic output. As for energy intensity, the region is moving in the wrong direction: the Middle East and North Africa is the world's only region where energy use per output (BTUs per ton of output) has increased in the past three decades. Furthermore, clean-production incentives are largely absent, with the Middle East and North Africa the only region that has neither put nor initiated a price on carbon in the form of a carbon tax or an emissions trading system (World Bank 2021). Additionally, regulations regarding waste burning (both municipal and agricultural) are often poorly enforced, and the practice is still common in some Middle East and North Africa economies, contributing to the deterioration of the region's skies.

Weak solid waste management (SWM) in the Middle East and North Africa is a major reason why so much plastic is flowing into the region's seas. Especially in the Maghreb and the Mashreq subregions, a large share of waste (including plastics) is mismanaged. These deficiencies not only have an adverse impact on marine plastics[10] but also have important ramifications for air quality because of uncontrolled waste burning. Low recycling rates and few alternatives for reusing plastics help exacerbate the plastic tide. Price discrepancies between plastics and their greener alternatives as well as between virgin and recycled plastics are major reasons for the low adoption of these environmentally less harmful options. These discrepancies are driven largely by heavy subsidization of feedstock and necessary energy (also derived mostly from fossil fuels) for petrochemicals, first and foremost in the Gulf Cooperation Council (GCC) countries.

Inadequate management of coastal assets, exacerbated by rapid expansion of development along the coasts, has increased erosion of the region's shorelines. Pressures from natural forces contributing to erosion, such as the frequency and intensity of coastal floods, will increase as a consequence of climate change. Ill-conceived adaptations have also created certain coastal erosion hot spots in the Maghreb. For example, although coastal protection infrastructure may protect a specific beach, it may obstruct the sedimentation flow down current and causes coastal erosion there. At the same time, the current absence of knowledge about the state and evolution of the region's coasts impedes proper management. Consequently, despite some progress, most Middle East and North Africa economies lack comprehensive frameworks for

coastal development. Strong urbanization pressures in coastal cities have contributed to the fragmentation of coastal areas and their management in an unintegrated fashion. Furthermore, watershed and river management (including dam construction without sufficiently considering its impact on sediment discharge) has reduced sediment transport to the coastline, exacerbating coastal erosion.[11]

Thus, numerous environmental challenges persist, and addressing them is imperative to conserve and restore the Middle East and North Africa's blue natural assets. Understanding these challenges and providing a way forward to build and strengthen the contribution of blue capital to the economy and human well-being will play a key role in the region's transformation toward a greener, more resilient, and inclusive development path. Although this path may be different for individual economies given their heterogeneous starting points and levels of development, it is also important to note that to be successful in restoring the blue assets, regional cooperation among economies is vital. The transboundary nature of air pollution, marine-plastics pollution, and coastal erosion highlights the need for regional cooperation on these issues (not to mention the positive knowledge spillovers from such cooperation).

WHAT SHOULD MIDDLE EAST AND NORTH AFRICA ECONOMIES DO?

The multifaceted problems affecting the region's skies and seas require integrated solutions that this report identifies as the "4 I's": *Inform* stakeholders, provide *Incentives*, strengthen *Institutions*, and *Invest in abatement options*. Each of these objectives is crucial for successfully tackling air pollution, marine-plastic pollution, and coastal erosion, as follows:

- *Informing the policy discussion* across stakeholders (such as the private sector, nongovernmental organizations, and civil society organizations as well as across government ministries) with evidence about the sources of negative externalities is imperative while also helping to avoid frictions between them where possible. Similarly, the broad and frequent dissemination of information to the public is important to increase awareness and nurture demand for change.
- *Providing incentives* to the private and public sectors as well as households—whether by increasing prices for polluting activities or by providing subsidies for greener alternatives—is a viable way of nudging actors to change their behavior and switch to more sustainable patterns of production, consumption, and disposal.

- *Strengthening institutions* is important to limit and lower air and plastic pollution as well as to manage and mitigate the uncontrolled development and erosion of the Middle East and North Africa coasts. This effort includes the development and implementation of legally backed, clearly communicated regulations and mandates; clearly defined competencies for the ministries and authorities enforcing them; and provision of a transparent legal framework for some of the incentive schemes.
- *Making sizable investments* can tackle the respective degradation of the region's skies and seas in certain areas, including improvement of SWM, expansion of renewable energy production and public transportation infrastructure, and promotion of sustainable options (such as nature-based solutions) to combat coastal erosion.

If residents of the Middle East and North Africa have access to good-quality information about degradation, it will raise public awareness and build stakeholder ownership for policy change—both key elements in successful solutions. More broadly, ensuring open access to information is important in building public trust, making it a fundamental element of a functioning social contract between government and people (World Bank 2019). Appropriate collection of environmental data requires investments not only in physical infrastructure (for example, ground monitoring stations for air pollution) but also in the *use* of technological advancements. The latter means training staff in the necessary skills, such as working with remote sensing data to detect coastal erosion patterns or conducting life-cycle analyses of plastic products.

Informing about air pollution. Even though many Middle East and North Africa economies monitor at least some air pollutants, many do not make this information publicly available in an easily comprehensible way. However, some have made progress in this regard. The United Arab Emirates, for example, now provides real-time information on air quality, with guidance on how to minimize pollution on the worst days. Public awareness campaigns should include messaging on health and other negative economic outcomes—thus conveying the importance of behavioral change; providing a rationale for new regulatory requirements; and also addressing younger residents, as the Qualit'Air program in Morocco did with a dedicated online learning platform.

Raising awareness about marine plastics. Residents need to understand the consequences of plastic pollution, not only for beaches, fisheries, and marine wildlife but also on drainage systems and public health. This will help build consensus for change, including for restriction of plastics use and the broader adoption of recycling. To that end, the Tunisian National Waste Management Agency, in cooperation with the Sweepnet network, set up a dedicated communications and

awareness office together with awareness-raising programs. It is also necessary to work with the plastics industry to jointly develop solutions and reach the youth to educate them about the consequences of excessive plastic consumption and inadequate disposal. This can be achieved through specialized campaigns on social media. One such effort is Jordan's "One Dead Sea Is Enough" initiative under the EU-funded SwitchMed project, which aims to induce a switch to a circular economy all along the southern and eastern Mediterranean.

Transparency about coastal erosion. In coastal areas, residents, municipalities, and affected industries need information on the processes behind erosion. This is key to building acceptance for policy changes that may involve restrictions on future development. Integrated coastal zone management (ICZM) processes also require open and transparent discussions of the impacts on different stakeholders.

Strengthening information about the sources of all three environmental issues is an important precursor to effective policy responses. High uncertainty remains about various drivers' contributions to the degradation of the skies and seas on a local scale. Which sector contributes how much to the pollution of a city's skies? Which cities, industries, and types of plastic products are the major culprits for the continuing flow of plastics into a subregion's seas? And which drivers—marine or terrestrial—cause the most coastal erosion? Obtaining clarity about these matters requires deep analyses in the form of source-apportionment studies for air pollution, life-cycle and flow analyses for plastic items, and geomorphological as well as wave-dynamics and sediment-transport studies for coastal erosion. Based on the information derived from these analyses and studies, locally specific policies can be tailored and adopted. Given the transboundary nature of cause-and-effect in the degradation of skies and seas, increasing regional cooperation is paramount. The sharing of knowledge and data across countries as well as across agencies *within* countries is important to guide policy makers in selecting the most effective policies.

"NO-REGRETS" POLICIES: A PRIORITY LIST

Even though source information is a crucial prerequisite for choosing the most effective policy mix, governments can readily take several priority measures to improve the management of their blue assets—their skies and seas. Just as the issues have multisectoral causes, the solutions must be multisectoral as well. Even as many questions persist about the drivers of negative externalities in many cities and countries—and related analytical work must be continuously supported—a set of

critical, no-regrets policies can be implemented now to hit the ground running. This Executive Summary briefly describes these priority policies, but the report's main chapters provide more information, including discussions of the distributional implications of certain measures and detailed reviews of a plethora of additional policies. Table ES.1 summarizes some of the most critical measures, highlighting their main objectives and time horizons in the respective problem areas. As it shows, some of these priority recommendations apply to more than one sector, implying possible cross-benefits or similarities between them. Given these synergies, cooperation across sectors is highly desirable to increase the measures' efficiency and effectiveness.

Air Pollution

Regional modeling shows that, for the Middle East and North Africa's residents, the largest contributors to ambient air pollution are (a) road vehicles, (b) municipal waste burning, and (c) industrial processes. In addition, agricultural waste burning is a key source (especially in North Africa) as well as power plant emissions (especially in the Middle East), as further discussed in chapter 3.

Urban Transportation

In cities throughout the Middle East and North Africa, urban transportation is a significant contributor to air pollution. Improving urban planning and traffic management and supporting modal shifts from motorized personal transportation to public transportation (also supporting the greening of public transportation) and to nonmotorized personal transportation are key steps to take. Increasing fuel prices, especially in countries where the prices are extremely low (because of existing subsidies), is another critical step because it incentivizes people to use fuel-efficient or noncombustion cars and also to switch to public transportation and nonmotorized options. Several economies in the Middle East and North Africa have initiated such reforms even though some of them unfortunately backtracked partially during the COVID-19 pandemic. However, it is also important to consider the adverse impacts of such reforms on low-income households and critical to make timely provisions for compensatory measures, such as reducing income taxes or increasing social transfers to those affected most.

Expanding public transportation and raising fuel prices (by removing fossil fuel subsidies) have both proven effective in reducing air pollution levels. Additional key measures are (improved) monitoring and inspection schemes for combustion vehicles, low-emission zones, and fuel-efficiency and emission-control mandates—as

TABLE ES.1

Priority Recommendations for Tackling Air Pollution, Marine-Plastics Pollution, and Coastal Erosion in the Middle East and North Africa

OBJECTIVE (4 I'S)	AIR POLLUTION	MARINE PLASTICS	COASTAL EROSION
Inform stakeholders	• Create public awareness to incentivize behavior with fewer negative environmental effects and to foster demand for interventions • Strengthen source information to help design appropriate interventions • Consult and plan jointly with the private sector, NGOs, civil society organizations, and across ministries to develop solutions • Disseminate information frequently, better enabling individuals to change behavior so they can avoid exposure		
Provide incentives	• Reduce fuel subsidies, while at the same time making provisions for compensation mechanisms, such as reducing income taxes or social transfers. • Create markets for emissions and/or pollution (through ETS), and strengthen recylable-plastic markets (to make prices competitive with virgin plastics) • Support greener alternatives (for example, through subsidies for cleaner technologies and alternatives, support of nature-based solutions)		
Strengthen institutions	• Manage and control polluting practices (for example, usage of certain SUPs, fuels, and technologies) • Mandate targets (for example, recycling targets and emission thresholds)		• Mandate coastal zoning and integrated coastal zone management
Invest in abatement options	• Install emission control technology (for example, fume scrubbers) • Facilitate uptake of clean production and resource efficiency technology • Strengthen SWM infrastructure (for collection, treatment, and disposal) • Switch to renewable energy production • Expand and "green" the public transportation infrastructure	• Support R&D for new plastic alternatives • Implement marine cleanup technologies	• Implement nature-based solutions (for example, construction of wind fences, restoration of dune vegetation, and cultivation of seagrass and mangroves)
Timeline for implementation	● short term (0–2 years)	● medium term (2–5 years)	● long term (5–10 years)

Source: World Bank.
Note: Green shading indicates short-term measures with an expected implementation horizon of up to 2 years; orange shading, medium-term measures with an implementation horizon of 2–5 years; and blue shading, longer-term measures with an implementation horizon of 5–10 years. ETS = emissions trading system; NGOs = nongovernmental organizations; R&D = research and development; SUPs = single-use plastics; SWM = solid waste management.

demonstrated in Tehran with successes in reducing the concentrations of harmful air pollutants. Additionally, reducing the number of internal combustion engine vehicles in cities should be advanced and the switch to low-emission alternatives supported. An important first step is to induce such a switch for public transportation fleets like the adoption of electric buses, as was done in some of the region's cities such as Doha, Marrakesh, or Tunis.

Municipal and Agricultural Waste Burning

Municipal waste burning, still practiced in and around many of the region's cities, must be tackled. The priority measures center around strengthening municipal SWM, reducing waste generation, and moving to a "circular economy"—an approach in which products are sustainably managed throughout their life cycles, from production to disposal or reuse. The region has made great progress in curbing agricultural waste burning. For example, over the past couple of years, strengthening regulation, enforcing penalties, and creating prices and markets for agricultural residue have proven to be key in reducing agricultural waste burning in Egypt.

Industrial and Energy Emissions

The regionwide adoption of best-in-class emissions control technology is crucial. There is large scope for the expansion of end-of-pipe emissions reduction programs paired with continuous monitoring schemes and regulations mandating emission caps. Reducing emissions is done most cost effectively by adopting an emissions trading system (ETS), paired with a regulatory cap as implemented in the EU ETS. Such cap-and-trade programs will create important incentives for resource efficiency and switching away from fossil fuels. Although no examples of such a system currently exist in the Middle East and North Africa, there are promising international examples such as the recent introduction of a cap-and-trade system directly targeting air pollutants in Gujarat, India. Switching to renewable energy sources is a crucial prerequisite for a transition to a less carbon-intensive energy sector and requires investments in energy generation, storage, and transmission infrastructure. The Middle East and North Africa region is highly suited for the adoption of renewable energy technologies, and projects are under way from Morocco all the way to the GCC countries.

Marine-Plastic Pollution

For reducing marine-plastic debris, improving SWM, including collection and safe disposal, is a key step. This will require adequate

financing mechanisms for public utilities and building capacity in local utilities management. In parallel, work on reducing the generation of waste—and moving toward a circular economy with less waste and keeping resources in continuous use—is the end goal. Switching to a circular economy will require a bouquet of policies ranging from charging consumer fees for single-use plastics (SUPs), to bans on extremely harmful types of plastics, to working with producers on reuse options and subsidizing alternatives (such as bioplastics). Morocco introduced an ecotax for producers of plastic products. And producers of plastic alternatives are gaining some foothold in the United Arab Emirates, where Abu Dhabi is also moving forward strongly in banning SUP items. All these measures need support from carefully managed information campaigns.

The price of fossil fuels that are not only the feedstocks of plastics but are also burned to create the energy to make plastics must be increased. Otherwise, environmentally friendly alternatives and recycling options cannot compete in the market. Here, cross-benefits for air pollution control could arise from reforming fossil fuel subsidies. Finally, beach cleanups may appear to be only a drop in the bucket, but they are an extremely effective approach to mitigation because plastics that accrue on shores often are dragged into the ocean by waves, where they last for decades or end up in the bellies of animals that in turn are eaten by humans. Along with directly reducing the amount of plastic ending up in marine spaces, such cleanups also raise awareness for the issue, as recognized by groups such as the Ervis Foundation, which organizes such events, as well as with the help of a mobile app to better reach the youth in the United Arab Emirates.

Coastal Erosion

For reducing coastal erosion, development of multistakeholder mechanisms for ICZM is important because there are many competing interests for using the coast. Setting up such collaborative ICZM processes—with a focus on land-use planning—is a particularly critical step for Middle East and North Africa economies, which lag in this respect, especially for parts of the coast that have not yet been developed. The recently introduced coastal management plan in the Rabat-Salé-Kénitra region in northern Morocco provides a regional example of how such schemes can benefit coastal areas.

For parts of the coasts that have already been developed, measures must be taken to mitigate further losses and, in some cases, to restore beaches. Ecosystem restoration and nature-based

solutions (NBS) using locally adapted species (of seagrass, seaweed, mangroves, corals, or dune grasses) are often no-regret solutions. In addition to regulating coastal erosion by controlling floods and storm surges, NBS such as coral reef or seagrass rehabilitation have significant co-benefits—for example, by capturing "blue carbon"[12] and offering a habitat for fish or bird species. Egypt and Saudi Arabia are implementing large-scale reforestation programs for mangrove woods along the Red Sea, while artificial reefs have been used in Morocco. Their multiple benefits make these solutions particularly interesting for combating coastal erosion.

Time Horizons for Change

The time horizon for implementing priority measures varies: some measures are realizable in the short term, while others will take longer to unfold. Recognizing these differences is important when selecting policies to tackle a particular issue in a timely manner. However, kicking off the process for implementing measures whose results reveal themselves only with a certain lag is important. In this sense, information measures can be approached right away, together with certain regulations and closer cooperation across ministries and the private sector. Other regulations such as the creation of markets for emissions or the strengthening of recyclable-plastic markets as well as the introduction of ICZM may need more time. This longer time frame stems from the necessity for stocktaking before their introduction and the need for some form of transition period during which affected parties can adjust. Hence, realizing large-scale infrastructure projects—such as strengthening SWM, switching to renewable energy sources, and launching public transportation schemes—have a longer-term horizon. But the preparations should start immediately.

CONCLUSION

Restoring the Middle East and North Africa's blue skies and blue seas will benefit not only the environment but also the health, livelihoods, and incomes of residents. This report identifies and discusses the human and economic impact of blue-asset degradation and proposes solutions to support the transition to greener, more inclusive, more resilient growth paths. In addition to reducing the cost of environmental degradation, green growth paths would have higher economic multipliers in job creation and economic development. Swift action is imperative in the

face of the current challenges posed by the COVID-19 crisis, but the region's economies should not lose sight of the much greater challenge posed by climate change and environmental degradation. In a world that painfully starts to feel the consequences of a warming planet, moving toward less-harmful economic models, including less reliance on fossil fuels such as oil and gas, becomes crucial.

Directing investments at carbon-intensive activities that will face ever-growing pressure in the coming decades is unsustainable from both the economic and environmental perspectives. Hence, even though setting the stage for a green transition that is just and that prepares the Middle East and North Africa for the challenges ahead is demanding and will not come without some adjustment costs, *not* doing so will likely have an even larger price tag. The region's leaders have the opportunity now to create jobs and growth with green investments, diversify their economies, and thereby make the region a more attractive place to live and work for today's residents and for future generations. Just as past decisions have shaped the region's current development, so will the actions taken by policy makers today shape these economies' trajectories for the coming decades. Laying the groundwork to address future challenges posed by environmental degradation, climate change, and a world striving to mitigate it is hence imperative.

NOTES

1. In this report, 20 economies are considered to be part of the Middle East and North Africa region, following the definition of the World Bank Group (except for Israel, which is excluded for the purposes of this report). Because of the region's heterogeneity, the report sometimes clusters these economies into three subregions: (a) *Maghreb*, comprising Algeria, Libya, Malta, Morocco, and Tunisia; (b) *Gulf Cooperation Council (GCC)*, comprising Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates; and (c) *Mashreq*, comprising Djibouti, the Arab Republic of Egypt, the Islamic Republic of Iran, Iraq, Jordan, Lebanon, the Syrian Arab Republic, West Bank and Gaza, and the Republic of Yemen.
2. Policies referred to as being "green" in this report are those with the potential to reduce long-run greenhouse gas (GHG) emissions, while "brown" policies are likely to increase net GHG emissions. Similarly, "green growth," "blue growth," or similar terms refer to increases in output and incomes that are accompanied by reductions in emissions and environmental degradation of blue assets—the region's skies and seas. Conversely, "brown growth" or

"brown recovery" refer to activities that foster economic growth at the likely expense of increased GHG emissions and intensified degradation of the region's natural capital.

3. Growth rates differed between Middle East and North Africa subregions. On average, real incomes rose by around 40 percent—by more than 50 percent in the Maghreb and Mashreq subregions and by about 11 percent in the GCC countries, albeit from a much higher starting point (Human Development Data Center, United Nations Development Programme, http://hdr.undp.org/en/data).
4. These sectors are directly dependent on low input prices, both in the form of feedstock (for example, oil and gas for petrochemicals) and energy (predominantly derived from fossil fuels); are high-emitting sectors given their high energy intensity; and also contribute to environmental degradation (for example, by contributing to plastics pollution in the region's seas), as examined in chapter 4.
5. These fish species are the European pilchard (*Sardina pilchardus*) and the European anchovy (*Engraulis encrasicolus*).
6. Research on the public health effects of microplastics is emerging quickly but is still in its infancy, and although many worrisome findings are beginning to emerge—such as discovery of microplastics in human placentas and an array of other human organs—microplastics have yet to be conclusively linked to diseases.
7. The US green-infrastructure investments recently enacted include the modernization of bus and rail fleets (including, for example, replacement of school buses with zero- and low-emission alternatives); large-scale expansions of clean energy transmission networks, including half a million electric vehicle chargers; and environmental remediation measures such as cleaning up pollution from former industrial and energy sites and capping orphaned gas wells. The plans also include substantial support for restoring, monitoring, and researching forests—recognizing them as important infrastructure and endangered by increasingly widespread forest fires.
8. A global analysis of vehicle emission standards showed that not a single Middle East and North Africa economy requires new vehicles to adhere to international best practices regarding European emission standards, with some countries such as Algeria or Tunisia lacking any regulations in this respect at all as of February 2019 (Abdoun 2019).
9. A 2017 United Nations Environment Programme report finds that only 2 out of the 18 Middle East and North Africa economies surveyed have specific air quality laws and regulations in place (UNEP 2017). However, several have at least defined ambient air quality standards, which is a sign of progress. Furthermore, the report notes that only four of the region's economies have implemented clean production incentives for industries.
10. Recent studies have shown that the vast majority of plastic that ends up in the seas is from land-based activities as opposed to marine sources such as fishing equipment. These studies also highlight the high share of single-use plastics (SUPs) that end up in the world's oceans and seas (Morales-Caselles et al. 2021).

11. This has been especially the case in North African countries, as in Egypt's Nile delta or the Medjerda River flowing into the Gulf of Tunis (Hzami et al. 2021).
12. The oceans are major sinks of carbon dioxide and annually store amounts of carbon comparable to those stored by terrestrial ecosystems.

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green press INITIATIVE

While economic and social indicators in many Middle East and North Africa (MENA) countries have improved over the past three decades, the region's blue natural assets—clean air, healthy seas, and coastlines—have degraded virtually everywhere. Air pollution levels in the region's cities are among the highest in the world. Per capita marine plastic pollution is among the highest in the world; coastal erosion rates are the second fastest in the world. These combined challenges threaten local communities, livelihoods, and economies. In fact, the economic cost of MENA's deteriorating skies and seas is estimated at more than 3 percent of GDP per year.

Blue Skies, Blue Seas: Air Pollution, Marine Plastics, and Coastal Erosion in the Middle East and North Africa reviews integrated solutions that the authors identify as the "four I's":

- Inform stakeholders about the sources of these challenges.
- Provide incentives that improve environmental outcomes for the public and the private sector.
- Strengthen institutions to lower air and plastic pollution and to mitigate uncontrolled development and erosion of coastlines.
- Invest in abatement options and promote sustainable solutions.

Restoring MENA's blue skies and seas will benefit the health, livelihoods, and incomes of residents. There will inevitably be trade-offs, but choosing a path of green growth will create jobs, diversify economies, and make the region a better place for current and future generations. The actions of policy makers today will shape the trajectory of economies and communities for decades to come.

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