

# OIC ENVIRONMENT REPORT 2021



ORGANISATION OF ISLAMIC COOPERATION

STATISTICAL ECONOMIC AND SOCIAL RESEARCH  
AND TRAINING CENTRE FOR ISLAMIC COUNTRIES  
(SESRIC)







Organisation of Islamic Cooperation  
Statistical, Economic and Social Research  
and Training Centre for Islamic Countries  
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# OIC ENVIRONMENT REPORT 2021



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# Acronyms

AQG	Air Quality Guidelines
BBB	Build Back Better
CO <sub>2</sub>	Carbon Dioxide
COMCEC	OIC Standing Committee for Economic and Commercial Cooperation
COMSTECH	Standing Committee for Scientific and Technological Cooperation
COVID-19	Coronavirus Disease of 2019
ECA	Europe and Central Asia
EPI	Environmental Performance Index
ESALA	East and South Asia and Latin America
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Green House Gases
IEA	International Energy Agency
INDC	Intended Nationally Determined Contribution
IOFS	Islamic Organization for Food Security
IPCC	Intergovernmental Panel on Climate Change
IsDB	Islamic Development Bank
ISESCO	Islamic Educational, Scientific and Cultural Organization
IWRM	Integrated Water Resources Management
LDN	Land Degradation Neutrality
LTS	Long-Term Strategies
MDBs	Multilateral Development Banks
MENA	Middle East and North Africa
NCA	Natural Capital Account
NCD	Nationally Determined Contribution
ND-GAIN	Notre Dame Global Adaptation Initiative
NO <sub>2</sub>	Nitrogen Dioxide

## Foreword

Our planet Earth is currently facing numerous environmental challenges ranging from climate change and pollution to deforestation and land degradation. These are interlinked challenges fuelled mainly by the unsustainable use of natural resources, increasing population and widespread urbanization. Due to unchecked and rapid degradation of environmental resources and changing climatic conditions, among others, abnormal weather patterns and extreme events such as floods, droughts, cyclones, and heatwaves are a common occurrence today, causing wide spread destruction, deaths and displacement across the world.

The *OIC Environment Report 2021* examines the current state of the environment and its management in OIC member countries by using the most recent data available on major environmental indicators. This edition of the report also highlights the progress of the OIC member countries towards meeting the targets on environment-related sustainable development goals (SDGs) and Paris Agreement commitments.

The report points out that environmental capital, unlike in developed countries, is a significant component of the wealth in OIC member countries, constituting over a third of their total wealth. Moreover, 13.8% of their GDP is generated through earnings from natural resources, mostly in the form of oil and natural gas revenues. Notwithstanding this huge dependence on natural resources, the OIC member countries, as a group, are still lagging behind the groups of other developing and developed countries in terms of environmental performance and sustainability.

The report underlines the fact that the so far achieved level of the socio-economic development has been achieved at the expense of deterioration of the environment, thereby putting the future well-being of society at great risk. The rate of deforestation, for example, has grown in OIC member countries from 0.27% per year in 2000-2010 to 0.44% in 2010-2020, though the global deforestation rate somewhat declined over the same period. At the same time, air pollution remained a serious threat to the health and well-being of the societies in many OIC member countries, leading to 1.6 million premature deaths in 2019. The OIC member countries are also at great risk of depleting their water resources, as 29 countries are experiencing water stress and 18 of them are at critical stress levels.

The impacts of climate change are further exacerbating environmental challenges across the world. Although the average per capita greenhouse gas emissions in OIC member countries are lower than the world average, action is necessary to alleviate the worst effects of climate change, increase resilience, and eventually mitigate the future environmental risks. As per the latest available estimates, more than half of the OIC



member countries are highly vulnerable to climate change with insufficient mitigation and adaptive capacities. In this regard, the OIC member countries need to reinforce their commitment to the Global Climate Negotiation table and to integrate sound environmental policies into their overall sustainable economic development strategies in order to, progressively, reach net-zero emissions in the near future.

In this regard, the report proposes some policy recommendations to enhance the OIC member countries efforts towards achieving a more sustainable management of environmental resources. While the current COVID-19 pandemic has offset gains in many economic areas, there is still a chance to grow towards a greener future. The policy recommendations in this report specifically address the need for greener development to "*build back better*" from the COVID-19 pandemic. The OIC member countries should work together and take the development path towards sustainable, inclusive, and resilient growth. I strongly believe that the findings of this report will guide readers and policymakers along these lines.

Nebil DABUR  
Director General  
SESRIC

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Part 2 on *State and Trends of the Environment* and Part 3 on *Environment and Climate Change* were prepared by Fahman Fathurrahman. Part 1 on *Setting the Scene* was prepared by Esat Bakımlı. *Introduction* and *Conclusions and Policy Suggestions* sections were jointly prepared.

# Executive Summary

## ENVIRONMENTAL CAPITAL AND KEY DRIVERS OF CHANGE

### Environmental Capital and Performance

Environmental or natural capital is a significant component of the wealth of nations, particularly in developing countries. In developed countries, natural capital accounts only for less than three percent of the wealth, while, in developing countries, more than a fifth of wealth derives from natural capital. OIC member countries are even more reliant on natural resources – particularly non-renewable, subsoil assets – for economic well-being, with natural capital accounting for more than a third of the total wealth. Moreover, in 13 OIC countries, natural capital accounts for at least half of total wealth.

OIC countries' high dependency on natural capital is also reflected by the fact that a significant proportion of their GDP is generated through earnings from natural resources. The share of natural resources rents in GDP of OIC countries averaged at 13.8% in 2018, down from as high as 23.9% in 2008. However, it was less than 1% for developed countries and 5.3% for developing countries, averaging at 2.5% on a global scale in the same year. The relatively high contribution of natural resource rents to GDP in OIC countries predominantly originates from oil rents, which accounted for up to 21.7% of GDP in the Middle East & North Africa (MENA), where most of the oil-producer OIC member countries are located.

OIC member countries with an average score of 38.3 points on the Environmental Performance Index (EPI) for 2020, still lag behind both other developing countries (41.4) and developed countries (72.0) despite the improvement they have achieved in the last decade. OIC member countries in MENA and in Europe & Central Asia (ECA) are performing relatively well and have also improved their environmental performance more than those in other regions in the last decade. Among the 52 OIC member countries covered in the 2020 EPI, the United Arab Emirates had the highest score (55.6), securing the 42nd position in the global rankings, while Bahrain emerged as the top country in the world to improve its EPI score (+17.3 points) over the last decade.

### Key Drivers of Change

The world population is expected to exceed 8.5 billion by 2030 and to continue growing – albeit at a much slower rate – to reach 10 billion in the second half of the 2050s, owing primarily to population growth in developing countries. Given the fact that many experts have been expressing great concerns about the negative impacts that even the current 7.8 billion people are having on the planet, population growth, as a stress factor on the environment, will be of particular concern to developing countries in the coming

decades. The situation is even more challenging for OIC countries since they continue to have higher population growth rates.

The global urban population has been continuously growing and will continue to grow in the foreseeable future, bringing with it a set of environmental challenges. As of 2020, it is estimated that about 4.4 billion people, 56.2% of the world population, live in urban areas, and this number is projected to reach 5.2 billion by 2030, increasing the share of the urban population to 60.4%. Urbanization has also been on the rise in OIC countries. The percentage of the urban population is estimated to have increased from 41.9% in 2000 to 51.4% in 2020, and it is projected to further increase to 55.7% by 2030.

Economic growth is needed for the wellbeing of the economy, raising standards of living, and improving quality of life in both advanced economies and in the developing world. However, it is also considered responsible for the excessive depletion of natural resources and the degradation of ecosystems, although discussions about the complex relationship between economic growth and environmental quality continue to be on the global agenda under the umbrella of sustainable development. With this in mind, statistics show that developing countries and OIC countries have been growing at much faster rates than developed countries in the last two decades, and this trend is expected to continue in the next five years until 2025. Given the average growth rate estimates for the next five years, developing countries' output is expected to rise by 5.1% a year and, by 2025, will be 3.5 times what it was in 2000. Similarly, the output of OIC countries is expected to rise by 4.3% annually to almost triple over the same period. Thus, this high-growth performance requires more attention to be paid to its environmental reflections.

## **MAJOR ENVIRONMENTAL TRENDS IN OIC COUNTRIES**

### **Land & Biodiversity**

Conservation of land ecosystems remains an unsolved issue globally and in OIC countries. Despite the growing number of protected areas worldwide, land areas are still being degraded rapidly. Currently, one fifth of the Earth's land area is degraded, undermining the wellbeing of billions of people, driving the loss of biodiversity, and intensifying climate change. One of the reasons for land degradation is deforestation. Despite the fact that forests provide critical ecosystem services (such as water supply, livelihoods, climate change mitigation, and food production), forest degradation and deforestation continued at an alarming rate. Globally, approximately 420 million hectares of forest have been lost since 1990 due to conversion to other land uses, though the rate of deforestation has slightly decreased in recent decades –from 0.13% forest area loss per year between 2000 and 2010 to 0.12% between 2010 and 2020. While the global deforestation rate is improving (somewhat), the OIC group is showing an opposite trend. During the period 2000-2010, the rate of deforestation in the OIC countries was 0.27% per year, but it increased significantly to 0.44% for the period 2010-2020.

Land degradation and deforestation have both contributed significantly to the ongoing loss of biodiversity, and thus to people's livelihoods. According to the Red List Index (RLI), biodiversity has been declining in all world regions over the last decade. Globally, species are facing increased extinction risk, as evidenced by a drop in the RLI value from 0.8 in 2000 to 0.73 in 2020. Similarly, OIC countries, on average, are also experiencing an increased risk of extinction for all species, albeit at a slower rate. Their RLI levels averaged at 0.89 in 2020, decreasing slightly from 0.91 in 2000. The loss of biodiversity would be disastrous for human beings, as biodiversity provides them with ecosystem services that are essential for survival. It not only provides food and shelter but also keeps water cycles running and maintains the ecosystem's balance.

## **Air**

Air pollution is a "silent killer", ranked as the fourth leading cause of premature death. Globally, air quality has little improved over the last decade, as measured by annual mean PM<sub>2.5</sub> concentrations. The global average population-weighted annual mean PM<sub>2.5</sub> levels improved only marginally, falling from 42.7 µg/m<sup>3</sup> in 2010 to 42.6 µg/m<sup>3</sup> in 2019. In parallel, PM<sub>2.5</sub> concentrations in OIC countries also declined slightly, from 42.5 µg/m<sup>3</sup> to 42.3 µg/m<sup>3</sup> over the same period. The slow progress made in reducing PM<sub>2.5</sub> concentrations demonstrates that many countries lack national standards and do not monitor PM levels. It is also worth noting that only two OIC countries, Maldives and Brunei Darussalam, have met the World Health Organization (WHO) Air Quality Guidelines (AQG) annual average PM<sub>2.5</sub> standards of 10 µg/m<sup>3</sup>.

High levels of air pollution have serious implications for the health of population in OIC countries. The threat is now doubled as more evidence suggests that the COVID-19 disease is more likely to spread in areas with the high level of air pollution. According to Health Effects Institute (2020), in 2019, air pollution was responsible for the premature deaths of 6.7 million people worldwide. In the same year, deaths related to air pollution amounted to 1.6 million in OIC countries. In relative terms, deaths due to air pollution per 100,000 people were 131 in OIC countries, significantly higher than the global average of 86. The burden of air pollution varies greatly across regions, reflecting differences in exposure and the underlying prevalence of disease and other population susceptibilities. Countries with high levels of air pollution may have a low death rate, for example, because of a well-equipped healthcare system.

## **Water**

Water stress increased globally from 15.7% in 1997 to 18.5% in 2017. It also increased significantly in OIC countries over the same period, from 24.8% to 32.7%. At the moment, the OIC group is classified as a water-stressed region. According to UN-Water & FAO (2018), countries begin to experience "water stress" at a 25% level, with levels above 70% considered critically stressed. Individually, 29 OIC countries are suffering

from water stress, with 18 of them experiencing critical stress. The majority of countries experiencing water stress are in arid and semi-arid regions where water resources are scarce. At the sub-regional level, the majority of countries in MENA and ECA regions are facing severe water stress, and most OIC sub-regions are expected to experience an increase in water stress of at least 1.4 times by 2040.

Given the benefits they provide, it is critical to protect and restore water-related ecosystems. Waterbodies in OIC countries showed a sharp decline, with their area falling from 1.77% (of total land area) in 2005 to 1.70% in 2018. This corresponds to approximately 2.7 million hectares of lost waterbodies, an area roughly the size of Albania. In comparison, waterbodies worldwide decreased slightly during the same time period, from 2.15% to 2.14%. One method for preserving water resources is to protect and restore water-related ecosystems. Increasing waterbodies would mean increasing catchment and reservoir capacity in the region.

The application of Integrated Water Resources Management (IWRM) may indicate a high level of good governance in the water sector. The majority of OIC countries have implemented IWRM practices, albeit at varying degrees. In general, OIC countries fall into the “Medium” implementation category, indicating that the majority of IWRM elements have been institutionalized. Continuous efforts in water governance are still required. The existence of transboundary waterbodies should also be taken into account when resolving water issues. Transboundary water body improvement should be prioritized due to the fact that only about half of transboundary basins in OIC countries have a shared-management agreement.

## ENVIRONMENT AND CLIMATE CHANGE

### Greenhouse Gasses (GHG) Emissions Trend

The most significant driver of global climate change is GHG emissions from human activities. Despite various efforts at the economic, technical, and political levels, the rising trend of GHG emissions continues. Global GHG emissions increased by 43% between 1990 and 2017, reaching 50 Gt-CO<sub>2</sub> equivalent. During the same period, GHG emissions in OIC countries increased by 77%, reaching 9 Gt-CO<sub>2</sub> equivalent, which corresponds to 18.1% of total global GHG emissions.

Identifying what causes the increase in emissions has thus become critical in order to implement appropriate climate policies. Based on decomposition analysis using the Kaya identity framework, it is discovered that population and income growth, combined with a relatively stagnant trend in carbon intensity, are contributing factors to an increase in CO<sub>2</sub> emissions in OIC countries. This increase in CO<sub>2</sub> emissions also serves as a proxy for the OIC's overall rise in GHG emissions over the last two decades.

## **Vulnerability and Readiness**

On average, OIC countries are more vulnerable and less prepared to deal with the effects of climate change. This puts them at a greater risk of climate change impacts and threatens society's wellbeing. More than half of OIC countries are more vulnerable to climate change than the global average. Furthermore, 80 percent of OIC countries are not adequately prepared to deal with the consequences of climate change.

The health sector is the most vulnerable in OIC countries, indicating a high risk of death from climate-related diseases. The social dimension is the weakest link in adaptation to climate change impacts. This indicates that society is not adaptable enough to deal with the effects of climate change, as evidenced by lower levels of social equality, ICT infrastructure, education, and innovation.

## **Net-Zero Emissions and Energy Transition**

The world is currently experiencing a surge in the transition to renewable energy, fuelled primarily by growing concerns about climate change and energy security. The Paris Agreement, which aims to strengthen the global response to the threat of climate change, has motivated and strengthened this transition to sustainability. Parties to the Agreement, which include 52 OIC member countries, aim to reach the global target of greenhouse gas emissions as soon as possible, with the goal of reaching net zero emissions by the second half of the 21st century. Since fossil fuels are the largest source of carbon emissions, the energy transition and decarbonization process revolves around ceasing new investments in fossil fuels and gradually abandoning their use for more economically and environmentally suitable solutions.

The OIC countries must mobilize resources and efforts to achieve net-zero emissions, beginning with a transition to a low-carbon energy system. Climate finance has been provided to OIC and other developing countries through bilateral (country-to-country), multilateral (via international institutions), regional, and other channels in recent years. In 2018 and 2019, OIC countries received an average of \$23.9 billion in climate funds per year. Urgent climate action requires not only significant financial resources, but also money spent effectively. Climate finance, when managed properly, has the potential to bridge the gap between socioeconomic development and environmental needs.

## **MOVING FORWARD**

### **Build Back Better from the Crisis**

The COVID-19 pandemic is far from over yet, and many uncertainties remain over its duration and severity despite the measures taken to control the spread of the virus, such as domestic and international travel restrictions, curfews and bans on mass mobility, school and business closures, and stay-at-home campaigns. These containment measures have inevitably resulted in a slowdown of economic activities all over the world, having

significant effects on the environment, directly or indirectly. Current observations indicate that the pandemic situation, with less social and economic activity, may contribute to the restoration of the ecological system, given that it is leading to a significant improvement in air quality, a reduction in greenhouse gas emissions, a lessening of water pollution and noise, and a weakening of the pressure on tourist destinations. However, there are also some negative effects on the environment, such as the increase in medical waste, the haphazard use and disposal of disinfectants and personal protective equipment. However, as the world undergoes the normalization process, the gains of environmental restoration during the peak of the pandemic might be diminished.

Considering the ongoing COVID-19 crisis and environmental issues at hand, the main take-away from this report is that recovery from the pandemic should consider policies that are not only good for the economy and society, but also for the environment. This is an excellent opportunity to "*build back better*" (BBB) from the COVID-19 pandemic, where economic recovery is integrated with environmental and climate actions, and thus meets the Paris Agreement and SDG targets.

Under the BBB concept, human well-being should be prioritized, rather than focusing solely on economic growth. As a result, any environmental and climate-related project that provides long-term benefits to people's well-being should be pursued. There are five major recommendations for recovering from the pandemic and transitioning to more environmentally sustainable development:

- Recovery strategies should be consistent with long-term efforts to reduce GHG emissions.
- Invest in strengthening climate resilience.
- Pursue ambitious policies to stop biodiversity loss.
- Promote innovation that enhances long-lasting behaviour changes.
- Resiliency improvement of supply chains.

Finally, recovering from the pandemic and addressing environmental issues would be more effectively accomplished collectively. There is an urgent need to improve cooperation among OIC member countries and institutions through knowledge sharing, collaborative activities in research, policy, and management, as well as training and capacity building. These activities are critical for increasing member countries' capacity to address environmental issues while also recovering from the crisis.



# Introduction

The global outbreak of the coronavirus disease 2019 (COVID-19) is affecting human lives in every aspect. It has caused not only unprecedented global health and humanitarian crisis, but also large-scale societal and economic disruptions across the world, including OIC countries (SESRIC, 2020). The pandemic is far from over yet, and many uncertainties remain over its duration and severity despite the measures taken to control the spread of the virus, such as domestic and international travel restrictions, curfews and bans on mass mobility, school and business closures, and stay-at-home campaigns. These containment measures have inevitably resulted in a slowdown of economic activities all over the world, having significant effects on the environment, directly or indirectly.

Based on the assessment of the immediate effects of the pandemic on the energy system, the International Energy Agency expects the global energy demand to drop by 5.3% and energy-related carbon dioxide (CO<sub>2</sub>) emissions to decrease by 6.6% in 2020. Nevertheless, it also estimates that a rise in poverty levels worldwide in 2020 may have made basic electricity services unaffordable for more than 100 million people who already have electricity connections, pushing these households back to relying on more polluting and inefficient sources of energy (IEA, 2020).

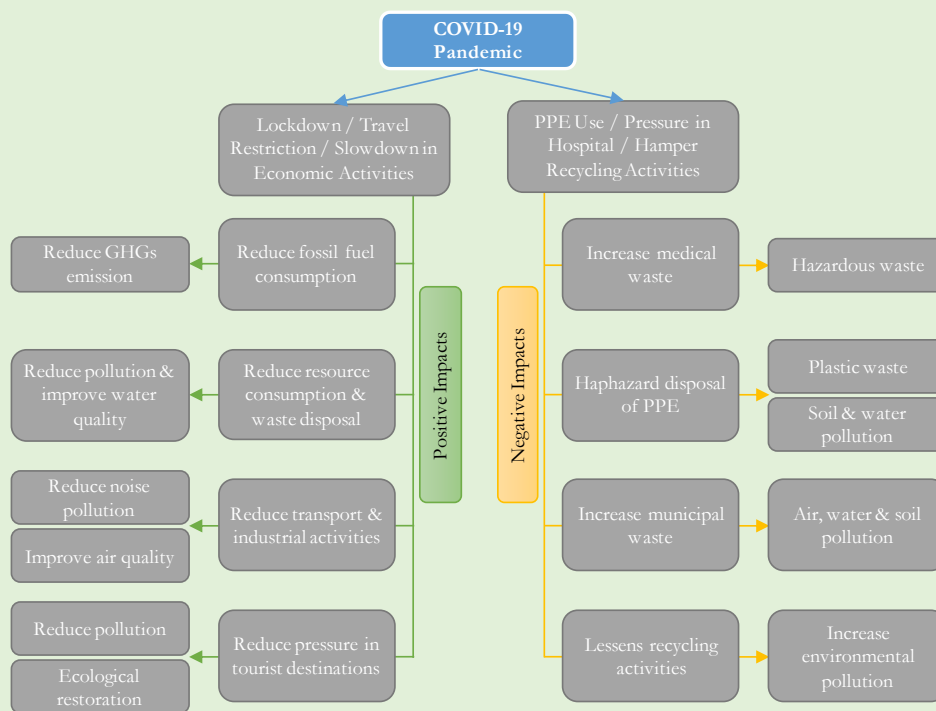
Since economic activities will resume as the pandemic fades away, the above-mentioned short-term environmental effects might change. Achieving long-term environmental benefits will be highly dependent on the extent to which environmental concerns are integrated into policy responses, wastes are reduced within the circular economy, and economic agents (governments, energy companies, investors, and consumers) contribute to clean energy transition.

While in the short-term the environmental impacts of the pandemic can be positive or negative (see **BOX 1**), OIC member countries are now facing the double challenge of recovering as quickly as possible from the damage to their historical development gains and adapting to a vastly changing world. On the bright side, these monumental challenges present an opportunity for "build back better" recovery, putting development on a path toward more sustainable, inclusive, and resilient growth. For the recovery to be durable and resilient, a return to conventional and environmentally destructive development pathways has to be avoided. Unchecked, global environmental emergencies such as climate change and biodiversity loss could cause social and economic damage far larger than that caused by COVID-19. Solutions to environmental issues will require multiple ongoing efforts to address their underlying risks to society; identify the policy changes needed to manage them; and keep track of progress over time.

### BOX 1: Environmental Impacts of COVID-19 Pandemic

Summarized in figure below, current observations indicate that the pandemic situation, with less social and economic activity, may contribute to the restoration of the ecological system, given that it is leading to a significant improvement in air quality, reduction in greenhouse gases (GHGs) emission, lessening water pollution and noise, and weakening pressure on tourist destinations. However, there are also some consequences of COVID-19 that have negative effects on the environment, such as the increase of medical waste, haphazard use and disposal of disinfectants and personal protective equipment (PPE) (masks, gloves, goggles, gowns, face shields, etc.).

**Positive and Negative Environmental Effects of COVID-19 Pandemic**



Source: Rume & Islam (2020)

The *OIC Environment Report 2021* supports these efforts by providing investigations into the status and progress of the environment in OIC member countries, identification of problems, and proposing policy suggestions. Natural capital has been the backbone of most OIC member countries, but in most cases, it is overexploited, resulting in environmental degradation. Various environmental issues are still clearly felt in terms of the degradation of land and biodiversity, air pollution, water insecurity, and, ultimately, climate change. Investigations on these environmental aspects in this report are done through assessment of OIC progress toward achieving relevant Sustainable Development Goals (SDGs) targets and Paris Agreement commitments.

## Guide to the Report

The *OIC Environment Report 2021* examines the challenges that OIC member countries face in sustainable management of environment. It addresses the challenges through the latest statistics on environment-related SDG indicators and progress towards the Paris Agreement commitments. The analysis involves examining the data of OIC countries as a group, with disaggregation for geographical regions and individual member countries, usually in comparison with the developed and non-OIC developing countries as well as the global averages.<sup>1</sup> Recommendations at the end of the report summarize the next steps needed to achieve greener development and "*build back better*" from the pandemic.

The report is organized into four parts. Part 1, *Setting the Scene*, presents a brief analysis of how environmental capital plays an important role in the overall economic development of the OIC member countries. It further illustrates a general overview of the environmental performance of the OIC member countries. Finally, the primary drivers of environmental changes are discussed in order to provide readers with an understanding of the reasons for various changes in the OIC environment.

Part 2 provides the state and trends of various critical environmental topics in OIC member countries, such as land and biodiversity, air, and water, under the theme of *State and Trends of the Environment*. The analysis is conducted by presenting relevant SDG indicators for each topic. It serves two purposes. First, it reviews the latest evidence on the SDG monitoring indicators of each theme to assess quantitative progress towards achieving the relevant targets. Second, it identifies monitoring challenges and advances for each target.

Part 3, *Environment and Climate Change*, presents a set of developments and OIC countries' progress toward mitigating and adapting to climate change and achieving the Paris Agreement commitments. It first identifies the status and trend of GHG emissions in OIC member countries, followed by the status of vulnerability and readiness of OIC member countries from the impacts of climate change. The final chapter of this section presents the OIC countries' climate change policy measures and responses, particularly the countries' commitments to the Paris Agreement.

Finally, the last part summarizes the findings of the report and provides policy recommendations to achieve greener development and "*build back better*" from the COVID-19 pandemic.

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<sup>1</sup> Country groupings and classifications used in this report can be seen in **ANNEX A**.



# **Part 1: Environmental Capital and Key Drivers of Change**



# Chapter 1

## Environmental Capital and Performance

Capital is a fundamental concept of economics, comprising different types of stocks that contribute to the production process. Accordingly, capital is usually disintegrated into such types as financial capital, natural capital, produced capital, human capital, and social capital (Goodwin, 2003). However, in most of the economic literature, it principally refers to produced (human-made) capital that consists of physical assets –durable goods– available for use as a factor of production, such as tools, machines, buildings, and infrastructure. This is mostly attributed to the scarcity of data and the problems in estimating the values of capital stocks.

The concept of “natural capital” has gained importance in the last decades along with the increased recognition of the role of environmental resources in production as well as the rising concerns over environmental degradation and climate change. As a continuance of its work on wealth accounting, the World Bank released a new book *The Changing Wealth of Nations 2018: Building a Sustainable Future* (Lange et al., 2018) that could be considered as a major step in providing improved estimates of natural capital. The book tracks the wealth of 141 countries between 1995 and 2014, with the objective of broadening the measures used to assess economic progress and sustainable development. In this work, natural capital –in addition to produced capital, human capital, and net foreign assets– is considered as one of the four components of wealth.

Natural capital is especially important for developing countries that heavily rely on their natural resources for economic growth and development. Therefore, accounting for the contribution of natural resources to economic output is an imperative task for sustainable development in these countries. Some of them are blessed with mineral and energy resources generating significant revenues for governments, some are rich in crop and pasture lands, and some others have forests and wild lands with abundant biodiversity, which can generate revenues by attracting tourists from all over the world (World Bank, 2011). Such revenues from natural resources account for a substantial share of GDP in some countries, and much of these earnings come in the form of “economic rents” –revenues above the cost of extracting the resources.

Based on World Bank data on both natural capital stock and natural resources rents, this section analyzes the situation in OIC member countries to shed light on the importance of environmental resources in their wealth and economic growth with a view to support their quest for sustainable economic development. In addition, the section briefly evaluates the

environmental performance of OIC countries via the 2020 Environmental Performance Index (EPI), which provides global metrics for the environment and ranks countries by their performance on sustainability issues.

## 1.1 Natural Capital in Total Wealth

Implementations of wealth accounting and natural capital accounts (NCA) has gained popularity all over the world in the last two decades, in search of practical solutions to estimate and integrate them in the System of National Accounts (**BOX 1.1**). This is especially important for estimating economic growth in countries that significantly rely on natural resource depletion and, more importantly, for monitoring whether natural capital

### **BOX 1.1: Measuring and Valuing Natural Capital: The GPS/WAVES Program and Experience from OIC Member Countries**

The World Bank Group is implementing the Global Program on Sustainability (GPS), to integrate environmental sustainability into public and private decisions, by providing high-quality data, analytical tools and technical assistance for measuring and valuing natural capital and ecosystem services.

Structured around three inter-connected pillars (global data, country level support and sustainable finance), GPS builds on the experience of the WAVES Partnership (Wealth Accounting and the Valuation of Ecosystem Services) which has been working since 2013 with over 20 countries to build natural capital accounts (NCA) and use them in development decisions. Progress has been made with the adoption of the System of Environmental Economic Accounting (SEEA), which is a UN-approved standard for calculating natural capital.

Of the OIC member countries, **Indonesia** joined WAVES as a core implementing country in late 2013 and it has made important strides toward developing NCA and using them for decision-making. In 2017, The Ministry of National Development Planning (BAPPENAS) introduced the Low Carbon Development Initiative for Indonesia (LCDI), with the technical assistance provided by WAVES, to explicitly incorporate GHG emissions reduction targets into the country's National Medium-Term Development Plan (RPJMN) 2020-2025, along with other interventions for preserving and restoring natural resources. As the new platform for Indonesia's development, LCDI allowed the government to understand ways to maintain economic growth while minimizing exploitation of natural resources and keeping the emissions low.

In 2017-2018, **Uganda** and the **Kyrgyz Republic** began working with GPS. These new countries are making steady progress. For example, Uganda is focusing on forests and wetland asset accounts, and on the development of experimental ecosystem services accounts. Recognizing the importance of building statistical systems that support better management of its natural resources, Uganda wants to assess the contribution of natural capital to its third National Development Plan's strategic direction of natural resource led industrialization.

Of the six new countries joining the program in March 2019, **Egypt** and **Morocco** joined as core implementing countries. The work program for Egypt will focus on development of air emission accounts, waste accounts, and coastal ecosystems accounts. In Morocco, the priority will be forests, coastal and marine ecosystem services, climate change, and cultural services/nature tourism.

Source: World Bank (n.d.) and WAVES (n.d.)

assets are sufficient to keep pace with population growth and economic growth –the major concern over sustainable economic development.

Heading the work in the field of wealth accounting, the World Bank first published a book *Where is the Wealth of Nations? Measuring Capital for the 21<sup>st</sup> Century* in 2006, which presented estimates of comprehensive wealth accounts for nearly 120 countries, decomposing the wealth of a nation into its component pieces: produced capital, natural resources and human resources (World Bank, 2006). That was followed by a second volume in 2011, *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*, which extended and built on the previous book and presented, inter alia, the changes in wealth by income group and geographic region, with a focus on natural capital (World Bank, 2011). In continuation, the World Bank released a new book *The Changing Wealth of Nations 2018: Building a Sustainable Future* in 2018 (Lange et al., 2018), which tracked the wealth of 141 countries between 1995 and 2014 and provided improved estimates of natural capital.

The latest book decomposed total wealth into four components: produced capital (buildings, machinery, and infrastructure); human capital (the present value of future earnings for the labor force, broken down by gender and types of employment); net foreign assets (foreign assets minus liabilities); and natural capital. Natural capital was reported in detail, consisting of the valuation of fossil fuel energy (oil, gas, hard and soft coal) and minerals (bauxite, copper, gold, iron ore, lead, nickel, phosphate, silver, tin, and zinc), agricultural land (cropland and pastureland), forests (timber and some non-timber forest products), and protected areas (a proxy for bio-diversity). Values were measured at market exchange rates in constant 2014 US dollars, using a country-specific GDP deflator.

The findings revealed that global wealth grew 66% between 1995 and 2014, from US\$690 trillion to US\$1,143 trillion, respectively. Although the value of natural capital assets doubled in the same period, most of the growth in natural capital was in non-renewables (308%), largely because of changes in both the volume and prices of minerals and fossil fuels. The renewables (forests, protected areas, and agricultural land) increased far more slowly (44%) than total wealth. The higher growth in the value of natural capital led to an increase in its share in total wealth, from 7.6% in 1995 to 9.4% in 2014.

### **OIC Countries More Dependent on Natural Capital**

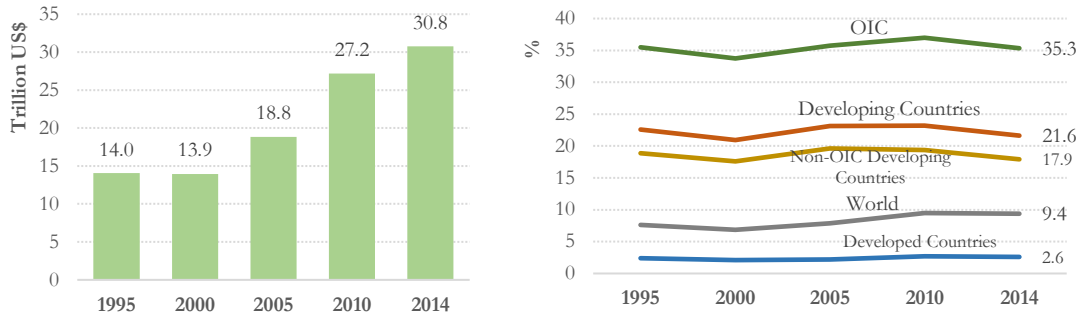
The World Bank’s dataset on wealth accounts included data for 46 out of the 57 OIC member countries<sup>2</sup>. The available data shows that the value of natural capital assets of OIC member countries more than doubled (119.1%) in the period from 1995 to 2014, reaching up to US\$30.8 trillion (**Figure 1.1, Left**), but its share in total wealth remained stagnant at around 35% (**Figure 1.1, Right**). Far above the average of both developed (2.6%) and

<sup>2</sup> 11 OIC countries with no data are Afghanistan, Algeria, Brunei, Benin, Guinea Bissau, Iran, Libya, Somalia, Sudan, Syria (OIC membership currently suspended), and Uzbekistan.



developing (21.6%) countries, this ratio clearly indicates that OIC countries, on average, are more dependent on natural resources for wealth creation than the rest of the world.

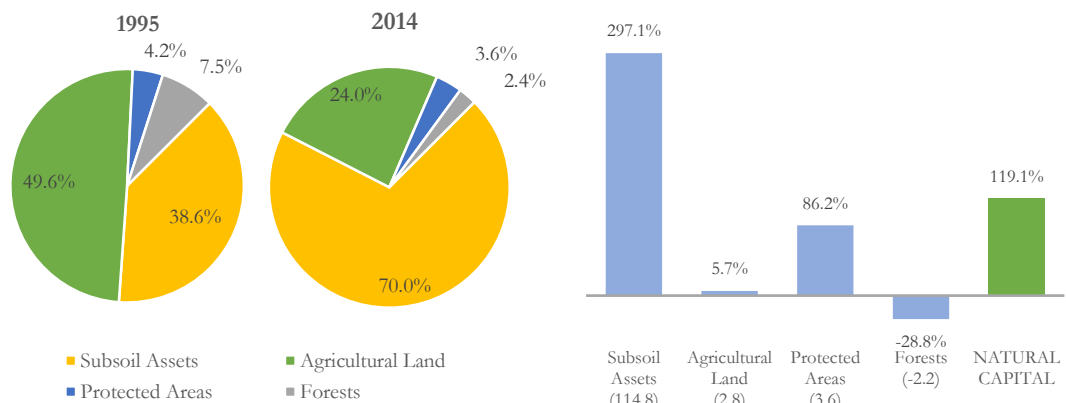
**Figure 1.1. Natural Capital of OIC Member Countries (Left) and Share of Natural Capital in Total Wealth (Right)**



Source: SESRIC staff calculation based on data from Wealth Accounts database of the World Bank.

Almost all of the increase in natural capital of OIC countries originated from the increase in non-renewable, subsoil assets (297.1%), such that these assets accounted for up to 70% of the natural capital in 2014 as compared to 38.6% in 1995 (Figure 1.2). Although all subsoil asset groups recorded significant increases (coal by 747%, minerals by 629%, gas by 346%, and oil by 284%), oil contributed most to that increase due to its overriding weight in total subsoil assets (88.9% in 2014 as compared to 92.1% in 1995). Accounting for half of the natural capital in 1995, agricultural land increased only by 5.7% by 2014, resulting in a significant decline in its share in natural capital, down to 24%. Forests faced a decline not only in their share –from 7.5% to 2.4%– but also in their value (-28.8%), which indicates a threat of depletion of forest assets in the OIC countries.

**Figure 1.2. Composition (Left) and Growth (Right) of Natural Capital in OIC Countries, 1995-2014**



Source: SESRIC staff calculation based on data from Wealth Accounts database of the World Bank.

\* The numbers in parenthesis show each component's contribution to the growth in total natural capital.

According to the most recent data from 2014, among the 46 OIC member countries with available data, Saudi Arabia has the most abundant natural capital, accounting for a quarter of the total natural capital (25.3%) of all OIC countries, followed by Iraq (8.2%), Indonesia (7.8%), United Arab Emirates (7.7%), and Nigeria (7.5%). Concerning the weight of natural capital in total wealth, however, Guinea takes the lead, as over four fifth of its total wealth (81.6%) come from natural resources. In twelve other countries, natural capital accounts for at least half of total wealth while this ratio is as low as 0.9% in Maldives, 5.2% in Bahrain, and 6.3% in Lebanon (**Figure 1.3**). It is worth noting that only Maldives has a ratio below the average of developed countries (2.6%) and only Bahrain and Lebanon are below the world average (9.4%).

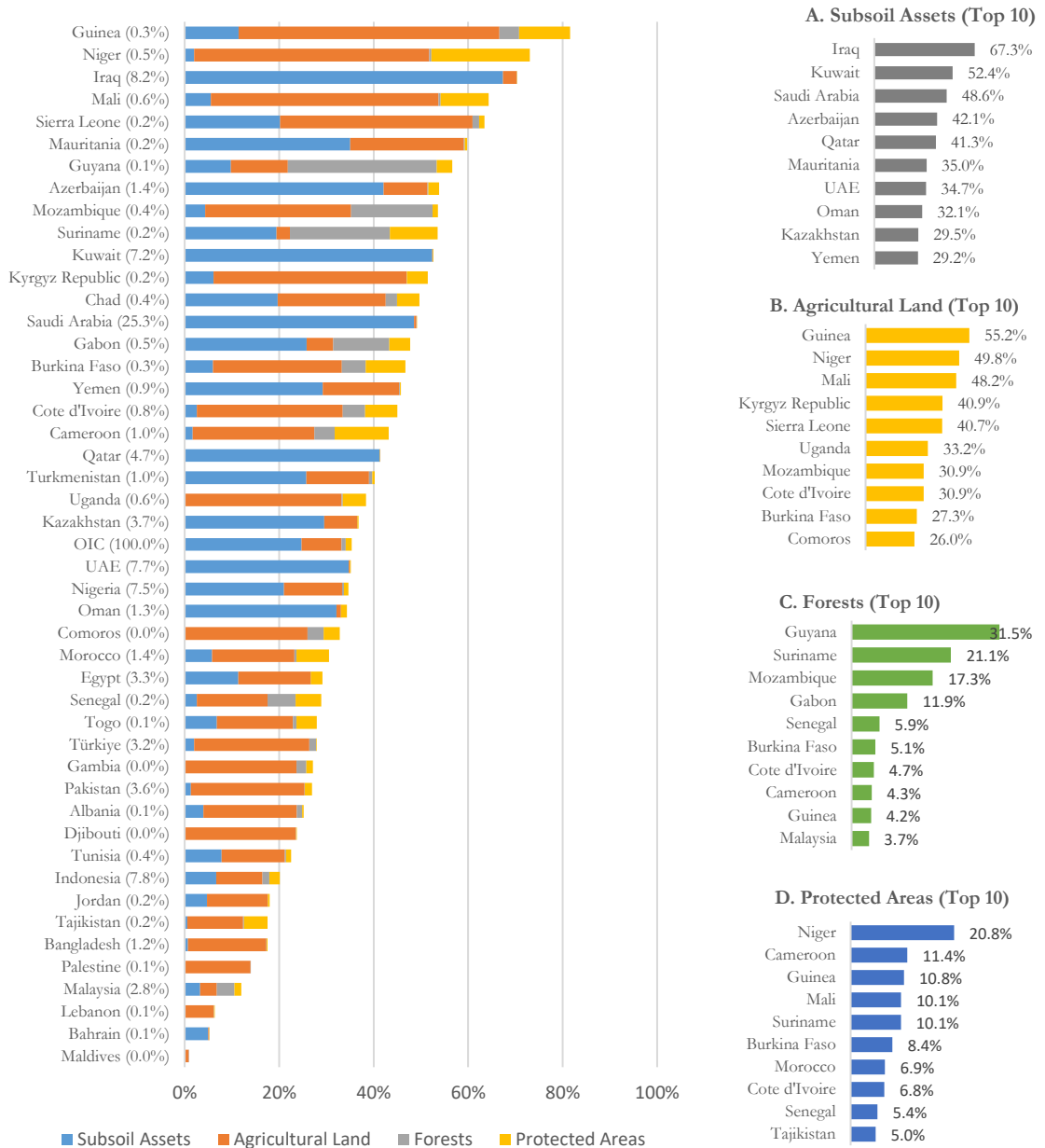
Regarding the composition of natural capital, OIC member countries present significant differences. Non-renewable, **subsoil assets** are a primary source of wealth in many of them. In Iraq, 70.3% of total wealth is tied to natural capital, and a large portion of that figure (67.3%) comes from subsoil assets. Among the other member countries with a relatively high share of subsoil assets in total wealth are Kuwait (52.4%), Saudi Arabia (48.6%), Azerbaijan (42.1%), and Qatar (41.3%) (**Figure 1.3/A**). **Agricultural land** is the dominant component of wealth particularly in Guinea, accounting for more than half of the total wealth of the country (55.2%). It is also of critical importance to the wealth of Niger (49.8%), Mali (48.2%), Kyrgyz Republic (40.9%), Sierra Leone (40.7%), and many other member countries (**Figure 1.3/B**). Accounting for almost one third of total wealth (31.5%) in Guyana, **Forests** constitute over 10% of total wealth only in three other member countries, namely Suriname (21.1%), Mozambique (17.3%), and Gabon (11.9%) (**Figure 1.3/C**). **Protected areas**, as a component of natural capital, contribute to wealth mostly in Niger, accounting for up to 20.8% of the total wealth of the country. This ratio is slightly over 10% in four other member countries, namely Cameroon (11.4%), Guinea (10.8%), Mali (10.1%), and Suriname (10.1%) (**Figure 1.3/D**).

Although OIC countries, on average, greatly outperform the rest of the world in terms of the share of natural capital in total wealth, this advantage diminishes to a large extent when population size is taken into account. **Figure 1.4 (Left)** shows that OIC member countries had higher values of natural capital per capita than the rest of the world had in both 1995 and 2014, but the differences were less remarkable and the per capita values became even more comparable in 2014. Natural capital per capita in OIC member countries increased from US\$14,490 in 1995 to US\$21,578 in 2014, corresponding to an increase of 49% over that period. However, although this increase was higher than that of developed countries (40%), it was lower than that of developing countries (69%) and the world average (62%).

Among OIC member countries, Qatar took the lead in natural capital per capita in 2014 (**Figure 1.4, Right**), with a value of US\$660 thousand, followed by Kuwait (US\$591 thousand), United Arab Emirates (US\$259 thousand), and Saudi Arabia (US\$252 thousand). It is worth noting that all of these countries are high-income oil-exporting countries, heavily dependent on non-renewable natural resources. It is also worth noting that Nigeria,

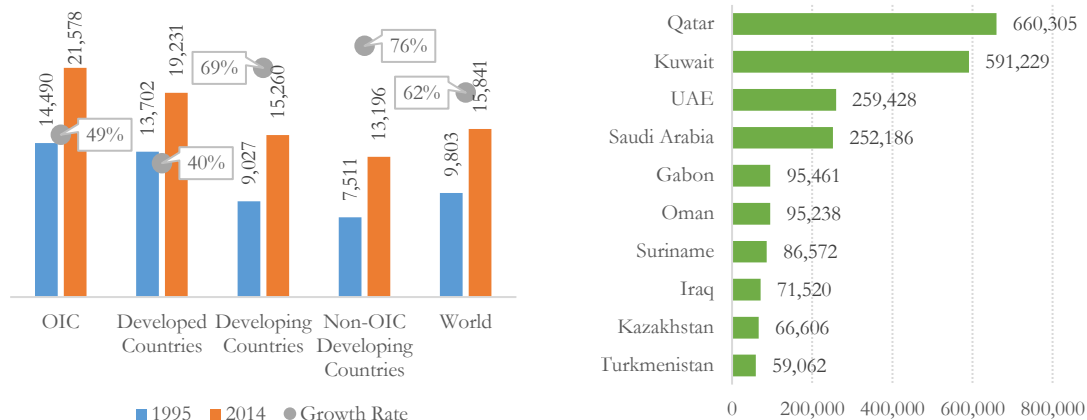
Lebanon, and Jordan recorded a decrease in their natural capital both in overall value and in per capita terms between 1995 and 2014. In addition, Maldives, Cote d'Ivoire, Türkiye, and United Arab Emirates –as well as Malaysia and Suriname to a rather limited extent–experienced a decline in their natural capital per capita in the same period.

**Figure 1.3. Share of Natural Capital in Total Wealth in OIC Member Countries by Type, 2014**



Source: SESRIC staff calculation based on data from Wealth Accounts database of the World Bank.  
 \* The numbers in parenthesis show each country's share in total natural capital of OIC member countries.

**Figure 1.4. Natural Capital Per Capita, 1995 vs 2014 (Left) and Top 10 OIC Countries by Natural Capital Per Capita, 2014 (Right), US\$**



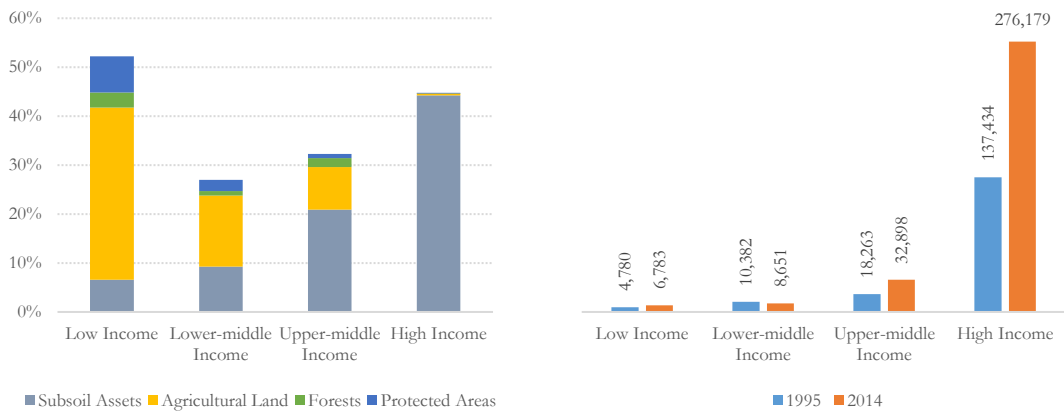
Source: SESRIC staff calculation based on data from Wealth Accounts database of the World Bank.

### Natural Capital: The Most Important Asset for Low-Income Countries

According to the World Bank (2018, p.8), there is a strong relationship between development and the composition of national wealth: The share of natural capital gradually declines as countries graduate from low- to middle- and high-income status. The reasoning behind this observation is that, at low incomes, economies are largely built around relatively abundant natural assets, investing the proceeds in the relatively scarce assets (produced and human capital) to foster development. From this point of view, it could be naturally suggested that low-income countries rely primarily on natural capital for their development. In this regard, grouping countries by income is useful because it reveals the direct links between wealth, income, and development (World Bank, 2011, p. 5).

Indeed, **Figure 1.5 (Left)** clearly shows that natural capital accounts for over half of total wealth (52.2%) in low-income OIC countries, and most of this is attributed to agricultural land (35.2%). Thus, it is not surprising that, in these countries, the economy is based mainly on agricultural activities and significant numbers of people rely on agriculture for livelihoods. In lower-middle-income OIC countries, where agricultural land also constitutes the majority of natural capital, natural capital accounts for a quarter of total wealth (27%). What is unusual is that upper-middle-income OIC countries and high-income OIC countries –even to a larger extent– have a higher share of natural capital in total wealth, 32.3% and 44.8%, respectively. However, in developed countries, which are all high-income countries, this ratio is as low as 2.6%, as mentioned above. Considering that all high-income OIC countries are oil and gas producers, this exception could well be attributed to the richness in subsoil assets. As shown in **Figure 1.5 (Left)**, subsoil assets represent the majority of the share of natural capital in total wealth in upper-middle-income OIC countries (20.9 percentage points of the 32.3%) and particularly in high-income OIC countries (44.2 percentage points of the 44.8%).

**Figure 1.5. Share of Natural Capital in Total Wealth in the OIC by Income Group and Type of Natural Assets, 2014 (Left) and Natural Capital Per Capita in the OIC by Income Group (US\$) (Right)**



Source: SESRIC staff calculation based on data from Wealth Accounts database of the World Bank.

\* Income grouping is based on World Bank classification by 2015 GNI per capita.

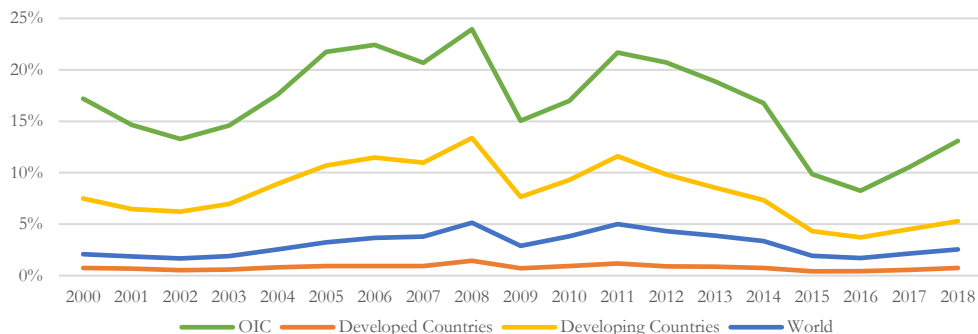
The low share of natural capital in the wealth of developed countries is due to a high share of human capital (70.3%) and produced capital (27.7%), rather than a lack of natural capital. Indeed, natural capital per capita in developed countries is actually higher than that in developing countries (see **Figure 1.4, Left** above) and three times that in low-income countries. For OIC countries, natural capital per capita also increases in line with the income level of countries: from as low as US\$6,783 in low-income countries to as high as US\$276,179 in high-income countries, according to 2014 data (**Figure 1.5, Right**). Doubled between 1995 and 2014, natural capital per capita in high-income OIC countries became almost 41 times that of low-income OIC countries in 2014 as compared to 29 times in 1995, indicating a divergence between the poorest and the richest member countries.

## 1.2 Natural Resources Rents

Given the high dependency on natural capital in OIC countries, it is important to evaluate the contribution of natural resources to their economic output. In countries that are endowed with rich natural resources, revenues from natural resources account for a substantial share of GDP. A significant part of these revenues is in the form of “economic rents”, which are simply the revenues above the cost of extracting the resources. As natural resources are not “produced”, they often provide returns well in excess of their cost of extraction. However, rents from non-renewable resources (fossil fuels and minerals) and rents from overharvesting of forests indicate the liquidation of a country’s natural capital stock. Unlike renewable resources (agricultural land, forests, and protected areas) that can provide continuous benefits if managed sustainably, non-renewable natural capital offers a one-time chance to finance development by investing the resource rents in other assets (human capital, infrastructure and other produced capital) to replace the depleted natural capital (World Bank, 2011). From an environmental perspective, it is also crucially important

to invest in mitigating the inevitable environmental effects of resource extraction and processing, such as air, soil, and water pollution, landscape destruction, ecosystem damage, and biodiversity loss.

**Figure 1.6. Total Natural Resources Rents (% of GDP), 2000-2018**

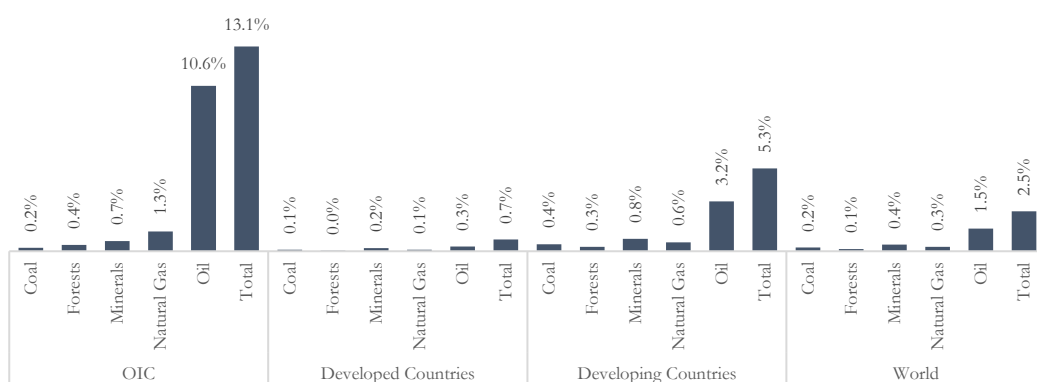


Source: SESRIC staff calculation based on data from Adjusted Net Savings database of the World Bank.

### Contribution of Natural Resources Rents to GDP

According to the most recent data from the World Bank, natural resources rents (see **BOX 1.2**) accounted for 2.5% of GDP on a global scale in 2018, peaking at 5% in 2008 and 2011 since 2000. This ratio was always less than 1% in developed countries during the period from 2000 to 2018 except in 2008 (1.4%) and 2011 (1.2%). In developing countries, the ratio averaged at 5.3% in 2018 and the highest level was recorded at 13.4% in 2008. Having much higher ratios during the whole period under consideration, the OIC recorded an average of 13.1% in 2018, down from as high as 23.9% in 2008 (**Figure 1.6**).

**Figure 1.7. Natural Resources Rents by Type (% of GDP), 2018**



Source: SESRIC staff calculation based on data from Adjusted Net Savings database of the World Bank.

The relatively high contribution of natural resources rents to GDP in the OIC relies on the abundance of natural capital –particularly non-renewable, subsoil assets– as explained

### BOX 1.2: Natural Resources Rents

Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. The estimates of natural resources rents are calculated as the difference between the price of a commodity and the average cost of producing it. This is done by estimating the world price of units of specific commodities and subtracting estimates of average unit costs of extraction or harvesting costs (including a normal return on capital). These unit rents are then multiplied by the physical quantities countries extract or harvest to determine the rents for each commodity as a share of GDP.

- ❖ **Oil rents** are the difference between the value of crude oil production at world prices and total costs of production.
- ❖ **Natural gas rents** are the difference between the value of natural gas production at world prices and total costs of production.
- ❖ **Coal rents** are the difference between the value of both hard and soft coal production at world prices and their total costs of production.
- ❖ **Mineral rents** are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.
- ❖ **Forest rents** are roundwood harvest times the product of average prices and a region-specific rental rate.

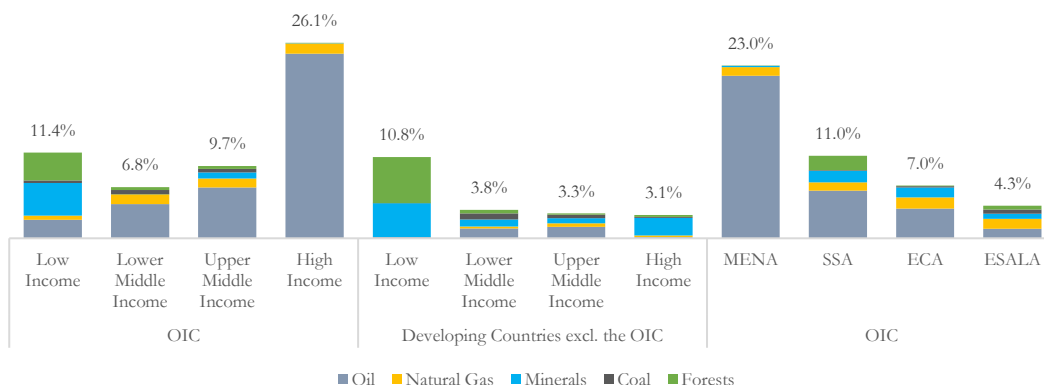
Source: World Bank, Adjusted Net Savings Database

above. Indeed, **Figure 1.7** shows that most of that contribution originated from **oil rents** – 10.6 percentage points of the 13.1% in 2018. While oil rents accounted for one tenth of GDP in OIC countries, only 0.3% of GDP in developed countries and 3.2% of GDP in developing countries consisted of oil rents. The contribution of **natural gas rents** to GDP was also much higher in the OIC (1.3%) than in both developed (0.1%) and developing (0.6%) countries. **Mineral rents** accounted for 0.7% of GDP in the OIC, a ratio again higher than that in developed countries (0.2%) but comparable to that of developing countries (0.8%). Contributions from **forest rents** and **coal rents** remained rather limited all over the world – less than half a percentage point.

### Higher Incomes Supported by Oil Rents

Similar to the case in the share of natural capital in total wealth, natural resource rents also tend to account for a lower share of GDP as the income level of countries rises. In high income, developed countries, total natural resources rents account for only 0.7% of GDP (**Figure 1.7**), and in developing countries other than OIC members, this ratio decreases gradually from 10.8% in low-income countries to 3.1% in high-income countries. However, this pattern is not observed in OIC member countries. Although the ratio does decline from 11.4% in low-income countries to 6.8% in lower-middle income countries, it increases to 9.7% for upper-middle income countries and up to 26.1% in high-income countries (**Figure 1.8**).

**Figure 1.8. Natural Resources Rents by Type, Income Level, and Region (% of GDP), 2018**



Source: SESRIC staff calculation based on data from Adjusted Net Savings database of the World Bank.  
 \* Income grouping is based on World Bank classification by 2019 GNI per capita.  
 \*\* MENA: Middle East & North Africa; SSA: Sub-Saharan Africa; ECA: Europe & Central Asia; ESALA: East and South Asia & Latin America

Behind this upturn lie oil rents. As **Figure 1.8** shows, in low-income developing countries, both OIC and non-OIC, mineral rents and forests rents are the major components of natural resources rents. Unlike in non-OIC developing countries, however, in OIC countries, oil rents contribute more to GDP as the income level rises and, in fact, themselves play a significant role in the rising incomes. Indeed, although natural resources rents account for over a quarter of GDP (26.1%) in high-income OIC countries, most of this contribution actually originates from oil rents (24.6%).

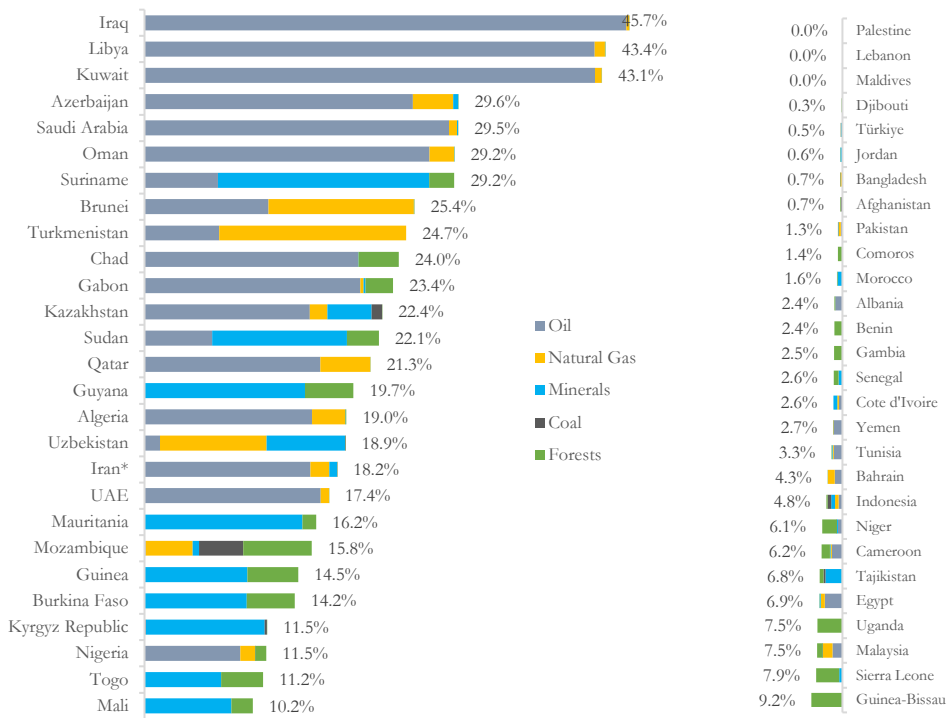
A similar situation could also be demonstrated from a regional perspective. In the Middle East & North Africa (MENA, where most of the oil-producer OIC member countries are located), oil rents, alone, account for 21.7% of GDP while the contribution of total natural resources rents to GDP is 23.0%. In Sub-Saharan Africa (SSA) and Europe & Central Asia (ECA), oil rents also contribute more to GDP than the other natural resources do, though to a lesser extent (**Figure 1.8**).

Regarding individual countries, among the 55 OIC member countries with available data (**Figure 1.9**), Iraq has the highest share of natural resources rents in GDP (45.7%) as of 2018, followed closely by Libya (43.4%) and Kuwait (43.1%). Next come Azerbaijan, Saudi Arabia, Oman, and Suriname, each with around 30% of GDP comprised of natural resources rents. In all of these countries except Suriname, oil rents account for a vast majority of natural resources rents. Oil rents are also the dominant component of total natural resources rents in eight of the other 20 countries with at least one tenth of GDP originating from natural resources rents (Chad, Gabon, Kazakhstan, Qatar, Algeria, Iran, United Arab Emirates, and Nigeria). Natural gas rents –the second largest natural resources rents in the OIC– are most notable in Turkmenistan, accounting for 17.6% of GDP, followed by Brunei Darussalam (13.7%), Uzbekistan (10.1%), Qatar (4.7%), and



Mozambique (4.4%). Minerals rents –the primary natural resources rents for low-income OIC countries– account for up to one fifth of GDP in Suriname (19.9%), followed by Guyana (15.1%), Mauritania (14.9%), Sudan (12.7%), and Kyrgyz Republic (11.2%). Forest rents are a significant component of GDP in many low-income OIC countries, particularly in Guinea-Bissau (9.2%), Uganda (7.3%), Sierra Leone (6.9%), and Mozambique (6.5%). Coal rents contribute to GDP most in Mozambique (4.2%) and somewhat in Indonesia (1.1%), Kazakhstan (1.0%), Tajikistan (0.5%), and Afghanistan (0.5%) (Figure 1.9).

Figure 1.9. Natural Resources Rents by Type in OIC Countries (% of GDP), 2018



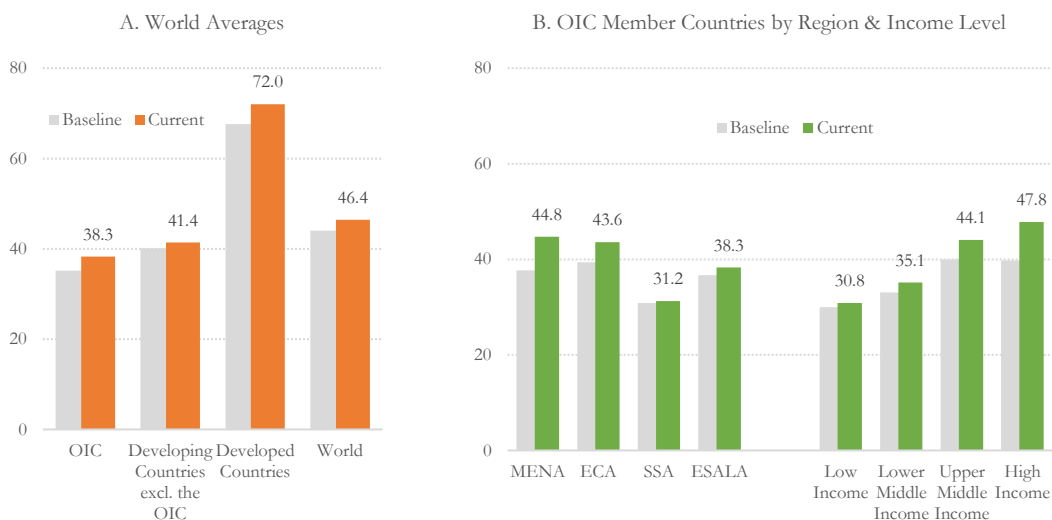
Source: SESRIC staff calculation based on data from Adjusted Net Savings database of the World Bank.  
 \* Data for 2017.

### 1.3 Environmental Performance

According to the 2020 Environmental Performance Index (EPI) (Wendling et al., 2020), which provides global metrics for the environment and ranks countries by their performance on sustainability issues (see BOX 1.3), OIC member countries, scoring 38.3 points on average, still lag behind both other developing countries (41.4) and developed countries (72.0) despite the improvement they achieved in the last decade (Figure 1.10/A). Member countries in the Middle East & North Africa and in Europe & Central Asia are performing relatively well and have also improved their environmental performance more than those in the other regions in the last decade (Figure 1.10/B).

Wealth is a determining factor in the environmental performance of countries, as highlighted in the 2020 EPI report (Wendling et al., 2020, p. 12) with a strong positive correlation ( $r=0.80$ ) between the EPI score and GDP per capita. This is attributed to the fact that achieving sustainability requires sufficient economic prosperity to fund public health and environmental infrastructure. The report has also found that this relationship is especially strong for issues within the “Environmental Health” policy objective, which requires significant investments in sanitation infrastructure, waste management facilities, and air emission control technologies. The relationship between wealth and the “Ecosystem Vitality” policy objective is weaker, which highlights the importance of sustainable development in that income growth too often comes at the cost of the environment, especially from the exploitation of natural resources –as explained above– and heightened generation of pollutants through material and energy consumption.<sup>3</sup>

**Figure 1.10. Change in Environmental Performance in the Last Decade: 2020 EPI Scores in the World and in the OIC by Region and Income Level**



Source: SESRIC staff calculation based on data from the 2020 EPI. ([epi.yale.edu](http://epi.yale.edu))

\* Current: Most recent year; Baseline: Approximately ten years prior to the most recent data.

\*\* Income grouping is based on World Bank classification by 2019 GNI per capita.

\*\*\* MENA: Middle East & North Africa; SSA: Sub-Saharan Africa; ECA: Europe & Central Asia; ESALA: East and South Asia & Latin America

In OIC member countries, too, it is observed that EPI score increases as income level rises. Moreover, the improvement achieved in EPI score in the last decade is also larger in higher income countries. Indeed, low-income OIC countries have an average EPI score of 30.8

<sup>3</sup> Economic prosperity, reflected in industrialization and urbanization, is usually associated with more pollution and other detrimental effects on ecosystem vitality. However, the existence of countries outperforming their economic peers at every level of economic development has led to a conclusion in the 2020 EPI report that there could be some other options that countries can utilize to improve performance without sacrificing sustainability for economic prosperity or vice versa. In this regard, the presence of long-standing policies and programs on environmental issues as well as good governance –including commitment to the rule of law, a vibrant press, and even-handed enforcement of regulations– are considered among the supportive elements having strong relationships with top-tier EPI scores, i.e. reinforcing environmental performance.

points and this has barely changed in the last decade (0.8 points). By comparison, the score for high-income OIC countries is as high as 47.8 and it increased 8 points in the last decade (Figure 1.10/B). Thus, it becomes evident that low-income OIC countries, most of which are in Sub-Saharan Africa and dependent on agricultural natural capital, cannot afford to adequately fund public health and environmental infrastructure and/or mitigate the negative

### BOX 1.3: The 2020 Environmental Performance Index (EPI)

Maintained by Yale Center for Environmental Law & Policy, Yale University, the 2020 Environmental Performance Index (EPI) provides a data-driven summary of the state of sustainability around the world. As a composite index, the EPI distills data on many indicators of sustainability into a single number. Initially, using the data received from various third-party sources, indicators are constructed on a 0-100 scale, from worst to best performance. Subsequently, for each country, the scores for indicators are aggregated into issue categories, policy objectives, and then, finally, into an EPI score. Currently, using 32 performance indicators across 11 issue categories, the 2020 EPI ranks 180 countries on 2 policy objectives—environmental health and ecosystem vitality (see the table below). Accordingly, the EPI provides a scorecard that highlights leaders and laggards in environmental performance—or in addressing the environmental challenges—and offers a policy tool in support of efforts to meet the targets of the UN Sustainable Development Goals (SDGs).

Organization of the 2020 EPI (weights within each level of aggregation)

Policy Objective	Issue Category	Weight	Indicator	Weight
Environmental Health (40%)	Air Quality	50%	PM <sub>2.5</sub> Exposure	55%
			Household Solid Fuels	40%
			Ozone Exposure	5%
	Sanitation & Drinking Water	40%	Unsafe Sanitation	40%
			Unsafe Drinking Water	60%
Heavy Metals	5%	Lead Exposure	100%	
Waste Management	5%	Controlled Solid Waste	100%	
Ecosystem Vitality (60%)	Biodiversity & Habitat	25%	Terrestrial Biome Protection (national)	20%
			Terrestrial Biome Protection (global)	20%
			Marine Protected Areas	20%
			Protected Areas Representativeness Index	10%
			Species Habitat Index	10%
			Species Protection Index	10%
	Ecosystem Services	10%	Biodiversity Habitat Index	10%
			Tree Cover Loss	90%
			Grassland Loss	5%
	Fisheries	10%	Wetland Loss	5%
			Fish Stock Status	35%
			Marine Trophic Index	35%
	Climate Change	40%	Fish Caught by Trawling	30%
			CO <sub>2</sub> Growth Rate	55%
			CH <sub>4</sub> Growth Rate	15%
			F-gas Growth Rate	10%
			N <sub>2</sub> O Growth Rate	5%
Black Carbon Growth Rate			5%	
CO <sub>2</sub> from Land Cover			2.5%	
GHG Intensity Trend			5%	
GHG per Capita			2.5%	
Pollution Emissions	5%	SO <sub>2</sub> Growth Rate	50%	
		NO <sub>x</sub> Growth Rate	50%	
Agriculture	5%	Sustainable Nitrogen Management Index	100%	
Water Resources	5%	Wastewater Treatment	100%	

Source: Wendling, Z.A., Emerson, J.W., de Sherbinin, A., Esty, D.C., et al. (2020). 2020 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. ([epi.yale.edu](http://epi.yale.edu))

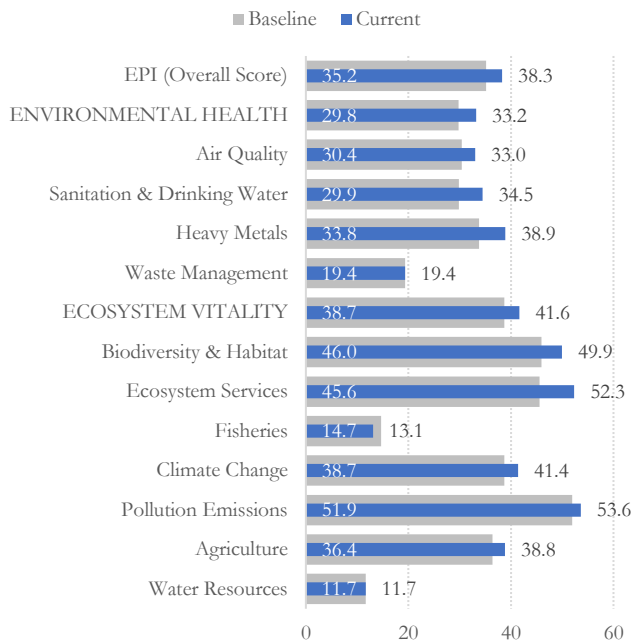
effects on the environment. In contrast, high-income OIC countries, which are rich in subsoil assets and generating about a quarter of their GDP from oil rents, have been capable of reinvesting in environmental health and ecosystem vitality, even to a greater extent in the last decade.

Digging into sub-categories of the 2020 EPI reveals that OIC countries score better in Ecosystem Vitality (41.6) than in Environmental Health (33.2), though both policy objectives have improved in the last decade (Figure 1.11). Within Environmental Health, waste management –included for the first time in the 2020 rankings– emerges as the weakest field in the OIC, with a score of 19.4. In air

quality and in access to safe sanitation & drinking water facilities, which are of utmost importance to human health, OIC member countries recorded improvement, driven by efforts around the Millennium Development Goals (MDGs) and the subsequent Sustainable Development Goals (SDGs). Nevertheless, the scores achieved (33 for air quality and 34.5 for sanitation & drinking water) are still below those of other developing countries (36.8 and 38.7, respectively) and developed countries (80.6 and 89.5, respectively).

Within Ecosystem Vitality, OIC countries score relatively well in reducing pollution emissions (53.6) –attributable to pollution control efforts and regulations as well as technological improvements– and in protecting ecosystem services (52.3) provided by forests, wetlands, and grasslands as a result of the rising awareness for their importance to biodiversity and climate change mitigation. Indeed, ‘ecosystem services’ is the most improved area in the OIC in the last decade, with a score rising by 6.8 points. However, the expansion of road transport accompanied by increasing vehicle use, industrial processes, and the use of fossil fuels in energy production continue to contribute to increasing emissions in many member countries, limiting the improvement in ‘pollution emissions’ in the last decade to only 1.7 points. On the other hand, OIC countries have had the lowest score in ‘water resources’ (11.7) due to low performance in wastewater treatment (Figure 1.11).

**Figure 1.11. 2020 EPI Scores: Ten-Year Change in Environmental Performance of the OIC by Category**



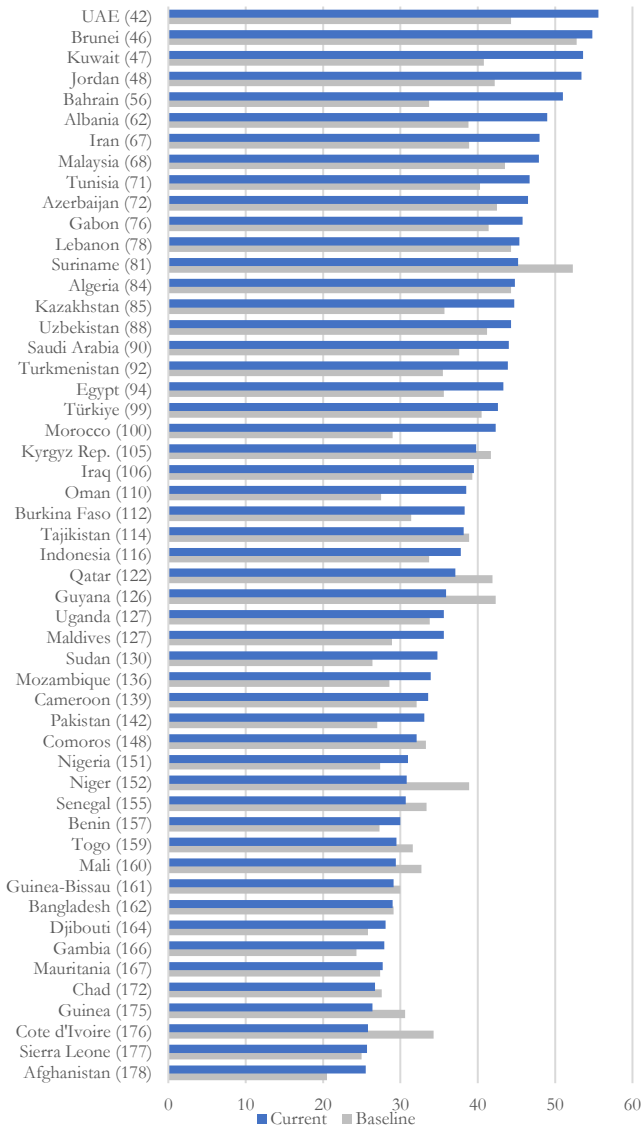
Source: SESRIC staff calculation based on data from the 2020 EPI. ([epi.yale.edu](http://epi.yale.edu))  
 \* Current: Most recent year; Baseline: Approximately ten years prior to the most recent data.

Among the 52 OIC member countries covered in the 2020 EPI, United Arab Emirates had the highest score (55.6), securing the 42<sup>nd</sup> position in the global rankings, mainly due to strong results on Environmental Health and high scores on indicators in Biodiversity & Habitat as well as Water Resources. Brunei Darussalam (46<sup>th</sup>), Kuwait (47<sup>th</sup>), and Jordan (48<sup>th</sup>) followed next closely. On the other hand, Afghanistan (178<sup>th</sup>), Sierra Leone (177<sup>th</sup>), Côte d'Ivoire (176<sup>th</sup>), Guinea (175<sup>th</sup>), and Chad (172<sup>nd</sup>) were at the bottom of the 2020 EPI rankings (**Figure 1.12**). Low scores on the EPI indicate the need for more efforts on sustainability in many areas. According to the EPI report (Wendling et al., 2020), some of the lowest-ranking countries face broader challenges, such as civil unrest, but the low scores for others can be attributed to weak governance and poverty.

Bahrain has emerged as the top country in the world to improve its EPI score (+17.3 points) over the last decade, largely thanks to the improvement in Ecosystem Vitality as a result of efforts to reduce emissions of greenhouse gases and other air pollutants. Morocco (+13.3), Kuwait (+12.8), United Arab Emirates (+11.3), Jordan (+11.2), and Oman (+11.0) are also among the top countries that have made significant improvements (**Figure 1.12**).

On the other side of the spectrum, among OIC countries, Cote d'Ivoire's EPI score has dropped the most (-8.8 points) due to deterioration in several areas such as climate change, tree

**Figure 1.12. Environmental Performance of OIC Member Countries (2020 EPI Scores)**



Source: The 2020 EPI. (epi.yale.edu)  
 \* Current: Most recent year; Baseline: Approximately ten years prior to the most recent data.  
 \*\* The numbers in parenthesis show each country's global rank in 180 countries.

cover loss, and pollution emissions. Fourteen more OIC countries, mostly low-income Sub-Saharan African, have slipped in environmental performance in the last decade: Niger (-8.1), Suriname (-7.1), Guyana (-6.4), Qatar (-4.8), Guinea (-4.2), Mali (-3.3), Senegal (-2.7), Togo (-2.1), Kyrgyz Republic (-1.9), Comoros (-1.2), Guinea-Bissau (-0.9), Chad (-0.9), Tajikistan (-0.7), and Bangladesh (-0.1) (**Figure 1.12**).

# Chapter 2

## Key Drivers of Change

Demographic, economic, and ecological systems are closely interconnected at local, regional, and global levels. Demographic dynamics (population size, growth, density, migration, urbanization, etc.) and the pursuit for economic growth, whether to accommodate the population growth or to increase wealth, obviously result in various adverse effects on the environment, and the constant change in environment is affecting human life directly or indirectly.

Currently, at the beginning of the third decade of the 21st century, our planet is faced with numerous environmental problems caused by humanity due to interference in or mistreatment of nature. Among the major problems are global warming and climate change, pollution (air, water, and soil), overexploitation of natural resources, unsustainable waste production and disposal, deforestation, loss of biodiversity, and soil degradation, which are all interlinked in some way and affect each other. Population growth, urbanization, and economic growth have a crucial role in those environmental challenges.

### 2.1 Population Growth

Population growth has been firmly related to the natural environment and the limits or 'carrying capacity' of the planet Earth since the 18<sup>th</sup> century, when limited food production was the dominant concern, highlighted by the Malthusian predictions of catastrophes caused by population growth (Bretschger & Pittel, 2020). The linkages between population dynamics and the environmental changes are actually complex and difficult to disentangle but many environmental issues are usually associated with population growth; sometimes directly by increasing demand for food and materials accompanied by increasing waste production, and sometimes indirectly by exacerbating other conditions such as bad governance, poverty, and insufficient infrastructure. Particularly, land cover change and deforestation, agricultural land degradation, abstraction and pollution of water resources, coastal and marine environmental disturbances, and energy, air pollution, and climate change have been the major environmental issue areas in the literature concerning the population-environment relationship (Sherbinin et al., 2007).

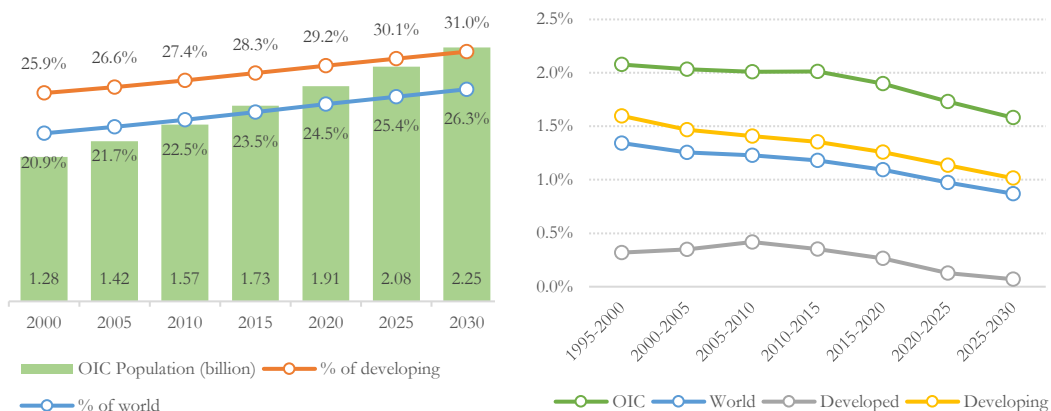
The UN (2019a) expects the world population to exceed 8.5 billion by 2030 and to continuously increase –though at a significantly reduced rate– to reach 10 billion in the second half of the 2050s<sup>4</sup>. The population of developed countries, growing at a rate already as low as 0.26% in the last 5-year period of 2015-2020 (**Figure 2.1, Right**), is expected to enter a declining trend after the mid-2030s. Thus, almost all of the population growth until the mid-2030s and all further growth is expected to occur in the developing world. Given

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<sup>4</sup> Under the 'medium variant' projections.

that the world is already concerned with the impact that even the current 7.8 billion people are having on the planet, population growth, as a stress factor on the environment, will be of particular concern to developing countries in the coming decades.

**Figure 2.1. OIC Population and Its Share in the World (Left) and Five-Year Average Growth Rate of Population (Right)**



Source: UN, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition. Rev. 1. [population.un.org/wpp/](http://population.un.org/wpp/)

Doubled in 33 years and exceeded 1.9 billion in 2020, the population of OIC member countries accounted for 29.2% of the total population of developing countries and 24.5% of the global population (Figure 2.1, Left). Although the population growth rate is declining in the OIC as well (Figure 2.1, Right), these ratios are estimated to rise up to 31.0% and 26.3%, respectively, by 2030 and to increase even further in the following years according to the projections of the United Nations. This clearly indicates that the OIC population will grow at even higher rates than the population of other developing countries, requiring to pay more attention to controlling the potential impacts on the environment.

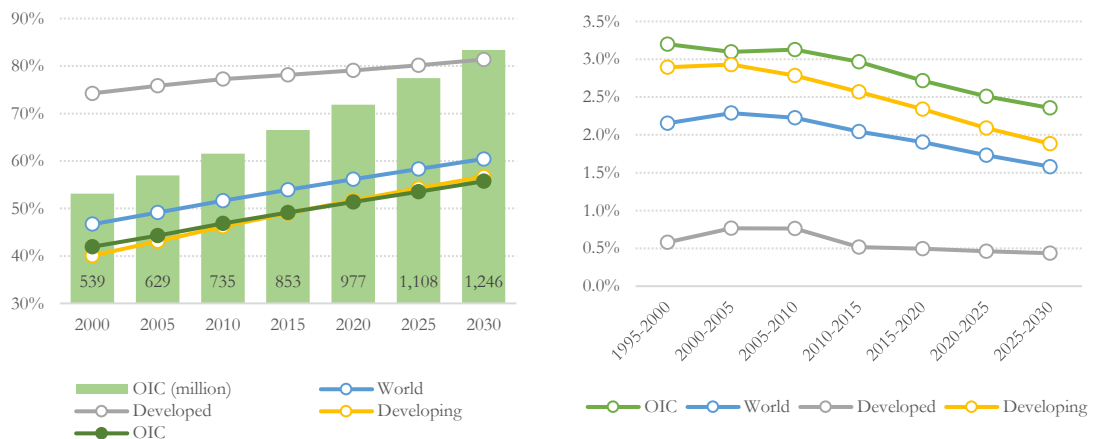
## 2.2 Urbanization

In practice, urbanization refers both to the increase in the percentage of population residing in urban areas and to the associated growth in the number of urban dwellers, in the size of cities, and in the total area occupied by urban settlements (UN, 2019b). Thus, by definition, its environmental impacts result from both (i) the geographical concentration of human population that brings with it a set of challenges associated with industrial growth, emissions, and wastes and (ii) the conversion of natural lands into urban settlements, the latter being among the most evident forms of human influence on the environment. With urban growth and sprawl, an increasing share of social and economic activities becomes concentrated in cities, which requires urbanization to be well-managed by integrated policies encompassing social, economic, and environmental aspects to minimize environmental degradation and to eventually ensure sustainable development.



Growth in the urban population could simply result from the reclassification of previously rural areas as urban areas, but more importantly, it is due to an overall population increase and people moving to settle in urban areas for various purposes. This eventual process is driven by numerous demographic, economic, political, and environmental factors (SESRIC, 2019). According to data from *World Urbanization Prospects* (UN, 2018), the global urban population has been continuously growing and will continue to grow in the foreseeable future. As of 2020, it is estimated that about 4.4 billion people, 56.2% of the world population, live in urban areas, and this number is projected to reach 5.2 billion by 2030, increasing the share of the urban population up to 60.4%. Of this increase of approximately 800 million people in a decade, 94% will originate from developing countries, where the percentage of the urban population will increase from 51.7% in 2020 to 56.7% in 2030. Developed countries that have already been highly urbanized will also see an increase from 74.2% to 81.4% over the same period (Figure 2.2, Left).

**Figure 2.2. Urban Population, % of Total Population (Left) and Five-Year Average Growth Rate of Urban Population (Right)**



Source: UN, Department of Economic and Social Affairs, Population Division (2018). *World Urbanization Prospects: The 2018 Revision, Online Edition*. [population.un.org/wup/](http://population.un.org/wup/)

As for OIC countries, urbanization has also been on the rise, following a similar trend to developing countries (Figure 2.2, Left). The urban population that numbered 539 million two decades ago is estimated to have reached 977 million as of 2020 and to exceed 1.2 billion by 2030. In parallel, the percentage of the urban population is estimated to have increased from 41.9% in 2000 to 51.4% in 2020, indicating that over half of the OIC population currently live in urban areas. This ratio is projected to further increase to 55.7% by 2030. Estimates also indicate that the growth rate of the urban population, despite showing a declining trend all over the world, will continue to be higher in OIC countries (Figure 2.2, Right), requiring them to implement comprehensive policies to plan and manage urban growth that sustainably improves the lives of both urban and rural residents.

## 2.3 Economic Growth

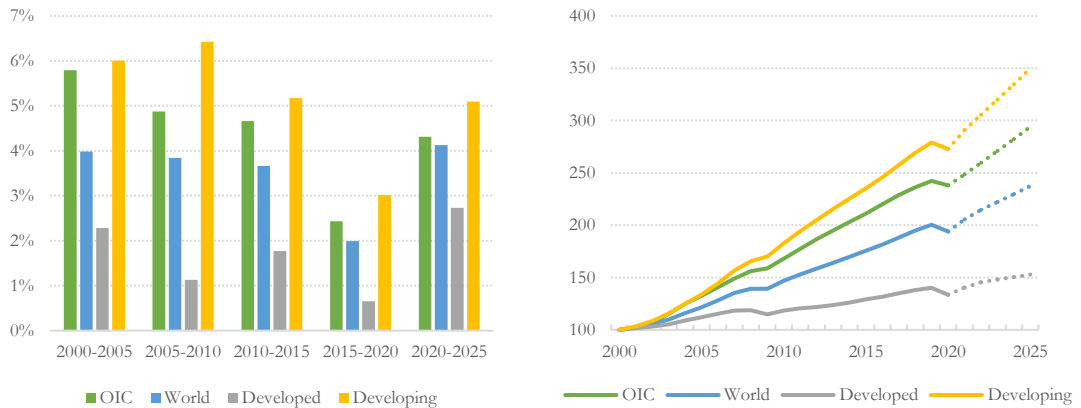
The relationship between economic growth and the natural environment has been a matter of discussion for a very long time, and this discussion has intensified especially with the popularization of the term ‘sustainable development’ mainly by the United Nations’ report “*Our Common Future*” (World Commission on Environment and Development, 1987) and the World Bank’s report “*Development and the Environment*” (1992). Both placing sustainability on the international agenda, these reports drew attention to the urgency of making progress toward economic development that could be sustained without depleting natural resources or harming the environment. Since then, numerous studies have addressed environmental issues in relation to economic growth –concerning whether environmental constraints will limit development and whether the development will cause serious environmental damage–but the varying results have clearly demonstrated how complex the relationship is.

The natural environment, without doubt, is central to economic activity, growth, and development. Besides delivering vital ecosystem services that support human life and all human activities, it provides the resources needed for production and also absorbs and processes the resulting pollution and waste. Economic growth, in turn, is needed for the wellbeing of the economy, raising standards of living, and improving quality of life in both advanced economies and in the developing world. Moreover, it is a key factor in generating the necessary level of investment in technology and infrastructure to facilitate the shift to a low carbon and resource efficient growth path (Everett et al., 2010). Nevertheless, economic growth is also responsible for the excessive depletion of natural resources and the degradation of ecosystems, posing risks of breaches in critical thresholds<sup>5</sup> beyond which irreversible changes may occur –natural assets cannot be replaced and can no longer support the desired level of economic activity, impairing the quality of life of the current and future generations.

Social, political, or economic, many factors play a role in the complexity of the relationship between economic growth and environmental quality, including but not limited to people’s awareness of environmental issues, consumption patterns, political willingness and determination, technological progress, international competition, income level and inequality, structure of economic activity, and stage of industrial development. Income level and the structure of economic activity are of particular importance to developing countries, including OIC members. As opposed to developed countries, which have high incomes and have already industrialized, lower income developing countries cannot adequately afford or are less inclined to introduce improved technology for environmental protection, as they prioritize poverty eradication. Correspondingly, the industrialization process in developing countries, reflected in an increasing share of industrial activities in GDP as opposed to service sectors, is also associated with increasing levels of pollution.

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<sup>5</sup> Overusing renewable resources beyond their rate of recharge and replenishment and passing the finite absorptive capacity of ecosystems as a “sink” for assimilating wastes and emissions.

**Figure 2.3. Five-Year Average Real GDP Growth (Left) and Real GDP (2000=100) (Right)**

Source: SESRIC staff calculation based on data from IMF, World Economic Outlook Database, April 2021.

With these in mind, statistics show that developing countries and OIC countries have been growing at much faster rates than developed countries in the last two decades, and this trend is expected to continue in the next five years until 2025 (**Figure 2.3, Left**). Consequently, although world real GDP doubled over the 2000-2020 period, the expansion in developing countries and in OIC countries was even greater, 2.7 times and 2.4 times, respectively (**Figure 2.3, Right**). Given the average growth rate estimates for the next five years, developing country output is expected to rise by 5.1% a year and, by 2025, will be 3.5 times what it was in 2000. Similarly, the output of OIC countries is expected to rise by 4.3% annually to almost triple over the same period. Thus, this high-growth performance requires more attention to be paid to its environmental reflections in the coming years with the aim of minimizing the negative impacts on human health and on the environment. This is particularly important for countries growing out of poverty, where optimal policies need to be formulated –with international support– in order to secure a balance between the protection of the environment and the development of the economy.



# **Part 2: Major Environmental Trends in OIC Countries**



# Chapter 3


## Land and Biodiversity

Conservation of land ecosystems and biodiversity has continuously become an unsolved issue globally. Despite an increase in the number of protected areas around the world, land areas are still degrading at an alarming rate, threatening the survival of many species. For instance, one fifth of the Earth’s land area is degraded, undermining the wellbeing of billions of people, driving the loss of biodiversity, and intensifying climate change (UN, 2020).

This chapter reviews the latest status and progress of OIC countries on achieving SDG targets concerning land and biodiversity. Land and biodiversity are directly related to SDG 15: Life on Land, with the official wording of “*Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*” (UN, 2017, p. 19). The goal includes 12 targets that need to be achieved, varying between 2020 and 2030. The progress in achieving these targets is measured by 14 indicators.


In this chapter, the analysis is divided into three topics, namely, *Conservation of Land Ecosystems*, *Land Degradation & Desertification*, and *Biodiversity Protection & Genetic Resources*. The analysis is done through related SDG targets and their corresponding indicators for each theme.

### 3.1 Conservation of Land Ecosystems




#### SDG TARGET 15.1

By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.



#### SDG TARGET 15.2

By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.



#### SDG TARGET 15.4

By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.

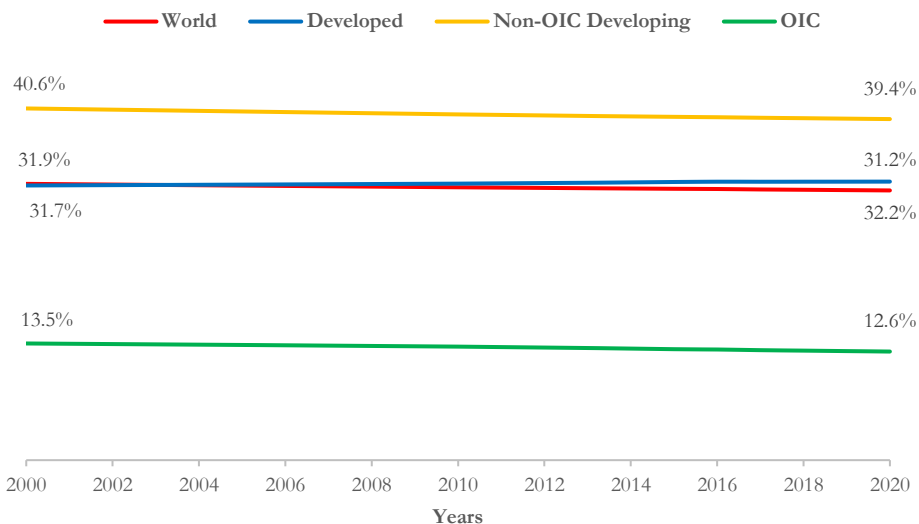
The conservation of land ecosystems is relevant to SDG target 15.1, 15.2, and 15.4. The targets place a special emphasis on protecting forest and mountain ecosystems in order to preserve biodiversity and continue to provide ecosystem services to society.

Forests are home to most of the earth’s terrestrial biodiversity. Despite important ecosystem services (e.g., water supply, livelihoods, climate change, and food production sources), forest degradation and deforestation continue at an alarming rate. This problem contributes significantly to the ongoing loss of biodiversity, which has a negative impact on people's livelihoods.

In 2020, the total forest area in OIC is 392.4 million ha, equivalent to around 10% of the global forest area. Forest areas are not distributed evenly, as countries with wetter climates have larger forests, whereas drier countries, such as countries in MENA, have little to none. More than half of the OIC’s forests are found in five countries, namely, Indonesia (92.1 million ha), Mozambique (36.7 million ha), Gabon (23.5 million ha), Türkiye (22.2 million ha), and Nigeria (21.6 million ha).

As a group, the OIC already has the lowest forest cover compared to its total land area. The OIC's forest area share was 12.6% of their total land area in 2020, which is lower than the global average of 32.2%. Furthermore, continued deforestation contributes to a downward trend in forest areas in the OIC (see **Figure 3.1**). The forest area in OIC has decreased by 0.9 percentage points from 13.5% in 2000 to 12.6% in 2020. The degree of forest loss is slightly higher than the global average level of forest loss, which accounts for a decrease of 0.8 percentage points. In comparison, during the same period, non-OIC developing countries recorded a 1.2 percentage decrease, while developed countries made slight gains in their forest areas by 0.4 percentage points.

**Figure 3.1. Forest Area by World Region (% of land area), 2000-2020**



Source: UNSTAT SDG Indicators

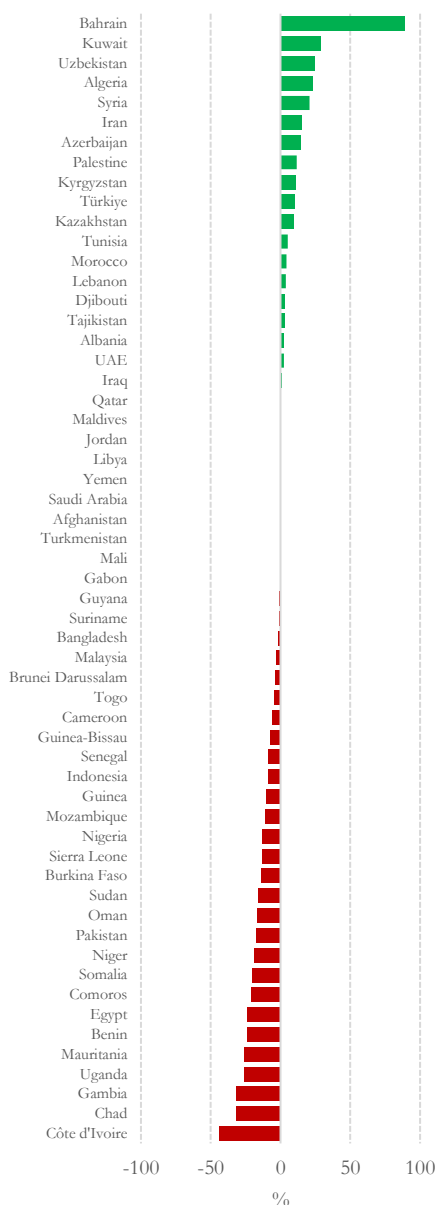
Globally, around 420 million ha of forest have been lost since 1990 due to conversion to other land uses, although the deforestation rate has declined over the past decades (FAO &

UNEP, 2020). In the period between 2010 and 2020, the global rate of deforestation was estimated at 0.12% forest area loss per year, down from 0.13% per year in 2000-2010. While the global deforestation rate is improving (somewhat), the OIC is showing an opposite trend. The deforestation rate in OIC was 0.27% per year during 2000-2010, and significantly rose to 0.44% per year for the period 2010-2020. This shows that deforestation in the OIC is increasing at a very alarming rate.

**Figure 3.2** shows the gain or loss of forest areas in OIC countries for the year 2020 relative to the year 2000. There are 29 OIC countries showing a loss of forest areas, 9 countries with relatively no change, and 19 countries showing a positive gain. Bahrain (+89.2%), Kuwait (+28.9%), Uzbekistan (+24.6%), Algeria (+23.4%), and Syria (+20.8%) had the highest increases in forest areas. On the other hand, the highest losses occurred in Côte d'Ivoire (-44.3%), Chad (-32.1%), Gambia (-32.1%), Uganda (-26.1%), and Mauritania (-25.8%).

Deforestation is mostly occurring in OIC countries located in the Sub-Saharan Africa (SSA) and East and South Asia and Latin America (ESALA) regions. This is due to rapid socioeconomic development, which motivates people to clear more land. Forests are being converted to other uses such as agriculture, land, housing, and industry. For instance, the expansion of subsistence and commodity agriculture, coupled with the expansion of the urban population, are the main drivers of deforestation in many SSA countries (Ordway et al., 2017; Rudel, 2013). On the other hand, in the ESALA region, deforestation is taking place due to the expansion of large-scale commodity agriculture. In Indonesia, for instance, the past decades of deforestation have been mainly due to the expansion of large-scale oil palm and timber plantations (Austin et al., 2019).

**Figure 3.2. Forest Area Gain/Loss (%), 2000-2020**

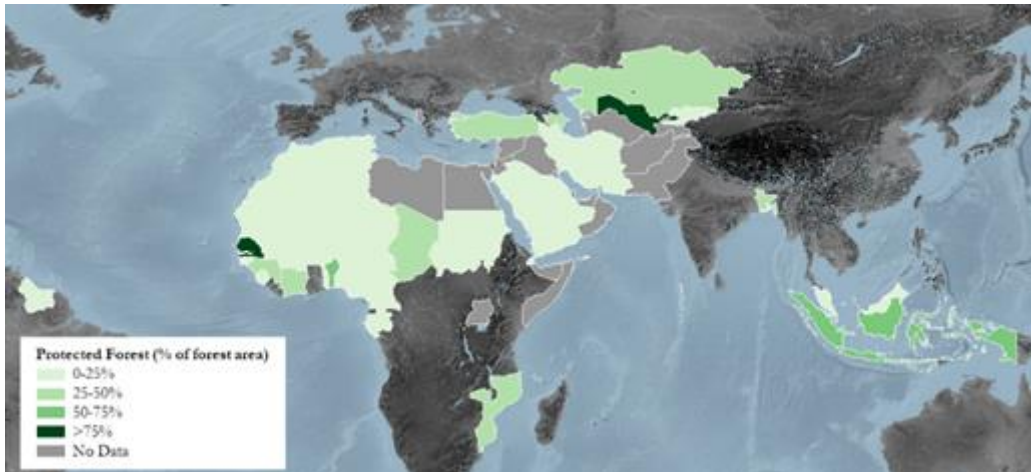


Source: UNSTAT SDG Indicators



Given the nature of the problem, a long-term solution is required. One of the governance tools to create barriers to deforestation and pursue biodiversity objectives is through the creation of protected areas (Watson et al., 2014). The latest statistics indicate that globally there are more than 700 million hectares of forests (equivalent to 18% of global forests) that are legally protected, such as national parks, conservation areas and game reserves (FAO & UNEP, 2020). In OIC, 31% of forests are protected or equivalent to more than 120 million ha forest areas. Furthermore, there has been an additional 5.7 million hectares of protected forests since 2000.

**Figure 3.3. Protected Forest Area, 2020**



Source: SESRIC staff generated map, based on UNSTAT SDG Indicators

**Figure 3.3** depicts the proportion of protected forest areas in OIC member countries. There are 4 countries having at least half of their forests area protected, namely, Uzbekistan (99.7%), Senegal (90.8%), Benin (74.5%), and Indonesia (54.5%). Furthermore, some OIC countries with a large share of forests still do not have adequate levels of protected forests. Suriname, Guyana, and Gabon, for example, are OIC countries with the highest forest cover, accounting for more than 90% of their total land area. However, only less than 15% of its forests are protected. Protected forest areas might have multiple benefits to the society through their important ecosystem services, such as provide resources (such as food and water); ecosystem support and regulation; and cultural services (such as aesthetic values, recreation, and provide peace and mental wellbeing) (Stolton et al., 2015).

## 3.2 Land Degradation & Desertification



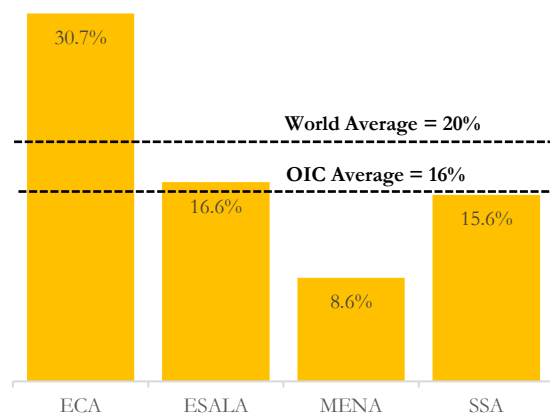
### SDG TARGET 15.3

By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

UNCCD (1994, p.4) defined land degradation as “the reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from a combination of pressures, including land use and management practices”. Desertification, on the other hand, is part of land degradation where fertile land turns into a desert.

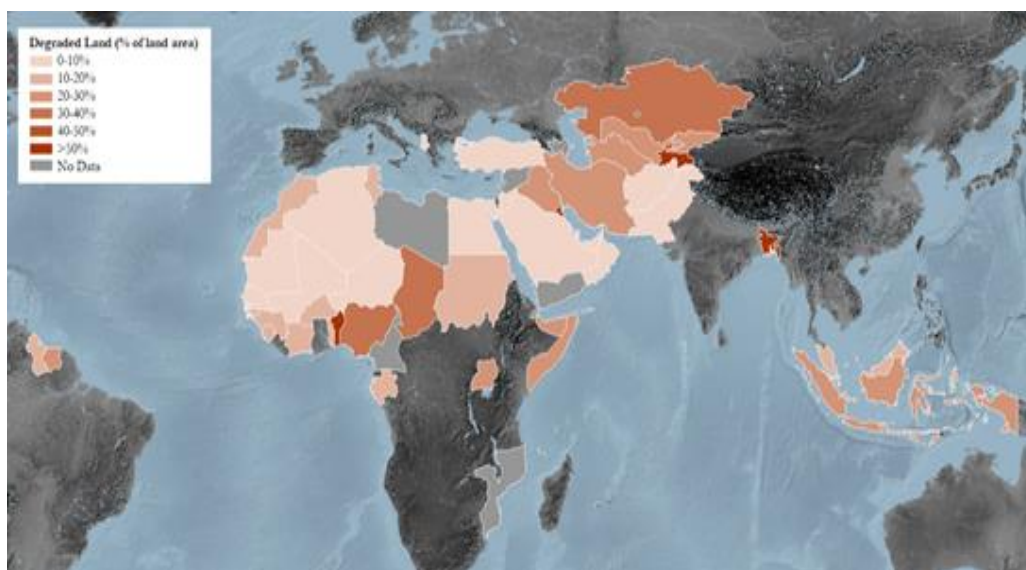
Between 2000 and 2015, approximately one-fifth of the Earth’s land surface covered by vegetation showed persistent and declining trends in productivity, primarily due to poor land and water management (UN, 2020). This is equivalent to around 2,600 million ha of degraded land. In comparison, 16% of the land area in the OIC is degraded, which is equivalent to around 500 million ha of degraded land. In OIC regions, the land degradation status is not equal, as seen in **Figure 3.4**. The highest rate of land degradation is occurring in ECA (30.7%), while the least is in the MENA region (8.6%). ESALA and SSA, in contrast, are close to the OIC average level, having land degradation levels of 16.6% and 15.6% respectively.

**Figure 3.4. Degraded Land by Regions (% of total land area), 2000-2015**



Source: UNSTAT SDG Indicators

**Figure 3.5. Degraded Land by Country (% of total land area), 2000-2015**




Source: SESRIC staff generated map, based on UNSTAT SDG Indicators

At the country's level, the status of land degradation can be seen in **Figure 3.5**. There are 4 countries having land degradation at an alarming level (land degradation of more than 50%), namely Tajikistan (97%), Bangladesh (65%), Kuwait (64%), and Benin (53%). Except for Bangladesh, these are countries with the majority of dry land. Further land degradation would result in desertification.

Nature is not the only cause of land degradation. It also occurs due to a human-induced footprint on the land. Factors such as unsuitable agricultural practices, rapid urbanization, weak land governance, and expansion of agricultural areas led to uncontrolled land-use change, which contributed to land degradation. In Tajikistan, for example, severe land degradation occurred due to inappropriate land management practices, poor irrigation, overgrazing, and deforestation. These factors combined have resulted in land abandonment and loss of productivity, as a result, intensifying the incidence and intensity of rural poverty in the country (UNDP-UNEP, 2012). Without intervention in good land management practices, degraded land may worsen in the future as a result of both climate change and rapidly expanding economic development.


Managing and restoring degraded land involves good governance of the dryland ecosystem. Currently, the concept of land degradation neutrality (LDN) needs to be implemented by member countries, especially those having high levels of degraded land. The LDN framework aims to achieve a “*state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems*” (UNCCD, 2015, p.4). Appropriate targets and measures need to be set to achieve measurable progress. Up to now, 43 OIC countries have defined LDN targets. It is therefore critical to implement, monitor progress, and make more ambitious LDN commitments in the future.

### 3.3 Biodiversity Protection & Genetic Resources




#### SDG TARGET 15.5

Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.



#### SDG TARGET 15.6

Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.



#### SDG TARGET 15.9

By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

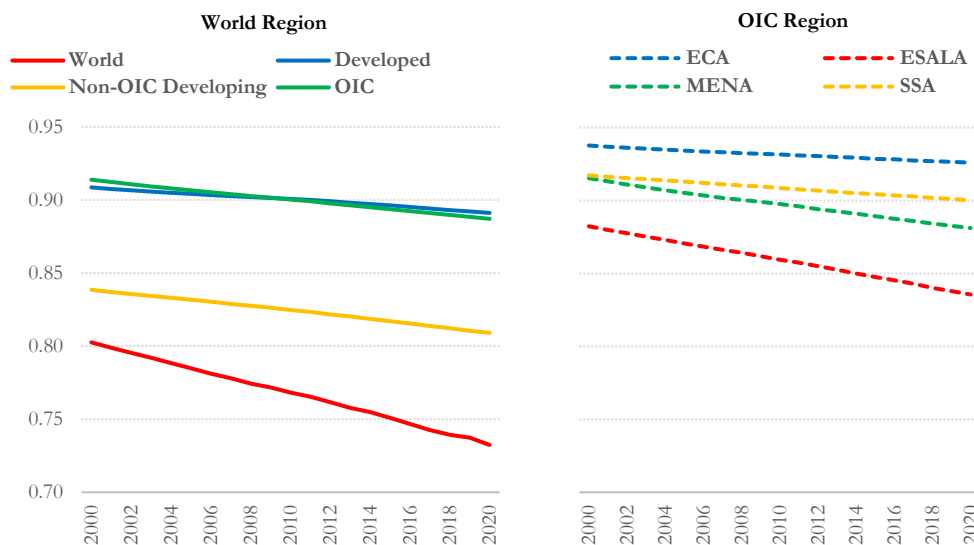
The loss of biodiversity would be disastrous for human beings as the richness of biodiversity provides humankind with ecosystem services that are needed for survival. Biodiversity

provides food, shelter, maintains water cycles, and maintains ecosystem balance. Currently, human activities have contributed to the loss of biodiversity worldwide. Climate change is also hastening this trend.

During the last decade, biodiversity in all world regions has shown a declining trend, as indicated by the Red List Index (RLI). The RLI categorizes the conservation status of major species groups based on the risk of extinction and measures trends in the proportion of species expected to remain extant in the near future without additional conservation action (IUCN, n.d.). **Figure 3.6** shows the trend of the RLI aggregated for all species in the world and the OIC regions. Globally, species are moving towards increased extinction risk, as shown by a decrease in the RLI value from 0.8 in 2000 down to 0.73 in 2020. In comparison, the OIC region, on average, is also showing an increase in extinction risk for its entire species, although at a slower pace. In 2020, the RLI levels of OIC were 0.89, decreasing slightly from the RLI levels of 0.91 in 2000. The OIC's rate of species extinction is comparable to that of developed countries. Despite having the least risk of extinction, the decline of species should be addressed.

While the OIC as a group shows a relatively lower risk of species extinction compared to other world regions, within OIC, the trends in species extinction risks are diverse. The fastest rate of extinction occurred in ESALA, where the RLI has declined from 0.88 in 2000 to 0.84 in 2020. In contrast, Europe and Central Asia (ECA) was the region with the lowest risk of species extinction, with RLI remaining relatively stable between 2000 and 2020 at 0.94 and 0.93, respectively.

**Figure 3.6. Red List Index of All Species, 2000-2020**



Source: UNSTAT SDG Indicators

Note: An RLI value of 1.0 equates to all species qualifying as Least Concern (i.e., not expected to become Extinct in the near future). An RLI value of 0 equates to all species having gone extinct.

While, in general, OIC countries are performing relatively better compared to other world regions, the trend still shows an increasing risk of species extinction. Continued ecosystem degradation will result in even more biodiversity loss. As a result, it endangers society's future well-being due to the economic costs of disrupted ecosystem services, increased vulnerability to food security, disease spread, loss of livelihoods, and accelerated climate change.

# Chapter 4

## Air

Air pollution and its serious consequences for human health are increasingly being recognized as one of the most pressing environmental issues of the 21<sup>st</sup> century. A recent report (Health Effects Institute, 2020) indicated that in 2019, air pollution was placed 4<sup>th</sup> as a leading risk factor for death globally, surpassing other widely recognized risk factors such as obesity, high cholesterol, and malnutrition. Ambient air pollution caused an estimated 6.7 million deaths worldwide in 2019 (Health Effects Institute, 2020). Even in the European Union (EU), air pollution is recognized as the number one environmental cause of premature death (EU, n.d.).

Recently, various restrictions and reduced social mobility during the COVID-19 pandemic have been observed to have an impact on local air pollution. While significant economic and social costs have to be paid, clear skies and starry nights are visible in many countries, which is sometimes a rare sight. Globally, air pollution, in terms of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM) levels, has declined by about 60% and 31% (Venter et al., 2020). The decreases are primarily the result of significant reductions in emissions from the transportation sector. However, as various restrictions are lifted and economic activities resume, air pollution has again risen. Nonetheless, the temporary improvement in air quality during the lockdown periods served as a stark reminder of what emissions deprive us of. Various restrictions to halt the spread of COVID-19 only provide a short-term solution; long-term solutions to air pollution are deemed necessary.

This chapter discusses the state and trends of the air in OIC countries based on the relevant SDG targets. There is no specific SDG for air pollution, although the problem is mentioned in two targets under SDG 3 (Good Health and Well-Being) and SDG 11 (Sustainable Cities and Communities). Accordingly, this chapter is divided into two parts, covering the status of air pollution and its health impacts.

### 4.1 Air Pollution



#### SDG TARGET 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

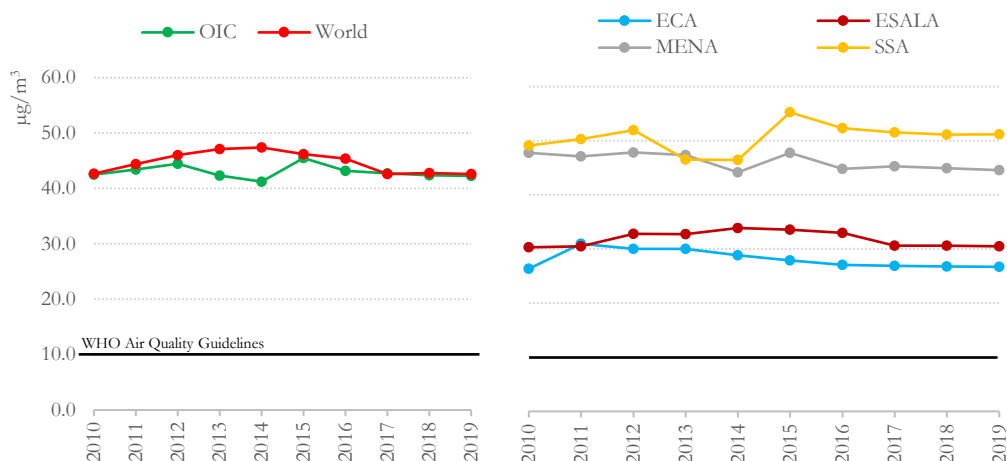
The quality of the air is indicated by its levels of pollutants. The amount of fine particulate matter (PM) is one of the most common indicators of air quality. These particles are generally the product of combustion from vehicles, coal-power plants, industrial activities, waste burning, and other natural and human sources. Continuous exposure to these

airborne particles, especially high concentrations of PM<sub>2.5</sub><sup>6</sup>, leads to an increasing risk of health and mortality, especially from cardiovascular and respiratory diseases.

The WHO Air Quality Guidelines (WHO, 2006) recommend an annual mean PM<sub>2.5</sub> concentration of 10 µg/m<sup>3</sup>. Globally, little has been done to address the high levels of PM. The Health Effects Institute (2020) estimated that the world's annual average levels<sup>7</sup> of PM<sub>2.5</sub> have improved only modestly, declined from 42.7 µg/m<sup>3</sup> in 2010 to 42.6 µg/m<sup>3</sup> in 2019. That being said, in 2019, more than 90% of the global population is still living in places where PM levels are above the WHO Air Quality Guidelines (AQG) value.

The trend in OIC countries is parallel to the global trend. As shown in **Figure 4.1 (Left)**, on average, PM<sub>2.5</sub> exposures in OIC declined slightly from 42.5 µg/m<sup>3</sup> in 2010 to 42.3 µg/m<sup>3</sup> in 2019. However, within the OIC regions, diversity exists. In 2019, the highest annual average exposures were seen in SSA (51.2 µg/m<sup>3</sup>) and MENA (44.6 µg/m<sup>3</sup>), while the lowest were in ECA (26.7 µg/m<sup>3</sup>) and ESALA (30.5 µg/m<sup>3</sup>) (**Figure 4.1, Right**). The fact that many OIC countries have made slow progress in reducing PM<sub>2.5</sub> exposure demonstrates that many countries lack national standards for PM and do not monitor PM levels.

**Figure 4.1. Annual Mean PM<sub>2.5</sub> Concentrations in World Region (Left) and OIC Regions (Right), Population-weighted, 2010-2019**



Source: Global Burden of Disease Study 2019

**Figure 4.2** shows the status of annual mean PM<sub>2.5</sub> exposure in individual OIC countries, categorized<sup>8</sup> based on the WHO Air Quality Guidelines (WHO, 2006). There were 35 OIC

<sup>6</sup> Fine particulate matter smaller or equal to 2.5 micrometers (µm) in diameter

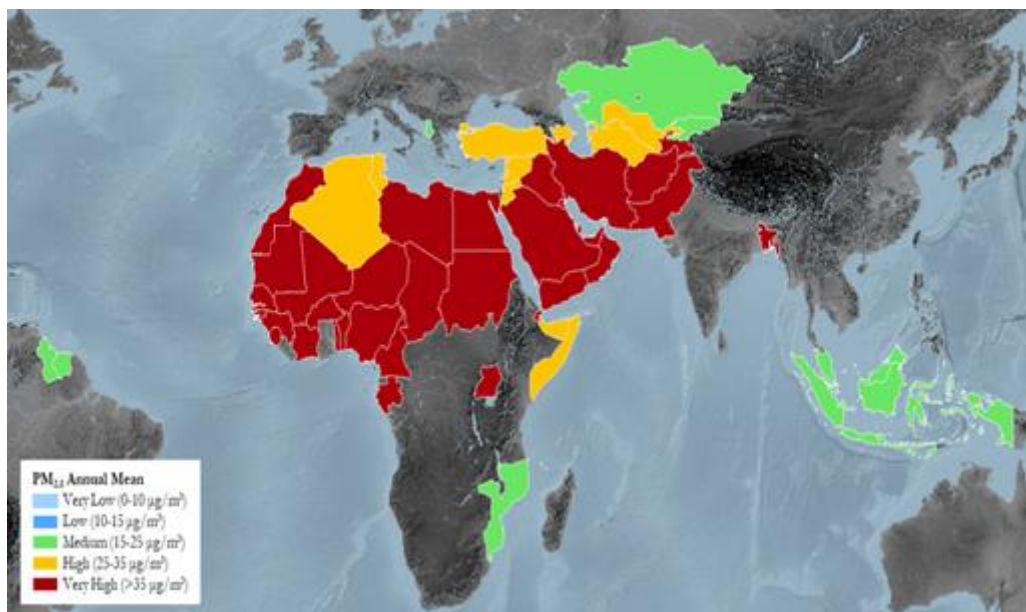
<sup>7</sup> population-weighted annual mean

<sup>8</sup> **Very Low/Air quality guideline (AQG):** These are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to PM<sub>2.5</sub>.

**Low/Interim target-3:** In addition to other health benefits, these levels reduce the mortality risk by approximately 6% [2-11%] relative to the Interim Target-2 level.

countries having a very high level of PM2.5 exposures, thereby having a very high mortality risk due to PM2.5 related diseases. The remaining OIC countries managed to reach at least the WHO interim target 1 (25-35  $\mu\text{g}/\text{m}^3$ ). There were only two countries that met (and almost met) the WHO AQG, namely the Maldives (10.9  $\mu\text{g}/\text{m}^3$ ) and Brunei Darussalam (7.7  $\mu\text{g}/\text{m}^3$ ).

**Figure 4.2. Annual Mean Levels of PM2.5, 2019**



Source: SESRIC staff generated map based on data from Global Burden of Disease Study 2019

It is worth noting that the most severe air pollution is observed in countries located in SSA and MENA regions. The top five OIC countries with the worst annual PM2.5 levels in 2019 were Niger (80.1  $\mu\text{g}/\text{m}^3$ ), Qatar (76  $\mu\text{g}/\text{m}^3$ ), Nigeria (70.4  $\mu\text{g}/\text{m}^3$ ), Egypt (67.9  $\mu\text{g}/\text{m}^3$ ), and Mauritania (66.8  $\mu\text{g}/\text{m}^3$ ). Countries with extremely high PM2.5 concentrations (greater than 35  $\mu\text{g}/\text{m}^3$ ) would have a 15% higher chance of long-term mortality risk compared to the AQG level. One of the reasons for the high level of pollution is because air pollution has not yet become a top priority in these countries' policies. For instance, according to Amegah & Agyei-Mensah (2017), the main challenges in establishing policies to control air pollution in many SSA countries are the absence of air quality monitoring and evidence of its associated health risk. Therefore, setting up plans for national air quality monitoring is the first step toward improving the national response to the air pollution problem and providing a health impact assessment related to air pollution.

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**Medium/Interim target-2:** In addition to other health benefits, these levels lower the risk of premature mortality by approximately 6% [2–11%] relative to the Interim Target-1 level.

**High/Interim target-1:** Associated with about a 15% higher long-term mortality risk relative to the AQG level.

**Very High:** More than 15% higher long-term mortality risk relative to the AQG level.



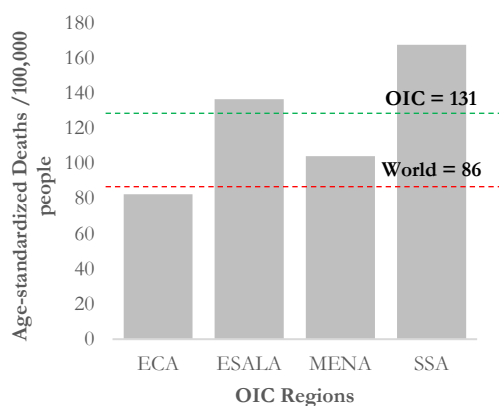
## 4.2 Health Impact



### SDG TARGET 3.9

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

**Figure 4.3. Mortality Rate Attributed to Ambient Air Pollution, 2019**



Source: Global Burden of Disease Study 2019

factor for death globally, exceeding other well-known risk factors for chronic diseases, such as obesity, high cholesterol, and malnutrition. Furthermore, air pollution affects the quality of life indirectly through loss of working hours, decreasing productivity and forced migration (Oliva et al., 2019). According to OECD (2016), the global welfare costs from premature deaths from outdoor air pollution reached US\$3 trillion in 2015 and are projected to be US\$25 trillion in 2060.

Health Effects Institute (2020) reported that in 2019, air pollution was responsible for the premature deaths of 6.7 million people worldwide. During the same period, 1.6 million people died as a result of air pollution in OIC countries. Although total numbers of deaths are useful for identifying the magnitude of the health impact, age-standardized rates<sup>9</sup> of death are important for comparing the health burden among regions. The health impact attributable to air pollution varies widely between regions, reflecting variation in exposures and the underlying prevalence of disease and other population susceptibilities. The age-standardized rate of death attributable to air pollution in OIC countries was 131

<sup>9</sup> Age-standardized rates: The total number of deaths per 100,000 people, calculated based on a standard distribution of population across age categories. Age-standardized rates allow direct comparison of the health burden among countries with very different population sizes and distributions of ages in the population. Higher air pollution-attributable age-standardized rates of disease reflect a combination of higher air pollution levels and/or sicker populations.

The COVID-19 pandemic has devastating impacts on our daily lives. A growing body of evidence suggests that the spread of COVID-19 disease may be sped up in areas with chronic air pollution (Travaglio et al., 2021; Fattorini & Regoli, 2020). COVID-19 is a disease where the virus breaks down the respiratory system, affecting the lungs, blood vessels, and many other parts of the body. Exposure to air pollution is known to affect the immune system, making an individual more susceptible to respiratory and other infections (Health Effects Institute, 2020).

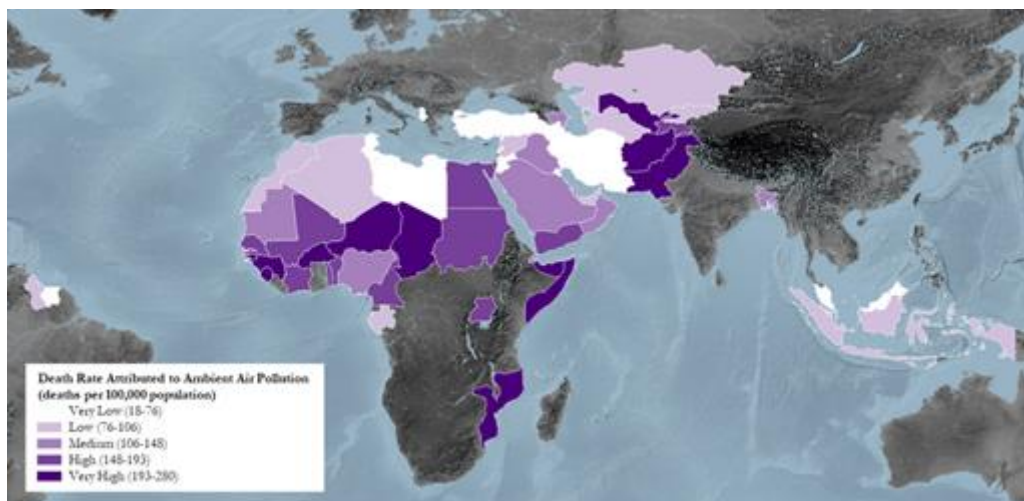
Recently, air pollution has also moved up to the 4<sup>th</sup> position in terms of the leading risk

deaths/100,000 people, significantly higher than the global average of 86 deaths/100,000 people.

Variation in the death rate exists within OIC regions as illustrated in **Figure 4.3**. Death rates were quite alarming, especially in the ESALA and SSA regions, which had the highest rates of deaths in the OIC regions, with 137 and 168 deaths/100,000 people, respectively. In comparison, the number of deaths per 100,000 people in the MENA and ECA regions was 104 and 83, respectively.

The burden of health due to air pollution also varies depending on the country. As shown in **Figure 4.4**, OIC countries in SSA and ESALA experience the highest death rates due to air pollution. For example, Somalia, Guinea-Bissau, Afghanistan, Chad and Niger were the top five countries with the highest death rates in the OIC, having a level of 280, 244, 238, 225, and 223 deaths per 100,000 people respectively. In contrast, the lowest levels of air pollution-attributable deaths occurred in Brunei Darussalam (18.1 deaths/100,000), the Maldives (29.9/100,000), Malaysia (45.5 /100,000), Türkiye (53.3/100,000), and Suriname (53.6/100,000). It is worth noting that Brunei Darussalam and the Maldives have the lowest levels of PM2.5 air pollution in OIC. This is clear evidence that controlling air pollution levels can prevent significant deaths.

**Figure 4.4. Mortality Rate Attributed to Ambient Air Pollution in OIC Countries, 2019**



Source: SESRIC staff generated map based on data from Global Burden of Disease Study 2019

The burden attributable to air pollution varies widely around the regions, reflecting variation in exposures and the underlying prevalence of disease and other population susceptibilities. Countries with a high level of air pollution might have low death rates, for instance, due to well-equipped health systems. As a result, a population exposed to air pollution is less likely to develop chronic diseases. Therefore, mitigating the health risks posed by air pollution should be accomplished simultaneously with both air pollution prevention and healthcare system improvement.

# Chapter 5

## Water

The sustainable management of water resources is crucial for the OIC member countries to address complex and multidimensional developmental issues, including, but not limited to, poverty, gender inequality, economic disparity, food insecurity, and global health pandemics. Access to water is a basic human right, but the preservation of this right is highly contingent upon effective and sustainable management of water resources and the development of adequate infrastructure and policy regulations.

This chapter reviews the latest status and progress on achieving SDG targets concerning water. Water is directly related to SDG 6: Clean Water and Sanitation for all, with the official wording of "*Ensure availability and sustainable management of water and sanitation for all*" (UN, 2017, p. 10). More detailed discussions of the water sector in OIC member countries can be found in the *OIC Water Report 2021* (SESRIC, 2021).

SDG 6 is in line with the OIC-2025 Programme of Action and emphasizes the need to improve and develop infrastructure and the utilization of modern technologies to address challenges pertaining to the optimal use of water resources. This need is enshrined under three different priorities of the *OIC-2025 Programme of Action*: Priority 5 on the Environment, Climate Change and Sustainability, Priority 8 on Agriculture and Food Security, and Priority 12 on Health, along with a need to minimize the destructive impact of water and strengthen cooperation in the domain of water resource management. Furthermore, the *OIC Water Vision* (OIC, 2012), which focuses on OIC member countries' "*working together for a water secure future*", recognizes access to water as an important milestone in improving water security, human health, and overall development in OIC member countries.

### 5.1 Water Scarcity & Use

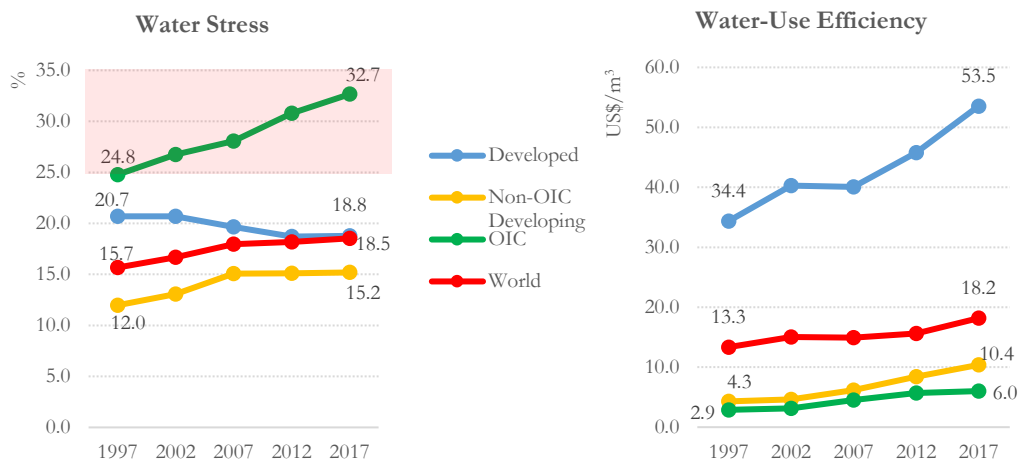


#### SDG TARGET 6.4

By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

Water scarcity can be measured by the level of water stress. The level of water stress describes the proportion of water withdrawal by all sectors from the available water resources, taking into consideration the water requirements for sustaining the natural environment as well. The indicator provides information on whether water is sufficient to be consumed for both the environment and society at large, thereby indicating the water security status of the region. A high level of water stress not only jeopardizes the natural environment's sustainability, but may also have a negative impact on socioeconomic development and food security due to competing water use.

**Figure 5.1. Water Stress (Left) and Water-use Efficiency (Right) by World Region, 1997-2017**



Source: FAO AQUASTAT database

By definition of the indicator, countries begin to experience water stress at a 25% level, while above 70% is considered to be critically stressed (UN-Water & FAO, 2018). **Figure 5.1 (Left)** shows the trend of water stress in various world regions between 1997 and 2017. During that period, all regions except developed countries were undergoing increasing trends of water stress. Globally, water stress increased from 15.7% in 1997 to 18.5% in 2017. In comparison, water stress has risen significantly in the OIC countries, from 24.8% to 32.7%. At the current level, the OIC is considered to be a region experiencing water stress.

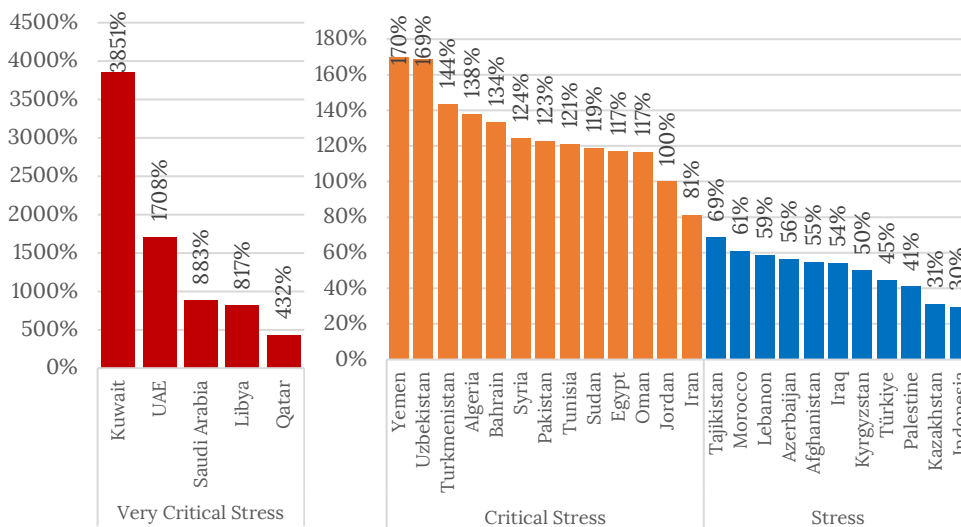
At the individual country level, in 2017, there are 29 OIC member countries undergoing water stress, 13 of which are at critical stress levels and five countries are at a very critical stress level (see **Figure 5.2**). The majority of water-stressed countries are located in arid and semi-arid regions where water resources are scarce. At the sub-regional level, MENA and ECA are the regions with the most countries under a serious threat of water stress.

Water stress is worsening over time as water demand rises due to population growth and shifting consumption patterns. On the other hand, the impacts of climate change will most likely change the availability of water in the future. By 2040, most OIC regions are projected to see an increase in the water stress level by at least 1.4 times (SESRIC, 2021). That being said, the regions that are already experiencing water stress will be more distressed, while some regions will start to undergo water stress.

Given the levels of water stress in OIC countries, the management of water will require improvements in water-use efficiency through calculated use and other water-use reduction measures. The use of water in the OIC continues to be less efficient, despite some improvement in recent years. **Figure 5.1 (Right)** illustrates the trends of water-use efficiency (WUE), which measures the value-added in US\$ per volume of water withdrawn

by various economic sectors in a region. The OIC as a group has the least water-use efficiency level compared to all the world regions under consideration. In 2017, OIC countries generated US\$6 per one m<sup>3</sup> of water, which is only one-third of the global average level of US\$18 per m<sup>3</sup>. In comparison, non-OIC developing and developed countries managed to generate US\$10.2 and US\$53.5 per m<sup>3</sup> of water respectively.

**Figure 5.2. Water Stress in OIC Countries, 2017**



Source: FAO AQUASTAT database

At the country level, 17 OIC countries have WUE values above the world average of US\$18 per m<sup>3</sup>, particularly Qatar (191.6), Kuwait (102.4), Gabon (94.8), and the UAE (92.8). On the contrary, 37 OIC countries had WUE values lower than the global average, with Somalia, Tajikistan, the Kyrgyz Republic, Afghanistan, and Syria having the lowest (less than US\$1 per m<sup>3</sup>).

Agriculture, as the most water-intensive sector, is in need of efficiency improvement to meet future food demand. This could be achieved through practising conservation, reusing water, and implementing various modern approaches to increase water use efficiency. Using efficient irrigation techniques is vital for boosting food production and thereby ensuring food security in the OIC region. However, available data on the irrigation techniques used in OIC countries indicates that surface irrigation, which is the most water-consuming technique, is by far the most widely used technique in 74.4% of the total area equipped for irrigation. Consequently, huge amounts of water diverted to irrigation in these countries are wasted at the farm level through either deep percolation or surface runoff. In contrast, sprinkler irrigation, which is more water-saving than surface irrigation, is practised in 4.6% of the total area equipped for irrigation in the OIC countries, and the localized irrigation technique, which is the most water-saving technique, is practised in only 3.1% of the total area equipped for irrigation in the OIC countries (SESRI, 2021).

## 5.2 Ecosystem Protection



### SDG TARGET 6.6

By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

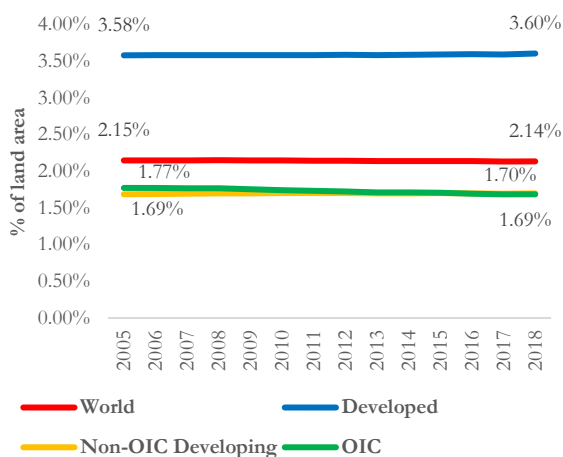
Over the last century, it is estimated that the global natural wetland has lost 70% of its area, which includes a significant loss of freshwater species (Davidson, 2014). Considering the importance of ecosystem services, it is essential to protect and restore water-related ecosystems and to ensure continuous benefits to society. To get an idea of how water-related ecosystems are preserved, it can be seen through the change in the extent of water bodies.

The change of water bodies over time can be seen in **Figure 5.3**. Various regions demonstrated different trends between 2005 and 2018. Globally, the proportion of water bodies relative to the land area has declined slightly from 2.15% in 2005 to 2.14% in 2018. During the same period, developed countries have managed to increase their water bodies from 3.58% to 3.60%, while in non-OIC developing countries, the proportion of water bodies was relatively stable at 1.69%. OIC countries, however, showed a sharp declining trend, where their water bodies declined from 1.77% in 2005 to 1.70% in 2018. This equates to approximately 2.7 million hectares of lost water bodies, an area roughly the size of Albania.

The individual country levels show a diverse picture as can be seen in **Figure 5.4**. There were 27 OIC countries which recorded an increase in their water bodies during the 2005-2018 period. The highest increases occurred in Algeria (72% increase), Sudan (55%), and Pakistan (42%). On the other hand, the countries with the highest loss of water bodies were Uzbekistan (47% decrease), Afghanistan (34%), and Somalia (25%).

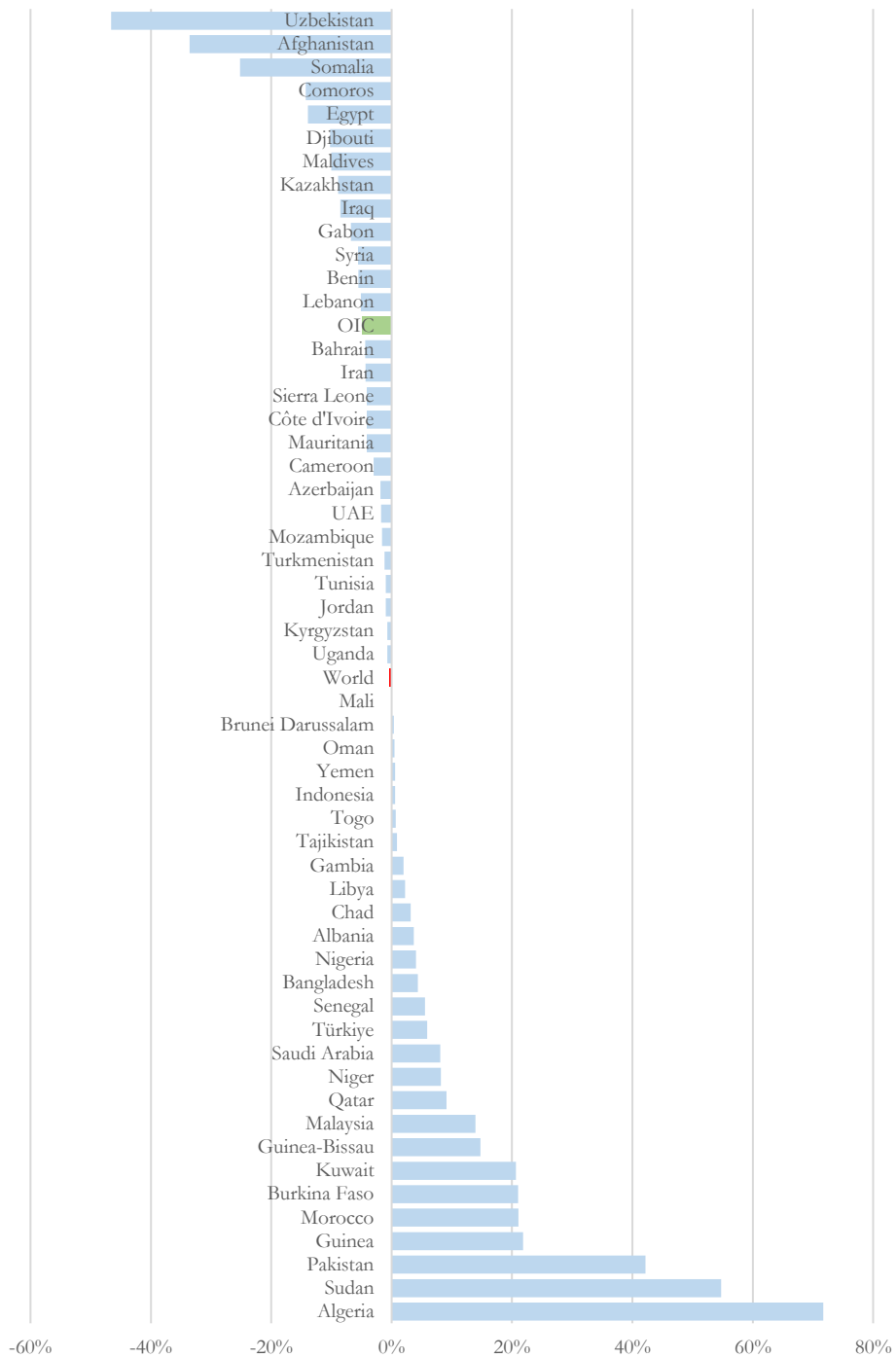
Protection and restoration of water-related ecosystems is one way to preserve water resources. Increasing water bodies would mean increasing the catchments and reservoirs for water in the region. This is important for all water-related ecosystems, such as vegetated wetlands, rivers, lakes, reservoirs and aquifers, and those found in mountains and forests that play a special role in storing freshwater and maintaining water quality.

**Figure 5.3. Water Body Extent (Permanent and Maybe Permanent), 2005-2018**



Source: UNSTAT SDG Indicators

**Figure 5.4. Change in Water Body Extent (Permanent and Maybe Permanent), 2005-2018**



Source: UNSTAT SDG Indicators

## 5.3 Water Governance



### SDG TARGET 6.5

By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.



### SDG TARGET 6.a

By 2030, expand international cooperation and capacity building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.



### SDG TARGET 6.b

Support and strengthen the participation of local communities in improving water and sanitation management.

The myriad of issues faced in the water sector requires responsive interventions that efficiently combine technical expertise, prescriptive governance, and effective management. The modern approach to water resource management stresses the need to fulfil the water needs of present and future generations by incorporating sustainable development approaches into the water sector. This can be achieved through multi-sector integration, broader stakeholder involvement, and raising awareness about the importance of the economic, social, and ecological values of water (Schoeman et al., 2014). Furthermore, the system also needs to be adaptable to future shocks and uncertainties, including climate change.

The failure of traditional physical/extraction-based water planning has encouraged international society to bring to the table a water management solution that incorporates ecological and societal values into water decision making. Integrated Water Resources Management (IWRM) is perhaps the gold standard of a water resources management framework, which tries to bridge the gap between sustainable development and cross-sectoral planning (Jeffrey & Gearey, 2006). IWRM recognizes the highly interrelated relations between water and other sectors; therefore, involving various stakeholders to form water policies is deemed necessary. In practice, the application of IWRM consists of basin-scale management of water resources, establishing water rights, water pricing for allocation, and participatory decision-making.

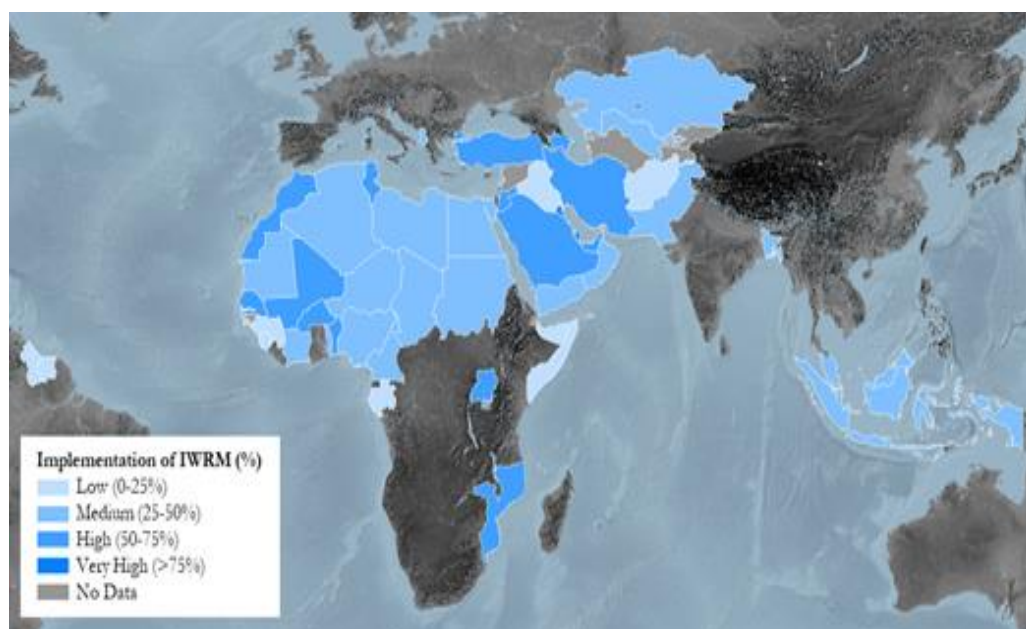
Implementation of IWRM, therefore, may indicate the level of good governance in managing the water sector. UNEP (2012) reports that, since 1992, 80% of countries have started reforming procedures to improve the enabling environment for water resource management based on the application of IWRM. Over the past decades of implementation, countries that have adopted integrated approaches have been reported to boost infrastructure development, provide diverse financing sources, and improve institutional frameworks, which has led to better water management practices and socio-economic benefits (UNEP, 2012). The economic benefits are suggested through efficiency



improvement, mostly in water-use in the agriculture sector. Social and environmental benefits are also reported in terms of improved access to water and improved water quality through wastewater treatment.

OIC member countries are also implementing IWRM. For instance, Kazakhstan, Kyrgyzstan, Azerbaijan, Tajikistan, and Turkmenistan have undergone IWRM implementation, such as the transition to a basin management approach, institutional setup, and regulatory reform, since the 2000s (OECD & United Nations, 2014). Furthermore, many other OIC countries are also undergoing implementation at differing stages. **Figure 5.5** shows the status of IWRM implementation with scores categorized into "*Low*" (0-25% implementation), "*Medium*" (25 - 50%), "*High*" (50 - 75%), and "*Very High*" (>75%). The majority of OIC countries fall into the "*Medium*" category, indicating that most aspects of the IWRM have been institutionalized. Eight countries are in the "*Low*" category, meaning they have started developing elements of IWRM. In the "*High*" category, there are 13 OIC countries. These countries have been implementing most elements of the IWRM in their long-term programmes. Finally, the remaining three countries, which are generally achieving their water-policy objectives, fall under the "*Very High*" category. These countries are Kuwait (82% IWRM implementation), Qatar (82%), and United Arab Emirates (75%). Collective action that builds on the multi-stakeholder monitoring and reporting processes is needed to set national targets to accelerate water resource development and management in a sustainable and equitable way.

**Figure 5.5. Implementation of Integrated Water Resources Management (%), 2018**

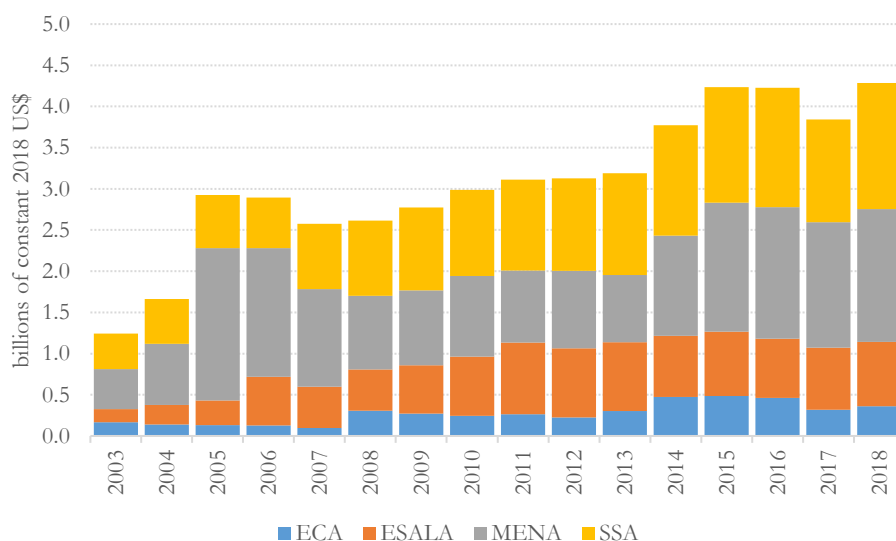


Source: UNSTAT SDG Indicators

The fact that there are 153 countries with trans-boundary rivers, lakes, and aquifers should not be overlooked in global efforts to solve water issues. Shared water basins are estimated to cover around 62 million km<sup>2</sup> of land (42% of global land), shelter over 2.8 billion people, and account for 54% of global river discharge (UNEP, 2016). One of the major impediments to addressing global water problems is a failure to cooperate appropriately in the management of shared basins. UN & UNESCO (2018) reported that while there have been around 450 transboundary water treaties adopted since 1820, there are still many shared basins which lack the necessary arrangements to support their management.

Globally, the percentage of transboundary basins covered by an operational arrangement was 59.2% in the period 2017-2018 for countries with data available (UNEP, 2019b). For comparison, developed countries have 82.2% of their shared basins covered by agreements, while non-OIC developed countries have covered 53.3% of their basins. OIC countries, on average, have the least coverage of basins under agreement with a share of 44.1%. Note that Bahrain, Comoros, Kuwait, Maldives, Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen are the OIC countries with no shared surface watercourses (SESRIC, 2018). On a country-by-country basis, Niger (90%), Cameroon (88.6%), Benin (81.5%), Mali (75.4%), Tunisia (80%), and Uganda (83.6%) have already covered more than 70% of their shared basins.

**Figure 5.6. Water Sector ODA in OIC Regions, 2003-2018**



Source: UNSTAT SDG Indicators

The progress in SDG 6 would not be achieved without strong financial support. There is a need to scale-up funding for projects in the water sector to tackle water issues. This would need an increase in funding both through internal and external channels. To be sustainable, investments in the water sector should be supported through an appropriate business model

and various alternative financial sources, such as blended finance, loans, and revolving funds.

According to UNEP (2019), total water sector overseas development assistance (ODA) disbursements were raised from US\$7.4 billion in 2011 to US\$9.0 billion in 2016. OIC countries, in this regard, have increased ODA disbursements from US\$1.24 billion in 2003 to US\$4.3 billion in 2018. **Figure 5.6** illustrates the trends of the water sector ODA in the OIC regions. MENA and SSA regions received the most ODA, accounting for 73% of total ODA in the OIC. The need to improve basic drinking water and sanitation in most SSA countries was the main target for ODA. On the other hand, the water-scarce MENA region needs to ensure the continued supply and distribution of water from scarce resources.

**Table 5.1. Users/Communities Level of Participation in Rural Drinking-Water Supply Planning Programs, 2019**

Participation Level	OIC Member Countries
<b>High (12)</b>	Afghanistan, Albania, Azerbaijan, Bangladesh, Burkina Faso, Guinea, Kazakhstan, Mali, Mauritania, Morocco, Palestine, Syria
<b>Moderate (24)</b>	Cameroon, Chad, Côte d'Ivoire, Gabon, Gambia, Indonesia, Iran, Jordan, Kyrgyzstan, Malaysia, Maldives, Mozambique, Niger, Nigeria, Oman, Pakistan, Senegal, Sierra Leone, Sudan, Tajikistan, Togo, Tunisia, Uganda, Yemen,
<b>Low (2)</b>	Comoros, Guyana
<b>N/A (5)</b>	Benin, Egypt, Guinea-Bissau, Lebanon, Uzbekistan

Source: UNSTAT SDG Indicators

Governance of water should also ensure the fulfillment of the basic drinking water needs of society. Rural populations, in most cases, lack the necessary infrastructure and resources to have adequate access to clean drinking water. SESRIC (2021) reports that 84.6% of the population in OIC countries had access to at least basic drinking water in 2017 – relatively low as compared to non-OIC developing countries (88.3%) and developed countries (99.5%). Regionally, there were disparities in the coverage of basic drinking water between the various OIC regions. For instance, member countries in MENA, ECA, and ESALA achieved 90% or higher coverage of basic drinking water services, whereas those in the SSA recorded a coverage level of only 64%. In fact, in Chad, Burkina Faso, and Uganda, less than 50% of the population had access to at least basic drinking water in 2017.

Community participation is a key component of increasing sustainable water, sanitation and hygiene (WASH) service provision, particularly in rural areas and for promoting IWRM. Achieving this can contribute towards increased participation of women in political, economic and public life. It can also contribute towards ensuring the conservation, restoration, and sustainable use of freshwater ecosystems and their services and ensuring responsive, inclusive, participatory, and representative decision-making at all levels (UNEP, 2019b). As shown in **Table 5.1**, the majority of OIC countries are reported to have moderate to high levels of community participation in rural drinking water supply planning programs. This is a positive indication of the improvement of WASH services, especially in rural areas.



# Part 3: Environment and Climate Change



# Chapter 6

## Greenhouse Gases Emissions Trend



### SDG 13

Take urgent action to combat climate change and its impacts.



### PARIS AGREEMENT

Strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

Climate change is one of the biggest challenges of the 21<sup>st</sup> century, and today's actions will determine the state of the future world we are going to live in. Without any intervention, the average global temperature is expected to increase by more than 2°C above pre-industrial levels by the end of this century (UNEP, 2019a). The OIC is one of the most vulnerable regions due to its high exposure and low adaptive capacity. According to modelling results (IPCC, 2014a), some of the highest increases in temperatures are estimated to occur in arid and semi-arid regions, particularly in SSA, MENA, and Central Asia, where many OIC countries are located.

The same regions will also have to bear the negative impact of climate change on renewable water resources, as global climate change is projected to increase the frequency of extreme events (such as heatwaves, drought, and floods) and climate variability (IPCC, 2014b). Moreover, changes in water quantity and quality due to climate change are expected to put further pressure on food security and access to clean water and sanitation and disturb the operation of water infrastructure (e.g. irrigation systems, hydropower, etc.), thus threatening the well-being of society.

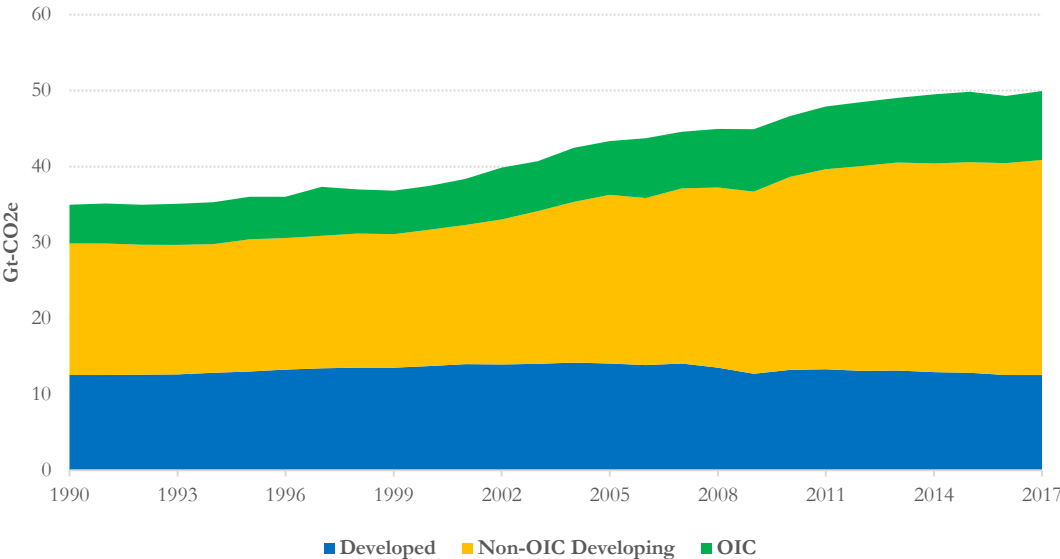
This chapter reports trends in greenhouse gases (GHG) emissions in the OIC countries. Historical GHG emissions, as well as CO<sub>2</sub> emissions (as the major contributor to GHG), are presented and analysed by presenting their major sources and types. Furthermore, CO<sub>2</sub> emissions are decomposed into four factors to identify the main reason for the emissions trend.

### 6.1 GHG Emissions

According to IPCC (2013) anthropogenic GHG emissions are the most significant driver of observed climate change since the mid-20<sup>th</sup> century. Increasing GHG emissions in the atmosphere have warmed the climate and led to other environmental changes which affect human lives.

Global GHG emissions increased 43% between 1990 and 2017, reaching a total of 50 Gt-CO<sub>2</sub> equivalent (CO<sub>2</sub>e) in 2017. In the same period, GHG emissions in OIC countries increased by 77%, while in non-OIC developing countries, they increased by 63%. For comparison, developed countries have managed to decrease their GHG emissions by 0.1%. **Figure 6.1** presented the historical GHG emissions trend in world regions between 1990 and 2017. It is apparent that the OIC and other developing countries have contributed the most to the increase in global GHG emissions. In 2017, GHG emissions from OIC countries totaled 9 Gt- CO<sub>2</sub>e, accounting for 18.1% of global GHG emissions. In comparison, non-OIC developing countries emit 26.7 Gt- CO<sub>2</sub>e (53.7% of global GHG emissions).

**Figure 6.1. Historical Global GHG Emissions by Region, 1990-2017**

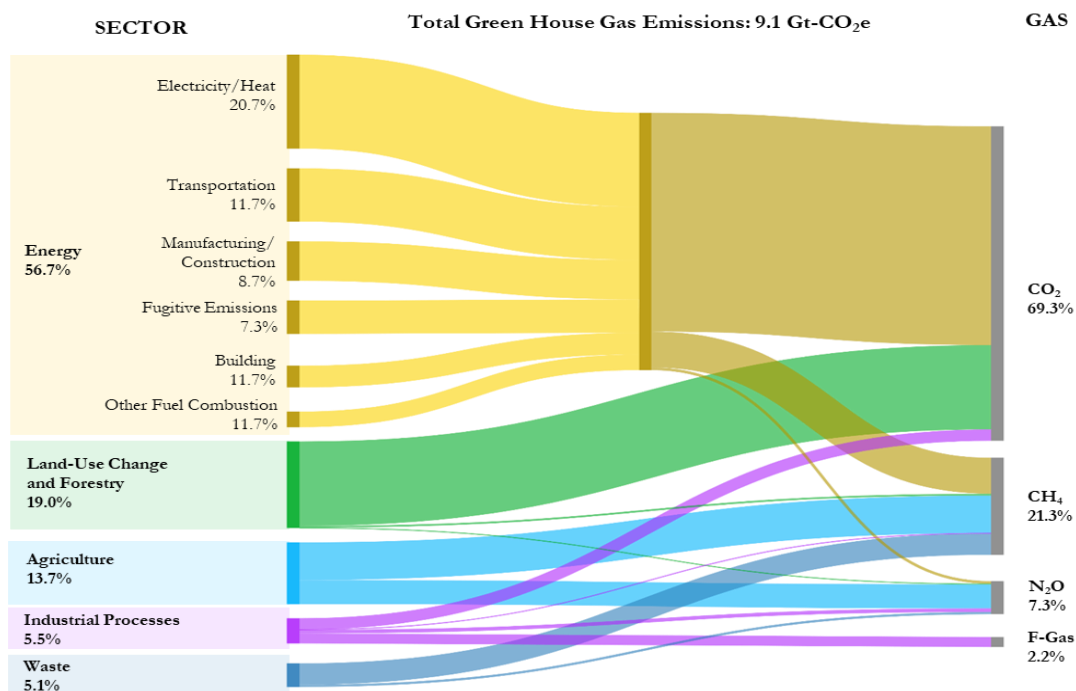


Source: WRI CAIT

Anthropogenic GHG emissions come from various economic sectors, with energy consumption accounting for most of the share. As shown in **Figure 6.2**, in 2017, the energy sector was attributed to more than half of the GHG emissions in the OIC countries. The majority of emissions come from electricity/heat production (20%), followed by transportation (11.7%), manufacturing/construction (8.7%), buildings (11.7%), other fuel combustion (11.7%), and fugitive emissions (7.3%). In non-energy sectors, land use change and forestry contributed to 19% of total emissions, while the agricultural, industrial, and waste sectors contributed to 13.7%, 5.5%, and 5.1% of total emissions respectively.

On the other end, CO<sub>2</sub> remains the largest GHG emissions, accounting for almost 70% of total GHG emissions in OIC countries. Other GHG emissions, such as methane, N<sub>2</sub>O, and F-gas, have a smaller share, amounting to 21.3%, 7.3%, and 2.2% respectively.

Figure 6.2. GHG in OIC by Sector and Gas, 2017



Source: SESRIC staff calculations based on WRI CAIT

## 6.2 CO<sub>2</sub> Emissions

The fact that CO<sub>2</sub> plays a major role in overall GHG emissions (and therefore climate change) requires a closer look at this gas in particular. As seen in **Figure 6.2** above, CO<sub>2</sub> emissions from anthropogenic sources come from mainly three sources: energy (i.e., fossil fuel combustion), land-use change and forestry, and industrial processes. This part especially discusses CO<sub>2</sub> emissions from fossil fuel combustion, which is the largest source of CO<sub>2</sub> in OIC countries.

Based on the Emissions Database for Global Atmospheric Research (EDGAR)<sup>10</sup>, between 2010-2019, global CO<sub>2</sub> emissions from fossil fuel combustion increased annually by 1.1%, reaching a total of 36.7 Gt-CO<sub>2</sub>. In comparison, during the same period, CO<sub>2</sub> emissions grew faster in OIC countries, which have an average annual growth of 2.6%. This level is also higher than the non-OIC developing countries' annual emissions growth rate of 2.0%.

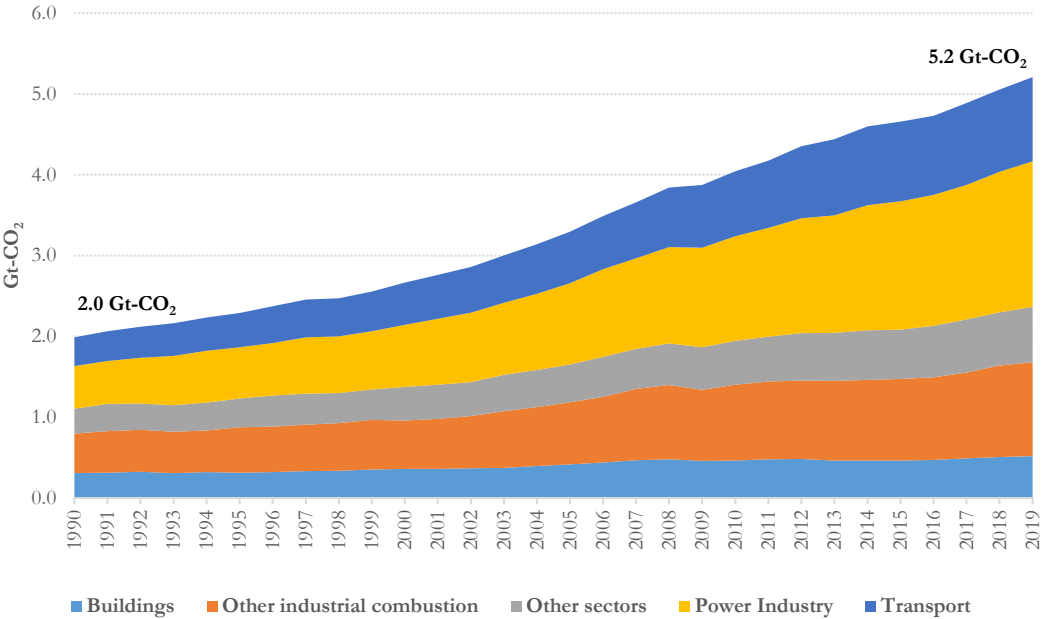
**Figure 6.3** presents historical CO<sub>2</sub> emissions in OIC countries in terms of their sectors from 1990 to 2019. During the period, CO<sub>2</sub> emission grew more than double from 2.0 Gt-

<sup>10</sup> EDGAR is a database under European Commission, which provides independent emission estimates compared to what reported by European Member States or by Parties under the United Nations Framework Convention on Climate Change (UNFCCC), using international statistics and a consistent IPCC methodology. See <https://edgar.jrc.ec.europa.eu/> for more details.



CO<sub>2</sub> to 5.23 Gt-CO<sub>2</sub>. The power sector, transportation, and other industrial combustion contribute to more than 70% of the total CO<sub>2</sub> emissions in the OIC.

**Figure 6.3. Historical CO<sub>2</sub> Emissions in OIC by Sector, 1990-2019**



Source: EDGAR V5.0 GHG Emissions Database

**Figure 6.4** depicts the growth in emissions from each sector in the OIC over the last decade. Growth of emissions from the power sector was the highest, with an increase of 39.6% in 2019, relative to the 2010 level. Furthermore, CO<sub>2</sub> emissions from fossil fuel combustion have grown by more than 20% in transportation, other industrial combustion, and other sectors. The least growth in emissions is observed from the building sector (+11.3%).

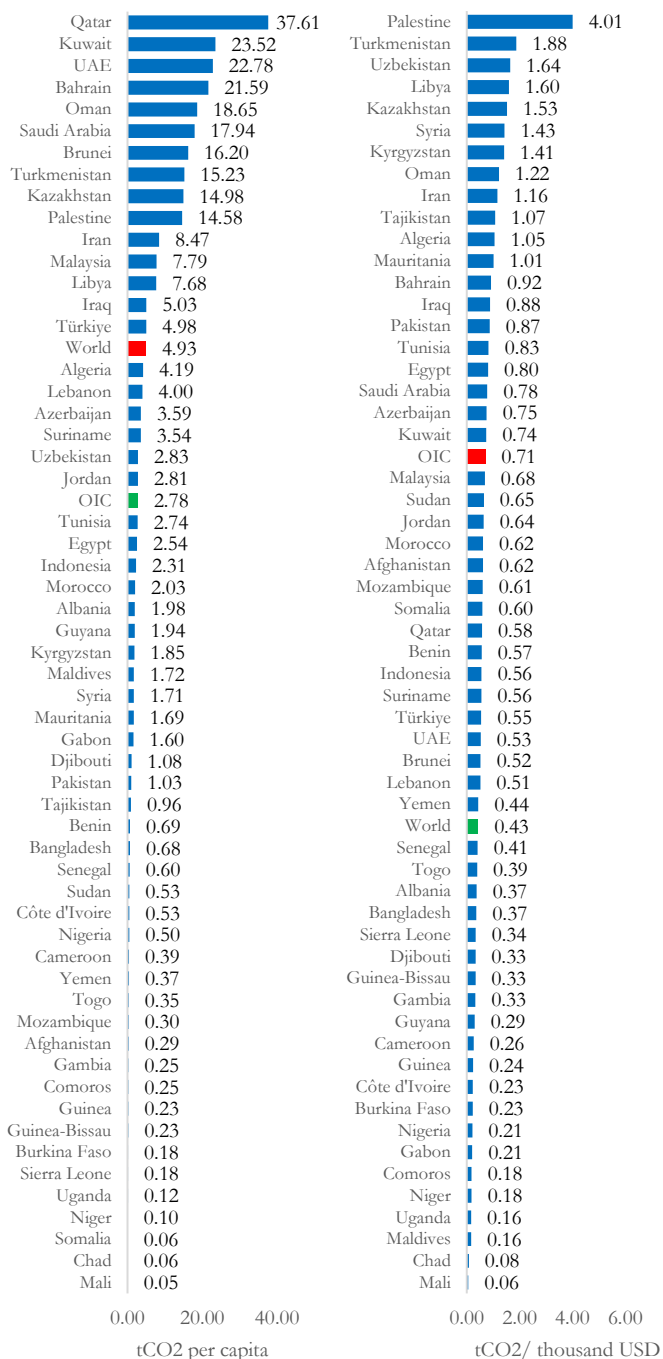
**Figure 6.4. CO<sub>2</sub> Emission Growth in OIC, 2010 vs 2019**

⚡ Power Sector	📈 +39.6%
🚗 Transport	📈 +29.2%
🏭 Other Industrial Combustion	📈 +23.7%
🏢 Other Sectors	📈 +26.5%
🏠 Buildings	📈 +11.3%

Source: EDGAR V5.0 GHG Emissions Database

Looking at the level of emissions in individual OIC countries, CO<sub>2</sub> is emitted unevenly. In 2019, half of the CO<sub>2</sub> emissions in OIC came from only 5 countries, namely Iran (0.70 Gt-CO<sub>2</sub>), Indonesia (0.63 Gt-CO<sub>2</sub>), Saudi Arabia (0.61 Gt-CO<sub>2</sub>), Türkiye (0.42 Gt-CO<sub>2</sub>), and Kazakhstan (0.28 Gt-CO<sub>2</sub>). Furthermore, almost half of OIC countries emit CO<sub>2</sub> for less than 0.01 Gt-CO<sub>2</sub>.

**Figure 6.5. CO2 Emission Relative to Population (Left) and GDP (Right) in OIC Countries, 2019**



Source: SESRIC staff calculation based on EDGAR V5.0 GHG Emissions Database

Country level comparison is more meaningful in terms of relative value. The relative comparison of CO<sub>2</sub> emissions in OIC countries can be seen in **Figure 6.5**. On average, per capita emissions in OIC countries in 2019 were 2.78 tCO<sub>2</sub>, lower than the global emissions per capita average of 4.93 tCO<sub>2</sub>. On the other hand, emissions per unit of GDP in OIC reached 0.71 tCO<sub>2</sub>/thousand US\$ - almost twice as much as the global average level of 0.43 tCO<sub>2</sub>/thousand US\$ - signaling a more emission-intensive economy.

At the country level, 15 OIC countries recorded higher per capita emissions than the global level. The highest per capita emissions happen mostly in MENA countries, as indicated by the top 5 highest emissions per capita, namely Qatar (37.61), Kuwait (23.52), United Arab Emirates (22.78), Bahrain (21.59), and Oman (18.65) (**Figure 6.5, Left**).

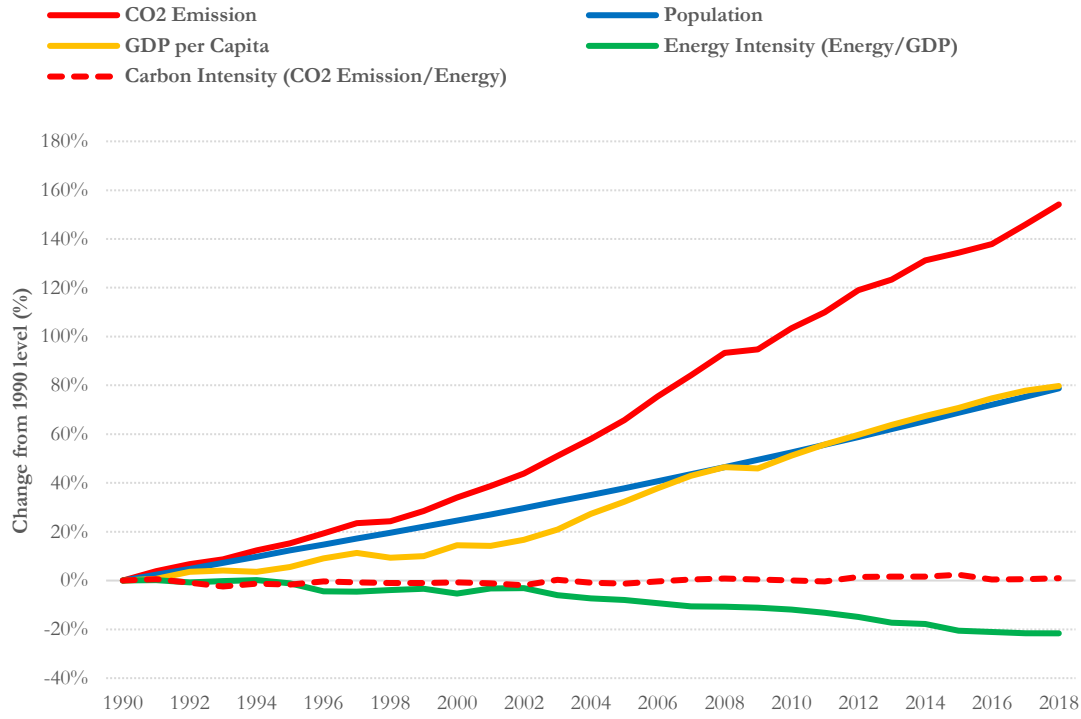
In terms of emissions per GDP, more than half of OIC countries recorded emissions more than the world average. The top 5 most emission-intensive economies in OIC countries are Palestine (4.01), Turkmenistan (1.88), Uzbekistan (1.64), Libya (1.60), and Kazakhstan (1.53) (**Figure 6.5, Right**).

### 6.3 Emissions Drivers

The identification of emissions drivers can serve as a good starting point for developing a well-targeted climate action plan. Analysing the emission driver is commonly done using Kaya identities (Kaya, 1990). Within the framework, overall changes in emissions are decomposed into four underlying factors (see **BOX 6.1** for a brief description of Kaya identity).

**Figure 6.6** presents the increase in fossil energy CO<sub>2</sub> decomposed into four factors, namely population, per capita GDP, energy intensity and CO<sub>2</sub> intensity of energy between 1990 and 2018. Looking at **Figure 6.6**, the population increased by 78.8%, GDP per capita was 79.7%, carbon intensity was 0.9%, and energy intensity decreased by 21.6%. All of these factors contributed to a 154% increase in CO<sub>2</sub> emissions. **Figure 6.6** suggests that the improvements in the energy intensity of GDP that the OIC has achieved over the last decades could not keep up with the continuous growth of the population and the vastly growing income. The increasing trend of carbon intensity also suggests that the transition to a sustainable energy system is not yet taking place in the OIC countries. However, the decreasing trend of energy intensity indicates a more efficient means of energy utilization, where less energy is utilized in generating GDP.

**Figure 6.6. Four Factor Decomposition of CO<sub>2</sub> Emission in OIC, 1990 – 2018**



Source: EDGAR V5.0 GHG Emissions Database

Overall, together with the growth in population and income, and the relatively stagnant trend of carbon intensity, CO<sub>2</sub> emissions from fossil energy in OIC countries have maintained a stable upward trend. This is also a proxy for the overall increase in the OIC's GHG emissions over the last two decades.

#### **BOX 6.1: Kaya Four-Factor Decomposition**

The Kaya identity is a special case of the more general IPAT identity which decomposes an impact (I, e. g., total GHG emissions) into population (P), affluence (A, e. g., income per capita) and technology (T, e. g., GHG emission intensity of production or consumption). The Kaya identity deals with a subset of GHG emissions, namely CO<sub>2</sub> emissions from fossil fuel combustion, which is the dominant part of the anthropogenic GHG emissions and their changes at a global level. The Kaya identity for CO<sub>2</sub> emissions can be written as:

$$CO_2 \text{ Emission} = \text{Population} \times \frac{GDP}{\text{Population}} \times \frac{Energy}{GDP} \times \frac{CO_2 \text{ Emission}}{Energy}$$

In other words, CO<sub>2</sub> emissions are expressed as a product of four underlying factors: (1) population, (2) per capita GDP (GDP / population), (3) energy intensity of GDP (Energy / GDP), and (4) CO<sub>2</sub> intensity of energy (CO<sub>2</sub> emissions / energy).

Source: Adapted from IPCC (2015)

# Chapter 7

## Vulnerability and Readiness



### SDG 13

Take urgent action to combat climate change and its impacts.



### PARIS AGREEMENT

Strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

Climate change impacts are unavoidable, and it will affect different countries in different ways. Therefore, there is a need to understand the level of vulnerability and readiness to deal with climate change. This chapter examines the vulnerability and preparedness of OIC countries using data from the Notre Dame Global Adaptation Initiative (ND-GAIN) index.

#### BOX 7.1: The Notre Dame Global Adaptation Initiative (ND-GAIN) Composite Index

The ND-GAIN composite index outlines countries' vulnerability to climate change together with their readiness to improve resilience. Within the index, vulnerability is defined as "*propensity or predisposition of human societies to be negatively impacted by climate hazards*" (Chen et al., 2015, p.3) through the interactions of three dimensions: **the exposure** to climate-related hazards; **the sensitivity** to the impacts of the hazard; and **the adaptive capacity** to cope with these impacts.

- ❖ **The exposure** dimension of the index measures the extent to which human society and its supporting sectors are stressed by the future changing climate conditions. Less exposure means future climate would not change the water resources so significantly.
- ❖ **The sensitivity** dimension of the index tells the degree to which society is affected by climate-related impacts on the water sector.
- ❖ **The adaptive capacity** dimension tells the ability of society and its supporting sectors to adjust to reduce potential damage and to respond to the negative consequences of climate events.

On the other end, the readiness index is meant to measure the country's ability to leverage investments to adaptation actions. The three main components of the readiness index are **economic readiness, governance readiness, and social readiness**.

- ❖ **Economic readiness** measures the investment climate that facilitates mobilizing capital from the private sector.
- ❖ **The Governance readiness** tells about the stability of the institutional arrangements that contribute to the investment risks.
- ❖ Finally, **Social readiness** evaluate the social conditions that encourage the efficient use of investment.

Source: Based on Chen et al. (2015)

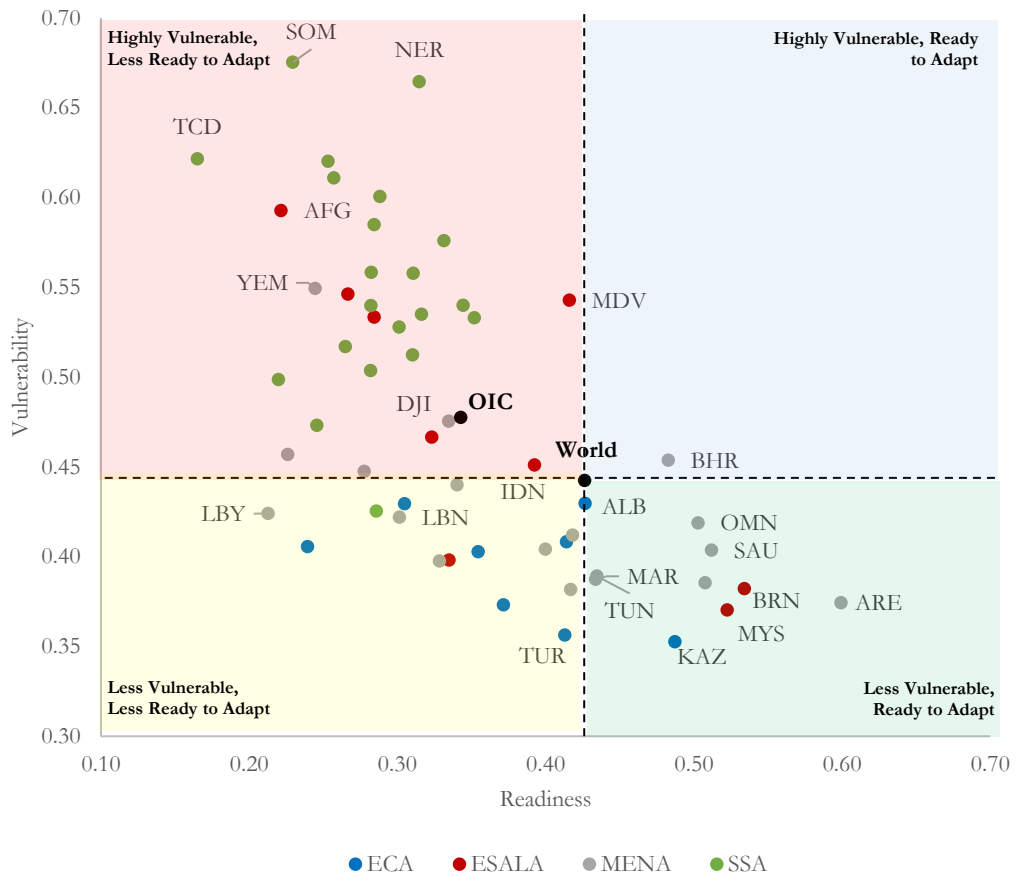
The general description of the index can be seen in **BOX 7.1**.

### 7.1 Overall Status

To quickly assess the OIC countries’ state of vulnerability and readiness for climate change, a scatter plot matrix is presented in **Figure 7.1**. Four quadrants on the plot delineated by the world's average level of vulnerability and readiness indicate the different levels of OIC countries compared to the world's average level. The countries are coloured depending on their regions to see the regional distribution on the plot. **Figure 7.1** shows the positioning of individual countries and a general overview of the OIC regions more clearly in terms of their vulnerability and readiness for climate change. The full results of the index can be seen in **ANNEX B**.

On average, in 2018, OIC had vulnerability levels of 0.47 and readiness of 0.34, while the world's average level of vulnerability and readiness were 0.44 and 0.43 respectively. This demonstrates that OIC countries are more vulnerable and underprepared for the effects of climate change than the rest of the world.

**Figure 7.1. OIC Vulnerability and Readiness to Climate Change Impacts, 2018**



Source: SESRIC staff calculation based on ND-GAIN

At the individual country level, it is observed that more than half of the OIC countries are more vulnerable than the world average, while 80% of OIC countries have readiness levels below the world average. Furthermore, several points can be drawn: *First*, the most vulnerable countries are Somalia, Niger, and Chad, while the countries with the least readiness for climate change are Chad, Libya, and Nigeria. *Second*, the top left box (red zone), which indicates highly vulnerable and less ready countries, comprises mostly SSA countries. *Third*, most MENA countries are both in the bottom left and right box (yellow and green zone), suggesting countries that are less vulnerable with varying levels of readiness. *Fourth*, the majority of ESALA countries are in the red zone. *Fifth*, ECA countries, with the exception of Albania and Kazakhstan, are in yellow zones (less vulnerable and less ready to adapt). *Lastly*, only one country is in the blue zone – the top right zone, which indicates they are highly vulnerable and ready to adapt, namely Bahrain.

The countries in the red zone are the ones needing special attention since the risks of getting climate change impacts are the largest. Countries in the yellow zone, despite their low level of vulnerability, need to improve their economic, social, and governance readiness to be more ready to adapt to climate change. As for the blue zone, despite its high vulnerability, the fact that countries have enough resources to adapt is beneficial for reducing future risks. Finally, the green zone has the lowest risks of climate change impacts as they are less vulnerable and have sufficient capacity to adapt.

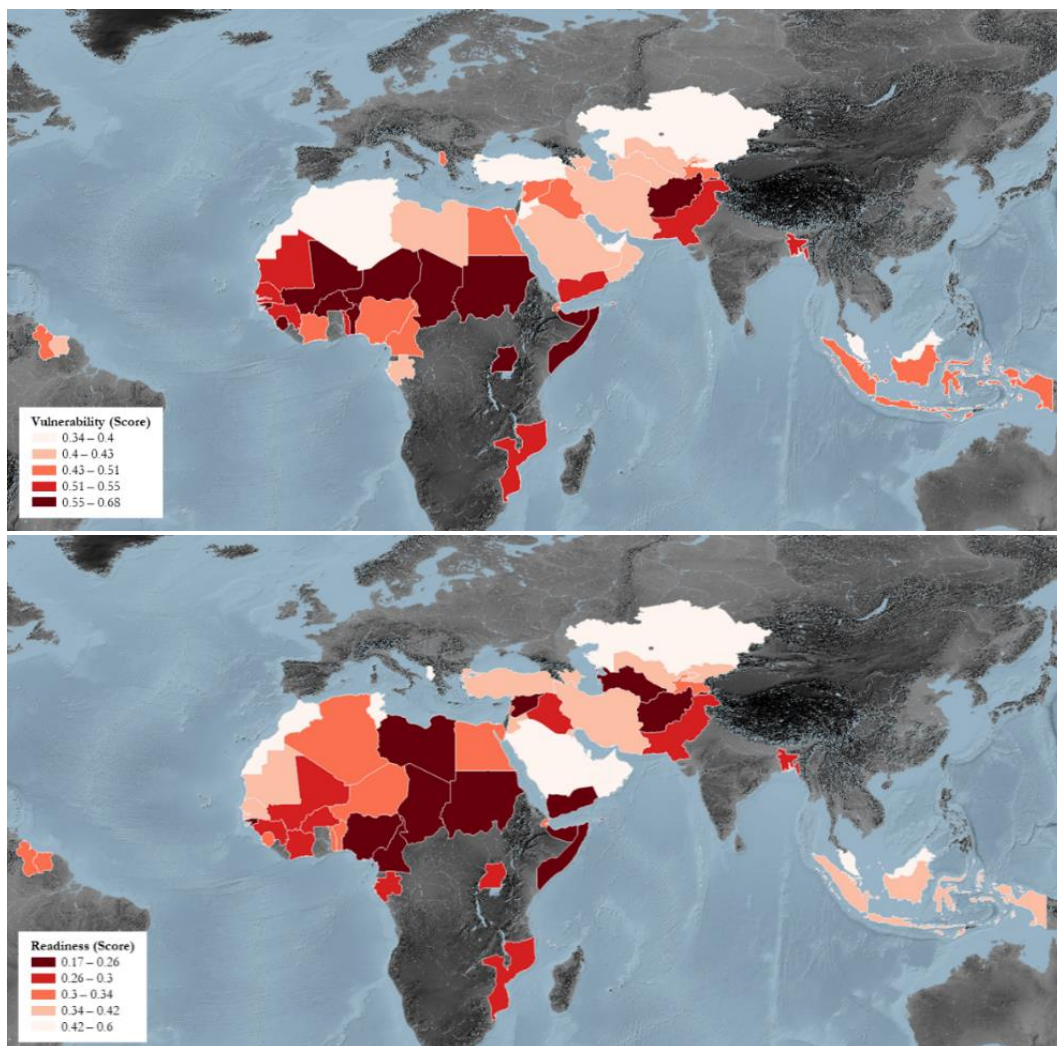
## 7.2 Vulnerability & Readiness

This sub-chapter delves deeper into each aspect of vulnerability and readiness in OIC countries. Vulnerability to climate change is defined as the "*propensity or predisposition of human societies to be negatively impacted by climate hazards*" (Chen et al., 2015, p.3). The vulnerability to the impacts of climate change in a region depends on its levels of exposure, sensitivity, and adaptive capacity. Higher vulnerabilities indicate a greater risk of societal impact from climate change.

**Figure 7.2 (Upper)** shows the overall level of vulnerability in OIC countries. It indicates that the vulnerability to climate change in OIC countries is quite diverse. Countries with high vulnerability should be aware of the deteriorating effects of climate change on their communities. Somalia, Niger, Chad, Guinea-Bissau, Sudan, Mali, Afghanistan, Uganda, Benin, Burkina Faso, Sierra Leone, Yemen, and Bangladesh, for example, have the highest levels, ranging from 0.55 to 0.68. Unfortunately, some of the most vulnerable OIC countries are also categorised by the UN as the least developed countries. There is a need for these countries to improve their adaptive capacity to deal with climate change impacts.

The overall degree of vulnerability is calculated by aggregating vulnerability levels from six life-sustaining sectors: food, water, health, ecosystem services, human habitat, and infrastructure. As a result, the level of vulnerability in each sector can also be identified.

**Figure 7.2. Vulnerability\* (Upper) and Readiness\*\* (Lower) to Climate Change in OIC Countries, 2018**



\*Lower scores are better

\*\* Higher scores are better

Source: SESRIC staff generated map based on ND-GAIN

**Table 7.1** shows the overall and sectoral level vulnerability in the world and OIC regions. On average, the OIC as a group is more vulnerable than the rest of the world in all sectors, with the health sector being the most vulnerable. Vulnerability in the health sector means that OIC countries are highly vulnerable to climate-related diseases while also lacking adequate healthcare services. It is also worth noting that vulnerability levels in the food and human habitat sectors are quite alarming. Growing population and urbanization in OIC countries necessitate increased food production and resilient urban environments in order to prepare society for climate change.



Looking at the OIC regions, there is a diversity of sectoral vulnerabilities. SSA was the most vulnerable region in OIC while ECA and MENA regions are less vulnerable than the world. On a sectoral basis, the health sector is the most vulnerable in SSA and ESALA, while human habitats and ecosystem services are the most vulnerable in ECA and MENA. It is critical to identify the most vulnerable sectors in order to respond in a targeted manner and reduce the risk of climate change impacts.

**Table 7.1. Vulnerability to Climate Change by Region and Sector (lower scores are better), 2018**

Region	Overall	Sectoral					
		Ecosystem	Food	Habitat	Health	Infrastructure	Water
World	0.44	0.46	0.47	0.51	0.48	0.35	0.35
OIC	0.48	0.48	0.53	0.52	0.54	0.36	0.39
ECA	0.39	0.44	0.39	0.44	0.38	0.33	0.35
ESALA	0.48	0.47	0.52	0.51	0.53	0.37	0.39
MENA	0.42	0.47	0.45	0.46	0.45	0.33	0.37
SSA	0.56	0.50	0.64	0.61	0.67	0.41	0.43

Source: SESRIC staff calculation based on ND-GAIN

**Figure 7.2 (Lower)** shows the overall level of readiness in OIC countries. Countries with a low level of readiness should be aware of their inability to respond to the adverse impacts of climate change. Chad, Libya, Nigeria, Afghanistan, Syria, Somalia, Turkmenistan, Yemen, Cameroon, Guinea-Bissau, Sudan, and Mozambique, for example, have the lowest level of readiness among OIC countries, with a score of between 0.17 and 0.26.

Similar to the vulnerability to climate change, some of the less ready OIC countries are also categorised by the UN as the least developed countries. Improvement in terms of economic, governance, and social development in various sectors is needed to better adapt to the impact of climate change.

**Table 7.2. Readiness to Climate Change by Region and Component (higher scores are better), 2018**

Region	Overall	Component		
		Economic	Governance	Social
World	0.43	0.43	0.49	0.36
OIC	0.34	0.36	0.37	0.30
ECA	0.38	0.44	0.37	0.34
ESALA	0.37	0.37	0.43	0.31
MENA	0.39	0.45	0.39	0.32
SSA	0.28	0.26	0.34	0.25

Source: SESRIC staff calculation based on ND-GAIN


The readiness dimension of the ND-GAIN index measures the country's ability to leverage investments into adaptation actions with three main components: economic readiness, governance readiness, and social readiness. **Table 7.2** presents the level of readiness based on each component in the OIC and the world average as a comparison. OIC as a group has a lower level of readiness in all components. Globally, the social dimension is the least ready

sector with a level of 0.36, while the governance and economic readiness levels are 0.49 and 0.43 respectively. In comparison, OIC countries have an average level of economic governance of 0.36, governance readiness of 0.37, and social readiness of 0.3. The fact that the social dimension is the least ready component means society is not adaptable enough to deal with climate change impact, as indicated by the lower level of social inequality, information and communications technology (ICT) infrastructure, education, and innovation.

In terms of OIC regions, all regions have an overall readiness levels lower than the world. It also observed that there is a variation in readiness within each component across regions. MENA and ECA are better at economic readiness, surpassing the global readiness level. In ESALA, governance readiness is better than in other OIC regions. Finally, SSA has a lower level of readiness in all components compared to the OIC average.


# Chapter 8

## Policy Measures and Responses



### SDG 13

Take urgent action to combat climate change and its impacts.



### PARIS AGREEMENT

Strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

Climate change is a global problem requiring action at a local level. Despite the unequal gap between countries in terms of their GHG emissions, a transition to a less carbon-based economy is deemed required not only to prevent the adverse effects of climate change, but also to ensure the well-being of society.

In an effort to reduce GHG emissions and address climate change issues, the world community is gathering together and trying to come up with a global consensus. Under the United Nations Framework Convention on Climate Change (UNFCCC), in 2015, the Paris Agreement on climate change was adopted by more than 160 countries with the prime objective of limiting the global temperature increase to well below 2°C above the pre-industrial level by the end of the century.

This chapter discusses policy measures and responses in OIC countries to respond to the challenges of climate change. *First*, the OIC countries' progress and commitments in terms of compliance with the Paris Agreement are discussed. *Second*, intergovernmental cooperation in OIC countries is analyzed in terms of climate finance. *Finally*, the forward-looking policy to achieve net zero by 2050 is laid out and presented as a future climate-policy reference for OIC countries.

### 8.1 Progress towards Paris Agreement Targets

Under the umbrella of the Paris Agreement, parties to the agreement are required to submit their plans to address climate change in a document known as the Intended Nationally Determined Contribution (INDC). Accordingly, the INDC is converted to a Nationally Determined Contribution (NDC) when a country decides to formally join the agreement by submitting an instrument of ratification, acceptance, approval or accession. Parties to the agreement will also have an opportunity to enhance their climate commitment through an update to their NDCs by 2020 and will continue to do so every five years.

**Table 8.1. Paris Agreement Status**

Climate Policy	Yes	No
<b>Ratification Status</b>	Rest of OIC	(5) Iran, Libya, Yemen
<b>INDC/ First NDC</b>	Rest of OIC	(1) Libya
<b>Second NDC</b>	*(28) Afghanistan, Benin, Burkina Faso, Chad, Comoros, Côte d'Ivoire, Djibouti, Gambia, Guinea, Guinea-Bissau, Guyana, Lebanon, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Pakistan, Sierra Leone, Somalia, Sudan, Suriname, Togo, Tunisia, Uganda, United Arab Emirates, Yemen	Rest of OIC

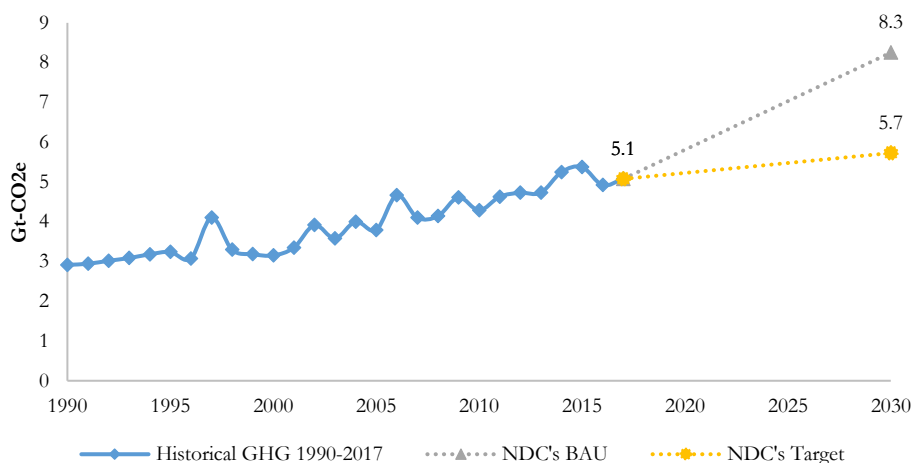
\* Countries submitted and intend to submit

Note: Data as per July 2021.  
Source: Based on WRI CAIT.

The status of the Paris Agreement in the OIC countries is shown in **Table 8.1**. All OIC countries, except Libya, have submitted their INDC, some of which were converted to NDC after formally joining the agreement. However, two OIC countries (Iran and Yemen) have opted out of the Paris Agreement because they have yet to ratify it. In terms of updating the NDC, 28 OIC countries either have submitted or intend to submit their second NDC.

Based on 26 OIC countries<sup>11</sup> that have clearly defined their quantified GHG emissions and reduction targets for 2030, OIC must reduce 30% of their GHG emissions relative to the Business as Usual (BAU) emission trajectory. As a result, GHG emissions should rise by no more than 13% compared to 2017 (**Figure 8.1**).

**Figure 8.1. OIC Countries Paris Agreement Target**



Note: Based on 26 OIC countries, which mentioned quantified BAU GHG emissions and reduction target in 2030.  
Source: SESRIC Staff Calculation based on Fenhann (2017).

<sup>11</sup> Countries included are Afghanistan, Bangladesh, Benin, Burkina Faso, Cameroon, Chad, Comoros, Côte d'Ivoire, Djibouti, Indonesia, Iraq, Jordan, Kyrgyzstan, Lebanon, Mauritania, Morocco, Niger, Nigeria, Oman, Pakistan, Senegal, Togo, Tunisia, Türkiye, Uganda, and Yemen. These countries combined covers 56% of OIC GHG emissions in 2017.

Individual countries' progress toward achieving NDC targets varies. **Table 8.2** presents 26 OIC countries' progress in achieving their NDC targets. Leading up to 2030, some OIC countries need to decrease their emissions, while others could increase emissions to varying degrees.

The emission reductions needed for 2030 in OIC countries range from 0.6 to 924 Mt-CO<sub>2e</sub>, or in relative terms, the reduction is between 15% and 92% of 2017 emissions. On the other hand, some countries can still increase their emissions by between 2% and 184% of their 2017 emissions. The most ambitious emissions reductions should happen in Chad (-92%), Comoros (-88%), Cameroon (-69%), and Afghanistan (-57%). On the other hand, the most flexible increments in GHG emissions can be achieved in Pakistan (184%), Burkina Faso (140%), Türkiye (112%), and Togo (88%). It is important to note that the NDC is an evolving document, where countries may revise their targets as they see fit. Therefore, OIC member countries are encouraged to update their NDCs and thus strengthen efforts to combat climate change and adapt to its effects.

**Table 8.2. OIC Countries Progress towards Achieving NDC Target**

OIC Countries	2017 Historical GHG (Mt-CO <sub>2e</sub> )	2030 GHG Target (Mt-CO <sub>2e</sub> )	Gap from 2017 level (Mt-CO <sub>2e</sub> )	Gap from 2017 level (%)
Afghanistan	97.4	42.3	-55.1	-57%
Bangladesh	211.1	304.0	93.0	44%
Benin	27.9	17.5	-10.4	-37%
Burkina Faso	40.3	96.8	56.5	140%
Cameroon	210.2	66.0	-144.2	-69%
Chad	106.7	8.3	-98.4	-92%
Comoros	0.7	0.1	-0.6	-88%
Côte d'Ivoire	31.6	24.7	-6.9	-22%
Djibouti	1.5	1.8	0.3	23%
Indonesia	2275.4	1692.7	-582.7	-26%
Iraq	198.8	240.8	42.0	21%
Jordan	36.7	43.9	7.2	19%
Kyrgyzstan	15.5	11.0	-4.5	-29%
Lebanon	35.6	30.3	-5.3	-15%
Mauritania	12.6	14.6	2.0	16%
Morocco	91.7	98.9	7.2	8%
Niger	44.5	63.1	18.6	42%
Nigeria	483.2	495.0	11.8	2%
Oman	78.5	88.7	10.2	13%
Pakistan	443.3	1259.2	815.9	184%
Senegal	35.0	29.7	-5.3	-15%
Togo	14.7	27.6	12.9	88%
Tunisia	40.7	42.4	1.7	4%
Türkiye	437.9	928.3	490.4	112%
Uganda	82.1	60.3	-21.9	-27%
Yemen	22.1	37.7	15.6	71%
<b>Total</b>	<b>5075.5</b>	<b>5725.6</b>	<b>650.1</b>	<b>13%</b>

Source: SESRIC Staff Calculation based on Fenhann (2017)

**BOX 8.1: Morocco Compatible with 1.5°C Paris Agreement Target**

Morocco is further advancing its climate policies and may as one of the few developing countries be able to curb its emissions by 2030. Expansion of renewables is continuing as planned, but the construction of new coal fired power plants may lock the country into higher emissions. New policies planned may lead to levelling emissions, but the impact of the COVID-19 pandemic is still unclear. Inconsistent historical data reporting also adds uncertainty to both historical and current policy projections. However, emissions trends indicate that Morocco is likely to achieve its climate pledge, which the Climate Action Tracker (CAT) rates as “1.5°C Paris Agreement Compatible.”

The COVID-19 pandemic has not spared Morocco, but the government’s early announcement of a state of sanitary emergency, coupled with lockdown measures, has meant cases have remained relatively low. As with the rest of the world, emissions will have likely decreased due to the economic standstill brought about by the crisis, notably due to the reduction in tourism and transport activity. We expect GHG emissions in 2020 to be 5 to 10% lower than in 2019.

Despite the coal-dominated power sector, Morocco’s Paris Agreement target is still within the range of what is considered to be a “1.5°C compatible” fair share of global effort under the CAT’s equity rating. This means that Morocco’s unconditional Paris Agreement climate commitment in 2030, although allows the country’s total emissions to increase, is consistent with holding warming well below 2°C, and limiting warming to 1.5°C, based on its historical responsibility and its capability.

In 2019, Morocco issued its 2030 National Climate Plan. The strategy confirms the climate objective set under Morocco’s Paris Agreement pledge and lays out measures to enhance climate governance, notably by creating a National Commission on Climate Change, by improving inter-sectoral coordination, and by involving non-governmental organisations in decision-making.

Source: Adapted from Climate Action Tracker (2020)

**8.2 Financing Climate Actions**

Climate finance is one of the core issues in the UNFCCC negotiations. “Climate Finance” refers to funds – either from public or private sources – which are utilized for climate change mitigation and adaptation projects. Under the UNFCCC, since 2009, developed countries have committed to providing US\$100 billion a year in climate finance to developing countries by 2020. According to the OECD (2020b), climate-related finance has reached close to US\$80 billion in 2018.

Latest statistics from OECD (2020b) reveals that OIC received climate funds totalling US\$22 billion<sup>12</sup> in 2018 and US\$25.7 billion in 2019, which corresponds to a two-year average of US\$23.9 billion/year. Bangladesh was the largest recipient on average, receiving US\$3.6 billion/year during the 2018-2019 period. It was followed, in order, by Indonesia

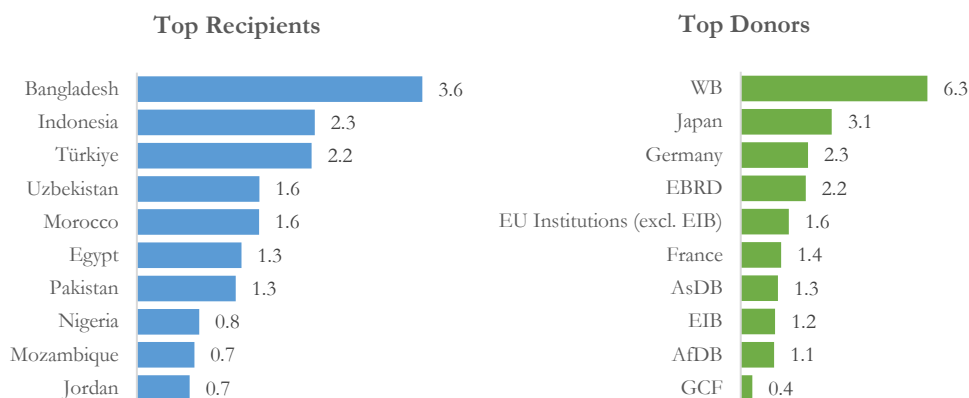
<sup>12</sup> Unless otherwise stated, all dollar amounts in this sub-chapter refer to the constant 2019 USD.

(US\$2.3 billion/year), Türkiye (US\$2.2 billion/year), Uzbekistan (US\$1.6 billion/year), and Morocco (US\$1.6 billion/year) (**Figure 8.2, Left**).

Climate finance includes financial support provided through bilateral (country to country), multilateral (via international institutions), regional and other channels. The largest climate finance donor to OIC countries was the World Bank, providing on average US\$6.3 billion/year over the 2018-2019 period. It was followed by Japan (US\$3.1 billion/year), Germany (US\$2.3 billion/year), EBRD (US\$2.2 billion/year), and EU Institutions (excl. EIB) (US\$1.6 billion/year) (**Figure 8.2, Right**).

The figure shows that multilateral development banks (MDBs) play an important role in overall climate finance in OIC countries. Indeed, according to a recent report by the Group of Multilateral Development Banks (2021), in 2020, the MDBs committed a total of (current) US\$66 billion in climate finance in all economies, where almost 60% of which was intended for low-income and middle-income economies. The same report revealed that climate finance received by OIC countries increased by 1.5 times from US\$8.5 billion in 2015 to US\$13.0 billion in 2020.

**Figure 8.2. Top 10 Largest Climate Finance Recipients (Left) and Donors for OIC Countries (Right), Billion US\$, Yearly Average 2018-2019**



Note: WB=World Bank; EBRD= European Bank for Reconstruction and Development; EIB= European Investment Bank; AsDB=Asian Development Bank; AfDB=African Development Bank; GCF=Green Climate Fund  
Source: SESRIC staff calculation based on OECD (2021)

In terms of the type of project, according to OECD (2021), around US\$16 billion/year went to mitigation-related projects, compared to US\$10 billion/year for adaptation-related projects. The energy sector received the most climate-financing, received an average of US\$6.9 billion per year. Energy and other sectors such as '*Transport & Storage*,' '*Water Supply & Sanitation*,' '*Agriculture, Forestry, Fishing*,' and '*Disaster Risk Reduction*' account for more than 70% of OIC receiving sectors.

Urgent actions to address climate challenges necessitate not only significant financial resources, but also money spent wisely. If properly managed, climate finance can be a bridge

between socio-economic development and environmental needs. There is still a gap between countries receiving climate funds in the OIC. Therefore, OIC countries need to take steps that further enable the environment for climate finance and climate projects to come.

Several enabling environments can be implemented in order to effectively benefit from climate finance (Zou & Ockenden, 2016). *First*, climate change should be at the forefront of the development agenda, integrating it into development planning and policies. *Second*, recipient countries should create a well-coordinated and clear system for tracking and monitoring of climate finance. *Third*, countries should increase their capacity to access and deliver climate finance. Improving climate finance readiness can be accomplished by considering its components, as shown in **Table 8.3**. *Finally*, the engagement of civil society, local government, and the private sector is needed to effectively implement climate projects.

**Table 8.3. The Component of Climate Finance Readiness**

	Financial Planning	Accessing Finance	Delivering Finance	Monitor, Report & Verify
<b>Levels of National Capacities</b>	<ul style="list-style-type: none"> <li>Assess needs and priorities</li> <li>Identify sources of financing</li> </ul>	<ul style="list-style-type: none"> <li>Programming finance</li> <li>Direct access to finance</li> <li>Blend and combine finance</li> <li>Catalyse private finance</li> </ul>	<ul style="list-style-type: none"> <li>Project, program, sector-wide implementation</li> <li>Local supply of expertise and skills</li> <li>Coordination systems</li> </ul>	<ul style="list-style-type: none"> <li>Monitor, report, and verify flows</li> <li>Performance-based payments</li> </ul>
<b>Policy Level</b>	Formulation of green, low-emission and climate resilient development strategies and implementation plan, including costing	Sectoral policy incentives and regulations to catalyse private investments		
<b>Institutional Level</b>	Effective national multi-stakeholder coordination mechanisms	Implementing entities with fiduciary systems and safeguards; national banking institutions	Implementing & executing entities with fiduciary systems and safeguards; project-level multi-stakeholder mechanisms; climate-aware public financial management systems	Centralised unit to compile and quality control reporting; communications unit
<b>Individual Level</b>	Baseline assessments; Investment and Financial Flows (I&FF) Assessments; expenditure reviews; cost-benefit analysis	Financial management (combining/blending) skills; project development skills; expertise in private sector pricing incentives	Specialist technology skills; Project management skills	Expenditure review methodology; GHG inventory skills; Independent verification skills

Source: Adapted from Vandeweerd et al. (2012)



### 8.3 Climate Policies and Net-Zero Target

A more ambitious effort to reduce GHG emissions is still needed to deal with climate change. These ambitious commitments will take the shape of a new NDC, Long-Term Strategies (LTS), setting out a pathway to net zero emissions; climate finance commitments to support the most vulnerable; and ambitious adaptation plans and underlying policies. These commitments will also help to build towards a green and resilient recovery from COVID-19. Current estimates by Climate Action Tracker (2021) show that if countries comply with current pledges and targets in their NDCs, the global temperature could still rise by 2.4°C by the end of the century, thereby will miss the 2°C target agreed in Paris. Furthermore, all pledges and targets have to be implemented and supported by ambitious policies, since the temperature estimate of currently adopted national policies is 2.9°C.

To achieve the Paris Agreement target, GHG emissions must be slashed by half during the next decade and reach net-zero early in the second half of the century. Given this need, a growing number of parties to the Paris Agreement are adopting net-zero emissions targets.

**Table 8.4** shows the OIC countries' current climate policies as well as their long-term strategy or net-zero commitment. There are already 27 countries with sectoral laws or policies addressing climate change. However, only eight countries currently have specific climate framework laws or policies. Climate laws and policies must be in place in order to mainstream climate change on the development agenda.

**Table 8.4. Climate Policies in OIC Countries**

Climate Policy	Yes	No
<b>LTS/Net-Zero Target</b>	(2) Benin, Kazakhstan	Rest of OIC
<b>Climate Framework Laws or Policies</b>	(8) Algeria, Benin, Gabon, Jordan, Malaysia, Maldives, Morocco, Türkiye	Rest of OIC
<b>Sectoral Laws or Policies</b>	(27) Afghanistan, Albania, Algeria, Azerbaijan, Bangladesh, Brunei, Burkina Faso, Comoros, Djibouti, Egypt, Gambia, Indonesia, Iran, Kazakhstan, Lebanon, Libya, Maldives, Mali, Morocco, Mozambique, Nigeria, Pakistan, Togo, Türkiye, Uganda, Uzbekistan, Yemen	Rest of OIC

Note: Data as per July 2021

Source: <https://www.wri.org/initiatives/climate-watch>

The Net-zero target of 2050 is being campaigned as a proper pathway to meet the 2°C target. Two OIC countries have submitted LTS and intend to submit it. Benin already submitted LTS for reduction of their GHG for the period 2016-2025. Kazakhstan, on the other hand, is the only OIC country that has pledged to achieve net-zero emissions by 2060.

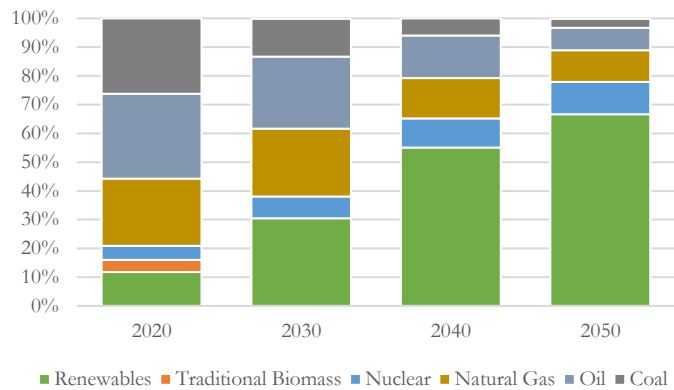
## The Need for Energy Transition and Decarbonization

The world is currently undergoing a surge in transition to renewable energy. In addition to the energy security concerns arising from the depletion of non-renewable energy sources, this process is mainly driven by concerns over climate change that is directly or indirectly attributed to human activities leading to a rise in carbon and greenhouse gas (GHG) emissions and global warming.

The International Energy Agency (IEA, 2021) reports that the number of countries that have pledged to reach net-zero emissions by mid-century or soon after continues to grow, and achieving this target requires a total transformation of the energy systems –how energy is produced, transported, and used. Revealing a comprehensive road map “to guide the global journey to net zero by 2050”, the IEA sets out more than 400 milestones for technologies, infrastructure, investment, and policy that include an immediate end to investments in new fossil fuel supply projects. Thus, since fossil fuels are the largest source of carbon emissions, the energy transition process revolves around ceasing new investments in fossil fuels and gradually abandoning their use for more economically and environmentally suitable solutions. As of 2020, fossil fuels (oil, natural gas, and coal) account for about 80% of the total energy supply globally, and according to the IEA’s Net- Zero Emissions by 2050 scenario, this share should drop to around 20% by 2050 in favor of renewable sources (Figure 8.3), particularly solar and wind.

In addition to the transition to renewables in the energy sector, electrification emerges as a critical complement of the energy transition process. As the electricity sector becomes cleaner with the shift towards using renewable sources in electricity generation, electrification will be a crucial tool for reducing emissions. The currently flourishing electric-vehicle market and the plans to end sales of new internal combustion engine cars in the near future are a vibrant indication of the electrification trend in the transportation sector. Increasing electrification of end-uses in the industry and buildings (e.g. space and water heating, cooking, machinery & appliances) will also contribute to the decarbonization process.

**Figure 8.3. Total Energy Supply by Source: Projections for Net-Zero Emissions by 2050**



Source: International Energy Agency (2021), Net Zero by 2050, IEA, Paris: Net Zero by 2050 Scenario - Data product - IEA.

Although countries are increasingly discussing climate change and the need to reduce carbon, substantial transitions are difficult to implement. On one hand, the energy transition and decarbonization process requires strong support from governments and businesses, with a change of mindset towards a green economy. Technological innovations for improvement in energy efficiency to reduce energy demand growth, and changes in behavioral patterns for energy conservation to reduce demand for energy services are also important to support the transition towards a greener future. On the other hand, all of these requirements translate into a set of challenges even for wealthy, developed countries, but an even more serious situation for developing countries with developmental priorities, where advocating the implementation of environmental policies is more challenging given that millions of people still lack access to reliable and affordable energy. Therefore, given the vast differences in income, vulnerability, and resilience between countries, the worldwide transition and decarbonization process also requires unprecedented international cooperation that recognizes differences in the stages of development of different countries and the varying situations of different parts of society (IEA, 2021).

According to studies, such a transition in energy systems is both technically and economically feasible. For example, Fathurrahman (2019) shows that a sustainable energy transition in Türkiye where at least 62% of electricity generation comes from renewables could technically be achieved by 2050 at a cost of between US\$18.42 billion and US\$31.27 billion per year, or equivalent to just between 2.2% and 3.7% of Türkiye's GDP in 2018. OIC member countries in SSA, on the other hand, despite still having a lack of technical and financial capacity, the renewable energy potential in the region is high (Suberu et al., 2013). With proper energy system planning, management, and investment, the transition to a sustainable energy system is attainable in SSA countries (Adulugba, 2021).

It is worth noting a particular concern for resource dependent countries, like oil-exporter OIC countries. The energy transition changes the relative roles of energy resources and poses a challenge for the built, energy-related infrastructures. The decline in the use of fossil fuels across the world and the consequent fall in their international prices may dramatically reduce incomes (rents) of producer economies, which finance a significant share of their national budget through hydrocarbon revenues (IEA, 2021). In addition to channeling investments to the renewable energy transition, these countries may need to design structural reform policies aimed to diversify the economy and reduce its vulnerability to decreasing resource rents.

# Conclusions & Policy Suggestions

## Concluding Remarks

Having a higher weight of natural capital in their total wealth and generating a significant proportion of GDP from natural resources rents, OIC member countries, particularly the oil exporters, heavily rely on their environmental resources for economic growth and development. Therefore, accounting for the contribution of natural resources to economic output is an imperative task for sustainable development in these countries. Measuring and valuing natural capital and ecosystem services is also essential for integrating environmental sustainability into both public and private decision-making processes.

Despite their high dependency on environmental resources for wealth creation, OIC member countries still lag behind both other developing countries and developed countries in environmental performance. The positive correlation observed between EPI score and income level and the better improvements achieved by higher income countries in the last decade indicates that wealth is a determining factor in the environmental performance of OIC countries. Accordingly, it becomes evident that low-income OIC countries, most of which are in Sub-Saharan Africa and dependent on agricultural natural capital, cannot afford to adequately fund public health and environmental infrastructure and/or mitigate the negative effects on the environment. In contrast, high-income OIC countries, which are rich in subsoil assets and generating about a quarter of their GDP from oil rents, have been capable of reinvesting in environmental health and ecosystem vitality, even to a greater extent in the last decade.

Population growth, although predicted to continue to decelerate in the next decade all over the world, remains higher in OIC countries than in the rest of the world. This situation requires paying more attention to controlling its potential impacts on the environment, such as land cover change and deforestation, agricultural land degradation, abstraction and pollution of water resources, coastal and marine environmental disturbances, air pollution, and climate change.

Urbanization has also been on the rise in OIC countries, following a similar trend to developing countries. Over half of the OIC population currently live in rural areas and this ratio is estimated to increase further in this decade. Estimates also indicate that the growth rate of the urban population, despite showing a declining trend all over the world, will continue to be higher in OIC countries, requiring them to implement comprehensive policies to plan and manage urban growth that sustainably improves the lives of both urban and rural residents.

The report also investigated the status and trends in specific key environmental areas, such as land and biodiversity, air, and water, through the latest available statistical indicators of relevant SDGs. It is found that OIC member countries still have a lot of work to do to ensure environmental sustainability. Environmental issues such as land degradation, loss of

biodiversity, air pollution, and water insecurity continue to threaten the well-being of the population in many OIC countries.

Deforestation in the OIC is increasing at a rate faster than the global average, while degraded land has continued to become a crucial issue in some member countries, driving further loss of biodiversity. During the last two decades, biodiversity in the OIC has shown a declining trend, indicating the continuous extinction of species.

The global problem of air pollution is also happening in OIC member countries. While, on average, the state of air pollution in the OIC is similar to the global average, the death rate due to air pollution is higher. The majority of OIC countries are still not able to meet the FAO-recommended AQG for PH2.5 levels, whilst the healthcare system is also not well developed.

In terms of the water sector, the present situation shows that OIC countries are experiencing increasing water scarcity, facing high water-related risk and stress, and lacking drinking water and sanitation services. The future of water security is also unfavorable unless significant changes take place. The water-secure future in OIC countries faces challenges in the form of intensifying pressure on water due to population growth, rapid urbanization, socio-economic development, changing consumption patterns, and climate change.

Climate change is another major environmental challenge that member countries must address. The OIC is one of the most vulnerable regions due to its high exposure and low adaptive capacity to climate change. Therefore, efforts to mitigate the severe impact of climate change, as well as increase adaptive capacity, should be pursued by member countries. In recent decades, the growth rate of anthropogenic GHG emissions – the primary driver of climate change – has been faster in OIC countries than in non-OIC developing countries. While this could indicate progress in economic development, this also shows that socio-economic development still follows conventional trajectories where environmental degradation is involved. Through decomposition analysis, it was found that the main drivers of increasing emissions in OIC countries were population growth, raising income, and stagnated efforts at decarbonization.

The majority of OIC countries are signatories to the Paris Agreement, which aims to provide collective action to reduce GHG emissions in order to keep temperature rises manageable. Ambitious commitments to fight climate change are expected through the submission of updated NDCs. There are currently 28 countries that have submitted or intend to submit their updated NDCs. Increasing ambitious commitments is important for OIC member countries to ensure the path of greener development. In the future, socio-economic development should take into consideration the long-term climate ambition to fully implement a net-zero carbon economy, thereby achieving a world less impacted by climate change and, at the same time, ensuring a climate-resistant society.

## Policy Recommendations for Member Countries

Similar to developing countries, OIC member countries have been recording much faster economic growth rates than developed countries in the last two decades, and this trend is expected to continue in the next five years until 2025. Although higher incomes seem to be associated with higher environmental performance, this high-growth performance requires more attention to be paid to its environmental reflections in the coming years, with the aim of minimizing the negative impacts on human health and on the environment. This is particularly important for countries growing out of poverty, where optimal policies need to be formulated –with international support– in order to secure a balance between the protection of the environment and the development of the economy.

The recent trend of decarbonization and transition to renewable energy, spearheaded by developed countries, is likely to have significant ramifications, particularly in the energy sector, with the potential to result in significant improvements in environmental quality. This long-term transition process, however, involves a number of difficulties to overcome. On one hand, it requires strong support from governments and businesses, with a change of mindset towards a green economy. Technological innovations for improvements in energy efficiency to reduce energy demand growth, and changes in behavioral patterns for energy conservation to reduce demand for energy services, are also important to support the transition towards a greener future. On the other hand, all of these requirements translate into a set of challenges even for wealthy, developed countries, but an even more serious situation for developing countries with developmental priorities, where advocating the implementation of environmental policies is more challenging given that millions of people still lack access to reliable and affordable energy. Therefore, given the vast differences in income, vulnerability, and resilience between countries, the worldwide transition and decarbonization process also requires unprecedented international cooperation that recognizes differences in the stages of development of different countries and the varying situations of different parts of society.

Oil-exporting OIC countries are most likely to be negatively affected by the transition process, given that the decline in the use of fossil fuels across the world and the consequent fall in their international prices may dramatically reduce their incomes (oil rents). In addition to channeling investments to the renewable energy transition, these countries may need to design structural reform policies aimed at diversifying the economy and reducing its vulnerability to decreasing resource rents.

The COVID-19 pandemic, with reduced social and economic activity, may contribute to the restoration of the ecological system. However, it also poses some negative effects on the environment. Since economic activities will resume as the pandemic fades away, the short-term environmental effects might change. Achieving long-term environmental benefits will be highly dependent on the extent to which environmental concerns are integrated into policy responses, wastes are reduced within the circular economy, and

economic agents (governments, energy companies, investors, and consumers) contribute to clean energy transition.

Given the ongoing COVID-19 crisis and the environmental issues at hand, the recovery should take into account policies that are not only good for the economy and society, but also good for the environment. This is an excellent opportunity to "build back better" after the COVID-19 pandemic, where economic recovery is integrated with environmental and climate actions, and thereby meet the Paris Agreement and SDG targets.

Build Back Better (BBB) is a concept coined during the Sendai Conference on Disaster Risk Reduction in 2015, which provides measures aimed at reducing the risk to the people of nations and communities in the wake of disasters. Officially, BBB is described as "The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies, and the environment." (UN Secretary-General, 2016, p.11). The BBB could provide the greatest benefits for communities and countries through the achievement of a stronger, faster, and more inclusive post-disaster reconstruction (World Bank, 2018).

Member countries are encouraged to adopt the BBB approach to achieve economic recovery and societal well-being that is sustainable, inclusive, and resilient. The BBB has five dimensions, as illustrated in **Figure 9.1**.

People should be the central focus of recovery, with the goal of improving their well-being and inclusiveness. Recovery should not solely focus on economic recovery- i.e., economic growth. Other factors that improve well-being, such as better health-care services, job quality, housing, and the environment, should be pursued. Any policies with environmental objectives should also consider their economic impacts, provide social inclusiveness, reduce inequalities, and ensure the well-being of society. While measures to achieve

**Figure 9.1. Components of "Build Back Better"**



Source: Adapted from OECD (2020)

this goal can be context specific for each country, in general, following policy actions can be pursued by the OIC member countries:

- **Recovery measures should consider and align with long-term efforts for reducing GHG emissions.** Maintain a line of sight towards long-term development goals and preventing the worst impact of climate change is one of the key components of a more resilient future. Any investments made during the recovery period should consider the long-term implications for the climate. Therefore, careful consideration of stimulus packages on future GHG emission pathways is critical, particularly in order to gradually transition to net-zero emissions.
- **Invest in strengthening climate resilience.** Improving climate resilience and adaptation efforts is as important as mitigating the worst climate change impacts. OIC countries have already become vulnerable to the impact of climate change, through increasing water supply variability, increasing food security, pressure on ecosystems and biodiversity loss. Member countries are encouraged to take advantage of various climate-financing opportunities, either through bilateral or multilateral channels. For example, MDBs have already committed US\$38 billion to climate projects in low- and middle-income countries in 2020, with plans to increase the funds to US\$50 billion by 2025 (Group of Multilateral Development Banks, 2021).
- **Pursue ambitious policies to stop biodiversity loss.** Degradation of ecosystems and loss of biodiversity in OIC countries should be considered when applying recovery measures. Various approaches that integrate ambitious policies to restore ecosystems and biodiversity should be pursued. For example, the modern approach to water resources management stresses the need to fulfil the water needs of present and future generations by incorporating sustainable development approaches into the water sector. This can be achieved through multi-sector integration, broader stakeholder involvement, and raising awareness about the importance of the economic, social, and ecological values of water (SESRIC, 2021). To do this, concepts such as Integrated Water Resource Management (IWRM) or Nature-based Solutions (NbS) can be applied by member countries to form a sound policy for ecosystem and biodiversity protection.
- **Promoting innovation that enhances long-lasting behavior changes.** The pandemic has highlighted the critical importance of being highly adaptable to a changing environment on short notice. Technological innovation is one of the factors that contributes to adaptability and resilience. For instance, progress in the digital world has prevented the worst impact of COVID-19 on people, where production and services can still operate even with certain disruptions. In the future, continued technological and process innovation will play a more vital part in achieving climate and sustainability goals.



- **Resiliency improvement of supply chains.** COVID-19 and its containment measures have disrupted global supply chains, setting off an interest in more diversified and localised production and shorter supply chains in certain sectors. Therefore, recovery from the pandemic should also ensure an improvement in supply chains. This can be done through increased adherence to circular economic principles, where the local supply chain is strengthened. Governments can include stimulus packages to ensure that local supply chains improve resilience and reduce environmental impacts, including resource efficiency improvement and increasing the circularity of supply chains.

Finally, there is also an urgent need to improve cooperation between OIC member countries to provide effective and efficient benefits to society. Activities that foster knowledge sharing, collaborative activities in research, policy and management support need to be strengthened. These activities are important for increasing the capacity of member countries to solve environmental issues. Member countries are invited to actively engage in various environmental programmes organized by various OIC institutions such as the Islamic Development Bank (IsDB), SESRIC, Standing Committee for Economic and Commercial Cooperation (COMCEC), Standing Committee for Scientific and Technological Cooperation (COMSTECH), Islamic Educational, Scientific and Cultural Organization (ISESCO), and the Islamic Organisation for Food Security (IOFS).

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# Annexes

## ANNEX A. Country Classifications

### OIC Member Countries (57):

AFG	Afghanistan	GAB	Gabon	MDV	Maldives	SDN	Sudan
ALB	Albania	GMB	Gambia	MLI	Mali	SUR	Suriname
DZA	Algeria	GIN	Guinea	MRT	Mauritania	SYR	Syria*
AZE	Azerbaijan	GNB	Guinea-Bissau	MAR	Morocco	TJK	Tajikistan
BHR	Bahrain	GUY	Guyana	MOZ	Mozambique	TGO	Togo
BGD	Bangladesh	IDN	Indonesia	NER	Niger	TUN	Tunisia
BEN	Benin	IRN	Iran	NGA	Nigeria	TUR	Türkiye
BRN	Brunei Darussalam	IRQ	Iraq	OMN	Oman	TKM	Turkmenistan
BFA	Burkina Faso	JOR	Jordan	PAK	Pakistan	UGA	Uganda
CMR	Cameroon	KAZ	Kazakhstan	PSE	Palestine	ARE	United Arab Emirates
TCO	Chad	KWT	Kuwait	QAT	Qatar	UZB	Uzbekistan
COM	Comoros	KGZ	Kyrgyzstan	SAU	Saudi Arabia	YEM	Yemen
CIV	Cote d'Ivoire	LBN	Lebanon	SEN	Senegal		
DJI	Djibouti	LYB	Libya	SLE	Sierra Leone		
EGY	Egypt	MYS	Malaysia	SOM	Somalia		

\* Syria is currently suspended from OIC membership.

Note: Country codes are based on ISO 3166-1 alpha-3 codes.

### Non-OIC Developing Countries (98):

Angola	Dominica	Madagascar	São Tomé and Príncipe
Antigua and Barbuda	Dominican Republic	Malawi	Serbia
Argentina	Ecuador	Marshall Islands	Seychelles
Armenia	El Salvador	Mauritius	Solomon Islands
The Bahamas	Equatorial Guinea	Mexico	South Africa
Barbados	Eritrea	Micronesia	South Sudan
Belarus	Ethiopia	Moldova	Sri Lanka
Belize	Fiji	Mongolia	St. Kitts and Nevis
Bhutan	Georgia	Montenegro	St. Lucia
Bolivia	Ghana	Myanmar	St. Vincent and the Grenadines
Bosnia and Herzegovina	Grenada	Namibia	Swaziland
Botswana	Guatemala	Nauru	Tanzania
Brazil	Haiti	Nepal	Thailand
Bulgaria	Honduras	Nicaragua	Timor-Leste
Burundi	Hungary	Palau	Tonga
Cabo Verde	India	Papua New Guinea	Trinidad and Tobago
Cambodia	Jamaica	Paraguay	Tuvalu
Central African Republic	Kenya	Peru	Ukraine
Chile	Kiribati	Philippines	Uruguay
China	Kosovo	Poland	Vanuatu
Colombia	Lao P.D.R.	Romania	Venezuela



Democratic Republic of the Congo	Lesotho	Russia	Vietnam
Republic of Congo	Liberia	Rwanda	Zambia
Costa Rica	North Macedonia	Samoa	Zimbabwe
Croatia	Panama		

**Developed Countries\*\* (39):**

Australia	Germany	Lithuania	Singapore
Austria	Greece	Luxembourg	Slovak Republic
Belgium	Hong Kong	Macao SAR	Slovenia
Canada	Iceland	Malta	Spain
Cyprus	Ireland	Netherlands	Sweden
Czech Republic	Israel	New Zealand	Switzerland
Denmark	Italy	Norway	Taiwan
Estonia	Japan	Portugal	United Kingdom
Finland	Korea, Rep.	Puerto Rico	United States
France	Latvia	San Marino	

\*\* Based on the list of advanced countries classified by the IMF.

**Geographical Classification of OIC Member Countries****Sub-Saharan Africa (21): OIC-SSA**

Benin	Gambia	Nigeria
Burkina Faso	Guinea	Senegal
Cameroon	Guinea-Bissau	Sierra Leone
Chad	Mali	Somalia
Comoros	Mauritania	Sudan
Côte d'Ivoire	Mozambique	Togo
Gabon	Niger	Uganda

**Middle East and North Africa (19): OIC-MENA**

Algeria	Kuwait	Saudi Arabia
Bahrain	Lebanon	Syria*
Djibouti	Libya	Tunisia
Egypt	Morocco	United Arab Emirates
Iraq	Oman	Yemen
Iran	Palestine	
Jordan	Qatar	

\*Syria is currently suspended from its OIC membership.

**East and South Asia and Latin America (9): OIC-ESALA**

Afghanistan	Guyana	Maldives
Bangladesh	Indonesia	Pakistan
Brunei Darussalam	Malaysia	Suriname

**Europe and Central Asia (8): OIC-ECA**

Albania	Kyrgyzstan	Turkmenistan
Azerbaijan	Tajikistan	Uzbekistan
Kazakhstan	Türkiye	

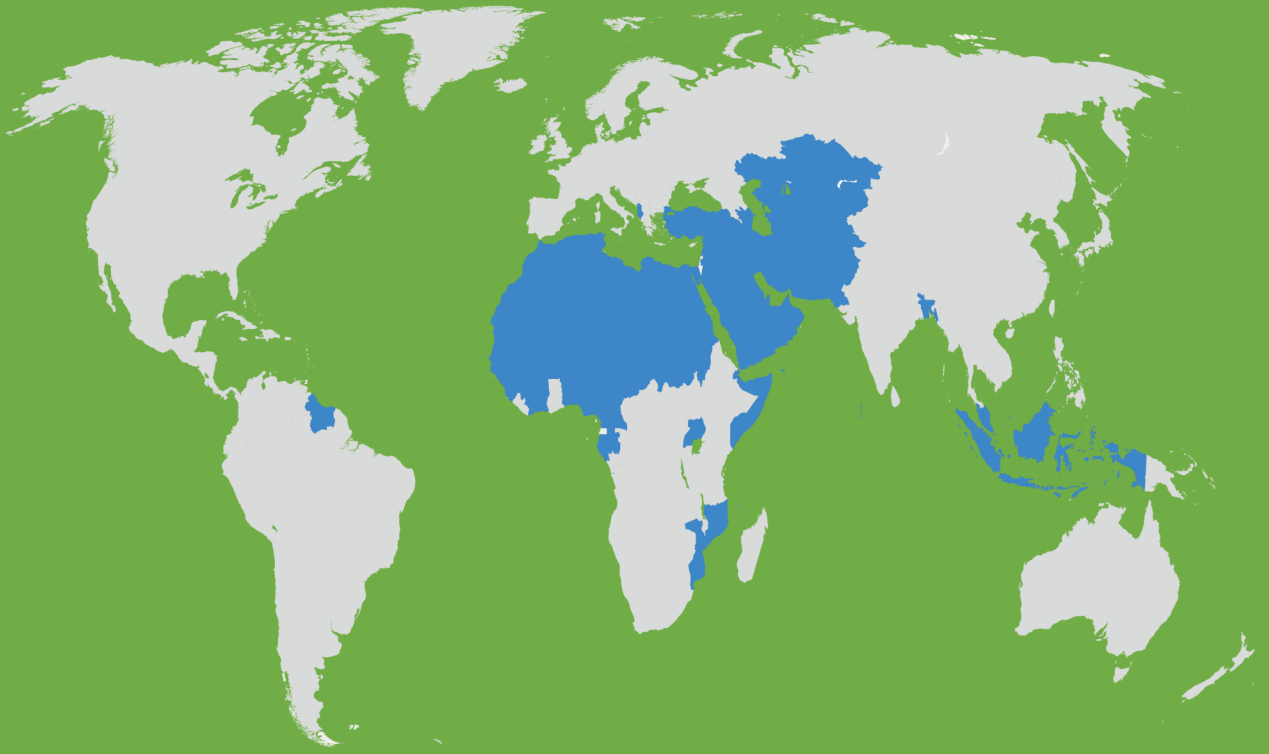
## ANNEX B. Vulnerability and Readiness Indices in OIC Countries

## Overall Vulnerability and Readiness

Country	Vulnerability (Lower = Better)	Rank	Readiness (Higher = Better)	Rank	Status
Afghanistan	0.59	50	0.22	53	Highly vulnerable, less ready to adapt
Albania	0.43	24	0.43	11	Less vulnerable, ready to adapt
Algeria	0.40	11	0.33	27	Less vulnerable, less ready to adapt
Azerbaijan	0.41	17	0.41	15	Less vulnerable, less ready to adapt
Bahrain	0.45	28	0.48	8	Highly vulnerable, ready to adapt
Bangladesh	0.55	44	0.27	44	Highly vulnerable, less ready to adapt
Benin	0.58	48	0.33	26	Highly vulnerable, less ready to adapt
Brunei Darussalam	0.38	7	0.53	2	Less vulnerable, ready to adapt
Burkina Faso	0.56	47	0.28	40	Highly vulnerable, less ready to adapt
Cameroon	0.47	31	0.25	48	Highly vulnerable, less ready to adapt
Chad	0.62	54	0.17	56	Highly vulnerable, less ready to adapt
Comoros	0.54	41	0.28	41	Highly vulnerable, less ready to adapt
Cote d'Ivoire	0.50	34	0.28	42	Highly vulnerable, less ready to adapt
Djibouti	0.48	32	0.33	25	Highly vulnerable, less ready to adapt
Egypt	0.44	25	0.34	23	Less vulnerable, less ready to adapt
Gabon	0.43	22	0.29	37	Less vulnerable, less ready to adapt
Gambia	0.53	40	0.32	29	Highly vulnerable, less ready to adapt
Guinea	0.53	37	0.30	35	Highly vulnerable, less ready to adapt
Guinea-Bissau	0.62	53	0.25	47	Highly vulnerable, less ready to adapt
Guyana	0.47	30	0.32	28	Highly vulnerable, less ready to adapt
Indonesia	0.45	27	0.39	18	Highly vulnerable, less ready to adapt
Iran	0.40	15	0.40	17	Less vulnerable, less ready to adapt
Iraq	0.45	26	0.28	43	Highly vulnerable, less ready to adapt
Jordan	0.38	6	0.42	13	Less vulnerable, less ready to adapt
Kazakhstan	0.35	1	0.49	7	Less vulnerable, ready to adapt
Kuwait	0.41	18	0.42	12	Less vulnerable, less ready to adapt
Kyrgyzstan	0.37	4	0.37	19	Less vulnerable, less ready to adapt
Lebanon	0.42	20	0.30	34	Less vulnerable, less ready to adapt
Libya	0.42	21	0.21	55	Less vulnerable, less ready to adapt
Malaysia	0.37	3	0.52	3	Less vulnerable, ready to adapt
Maldives	0.54	43	0.42	14	Highly vulnerable, less ready to adapt
Mali	0.60	51	0.29	36	Highly vulnerable, less ready to adapt
Mauritania	0.54	42	0.34	22	Highly vulnerable, less ready to adapt
Morocco	0.39	9	0.43	10	Less vulnerable, ready to adapt
Mozambique	0.52	36	0.26	45	Highly vulnerable, less ready to adapt
Niger	0.66	55	0.31	30	Highly vulnerable, less ready to adapt
Nigeria	0.50	33	0.22	54	Highly vulnerable, less ready to adapt
Oman	0.42	19	0.50	6	Less vulnerable, ready to adapt
Pakistan	0.53	39	0.28	39	Highly vulnerable, less ready to adapt
Qatar	0.39	8	0.51	5	Less vulnerable, ready to adapt
Saudi Arabia	0.40	14	0.51	4	Less vulnerable, ready to adapt
Senegal	0.53	38	0.35	21	Highly vulnerable, less ready to adapt
Sierra Leone	0.56	46	0.31	31	Highly vulnerable, less ready to adapt
Somalia	0.68	56	0.23	51	Highly vulnerable, less ready to adapt
Sudan	0.61	52	0.26	46	Highly vulnerable, less ready to adapt
Suriname	0.40	12	0.33	24	Less vulnerable, less ready to adapt
Syria	0.46	29	0.23	52	Highly vulnerable, less ready to adapt
Tajikistan	0.43	23	0.30	33	Less vulnerable, less ready to adapt
Togo	0.51	35	0.31	32	Highly vulnerable, less ready to adapt
Tunisia	0.39	10	0.43	9	Less vulnerable, ready to adapt
Türkiye	0.36	2	0.41	16	Less vulnerable, less ready to adapt
Turkmenistan	0.41	16	0.24	50	Less vulnerable, less ready to adapt
Uganda	0.58	49	0.28	38	Highly vulnerable, less ready to adapt
United Arab Emirates	0.37	5	0.60	1	Less vulnerable, ready to adapt
Uzbekistan	0.40	13	0.35	20	Less vulnerable, less ready to adapt
Yemen	0.55	45	0.24	49	Highly vulnerable, less ready to adapt
<b>OIC</b>	<b>0.48</b>		<b>0.34</b>		<b>Highly vulnerable, less ready to adapt</b>
<b>World</b>	<b>0.44</b>		<b>0.43</b>		

## Sectoral Vulnerability and Readiness

Country	Vulnerability (Lower = Better)						Readiness (Higher = Better)		
	Ecosystem	Food	Habitat	Health	Infrastructure	Water	Economic	Governance	Social
Afghanistan	0.51	0.63	0.53	0.83		0.47	0.15	0.17	0.35
Albania	0.42	0.47	0.52	0.45	0.48	0.25	0.40	0.49	0.40
Algeria	0.42	0.46	0.43	0.55	0.15	0.39	0.31	0.34	0.34
Azerbaijan	0.38	0.46	0.46	0.36		0.38	0.51	0.38	0.36
Bahrain	0.44	0.37	0.51	0.36	0.54	0.50	0.62	0.50	0.32
Bangladesh	0.49	0.58	0.54	0.71	0.44	0.52	0.18	0.34	0.28
Benin	0.52	0.67	0.63	0.67	0.52	0.45	0.28	0.43	0.28
Brunei Darussalam	0.40	0.44	0.54	0.36	0.20	0.36	0.59	0.67	0.35
Burkina Faso	0.43	0.64	0.59	0.70		0.43	0.22	0.41	0.21
Cameroon	0.43	0.58	0.66	0.55	0.28	0.34	0.15	0.29	0.29
Chad	0.58	0.72	0.64	0.77		0.40	0.04	0.24	0.21
Comoros	0.48	0.67	0.45	0.74	0.36		0.33	0.34	0.18
Cote d'Ivoire	0.50	0.59	0.59	0.58	0.40	0.36	0.24	0.40	0.21
Djibouti	0.54	0.55	0.60	0.72	0.42	0.02	0.41	0.38	0.22
Egypt	0.39	0.50	0.34	0.46	0.44	0.51	0.31	0.36	0.35
Gabon	0.36	0.48	0.75	0.47	0.16	0.34	0.18	0.37	0.30
Gambia	0.48	0.65	0.63	0.60		0.31	0.30	0.43	0.23
Guinea	0.48	0.65	0.66	0.53		0.32	0.28	0.31	0.32
Guinea-Bissau	0.61	0.68	0.60	0.79	0.75	0.29	0.21	0.27	0.27
Guyana	0.51	0.52	0.55	0.48		0.27	0.32	0.44	0.21
Indonesia	0.47	0.53	0.53	0.45	0.29	0.43	0.42	0.45	0.31
Iran	0.47	0.42	0.45	0.45	0.26	0.37	0.35	0.30	0.55
Iraq	0.54	0.48	0.51	0.56	0.22	0.38	0.34	0.17	0.32
Jordan	0.33	0.41	0.43	0.39	0.34	0.40	0.41	0.51	0.33
Kazakhstan	0.43	0.42	0.45	0.35	0.26	0.21	0.54	0.46	0.46
Kuwait	0.45	0.40	0.48	0.32	0.43	0.40	0.44	0.50	0.31
Kyrgyzstan	0.48	0.38	0.40	0.37		0.24	0.41	0.36	0.34
Lebanon	0.47	0.37	0.46	0.52	0.36	0.36	0.32	0.32	0.27
Libya	0.56	0.40	0.45	0.48	0.26	0.40	0.26	0.11	0.27
Malaysia	0.36	0.43	0.51	0.34	0.28	0.29	0.63	0.60	0.34
Maldives	0.54	0.55	0.42	0.57	0.63		0.45	0.41	0.39
Mali	0.51	0.67	0.59	0.76		0.47	0.25	0.31	0.31
Mauritania	0.48	0.60	0.52	0.70	0.52	0.42	0.41	0.36	0.26
Morocco	0.37	0.43	0.39	0.51	0.34	0.28	0.54	0.46	0.30
Mozambique	0.52	0.61	0.57	0.63	0.42	0.36	0.28	0.34	0.18
Niger	0.47	0.75	0.63	0.77		0.70	0.27	0.36	0.31
Nigeria	0.43	0.60	0.62	0.56	0.28	0.50	0.18	0.27	0.21
Oman	0.58	0.50	0.48	0.42	0.17	0.35	0.66	0.59	0.26
Pakistan	0.56	0.57	0.44	0.61	0.33	0.69	0.28	0.30	0.27
Qatar	0.59	0.38	0.40	0.33	0.40	0.21	0.64	0.64	0.24
Saudi Arabia	0.50	0.46	0.55	0.34	0.17	0.40	0.62	0.51	0.41
Senegal	0.41	0.63	0.56	0.67	0.48	0.46	0.27	0.48	0.30
Sierra Leone	0.58	0.65	0.67	0.63	0.36	0.46	0.22	0.39	0.32
Somalia	0.65	0.72	0.67	0.86		0.48	0.38	0.08	
Sudan	0.66	0.66	0.55	0.72	0.35	0.72	0.31	0.21	0.25
Suriname	0.43	0.47	0.57	0.39	0.43	0.10	0.28	0.46	0.26
Syria	0.48	0.53	0.46	0.40	0.31	0.57	0.25	0.11	0.32
Tajikistan	0.46	0.48	0.42	0.41		0.38	0.34	0.28	0.29
Togo	0.51	0.61	0.63	0.58	0.42	0.33	0.32	0.36	0.25
Tunisia	0.37	0.40	0.44	0.35	0.42	0.37	0.54	0.45	0.32
Türkiye	0.44	0.34	0.43	0.32	0.30	0.30	0.45	0.41	0.38
Turkmenistan	0.44	0.31	0.44	0.39		0.46		0.26	0.22
Uganda	0.51	0.64	0.57	0.77		0.45	0.27	0.39	0.19
United Arab Emirates	0.47	0.36	0.33	0.34	0.35	0.40	0.77	0.69	0.34
Uzbekistan	0.51	0.29	0.42	0.38	0.27	0.56	0.45	0.33	0.28
Yemen	0.57	0.69	0.61	0.69	0.33	0.40	0.37	0.12	0.25
<b>OIC</b>	<b>0.48</b>	<b>0.53</b>	<b>0.52</b>	<b>0.54</b>	<b>0.36</b>	<b>0.39</b>	<b>0.36</b>	<b>0.37</b>	<b>0.30</b>
<b>World</b>	<b>0.46</b>	<b>0.47</b>	<b>0.51</b>	<b>0.48</b>	<b>0.35</b>	<b>0.35</b>	<b>0.43</b>	<b>0.49</b>	<b>0.36</b>



**STATISTICAL, ECONOMIC AND SOCIAL RESEARCH  
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