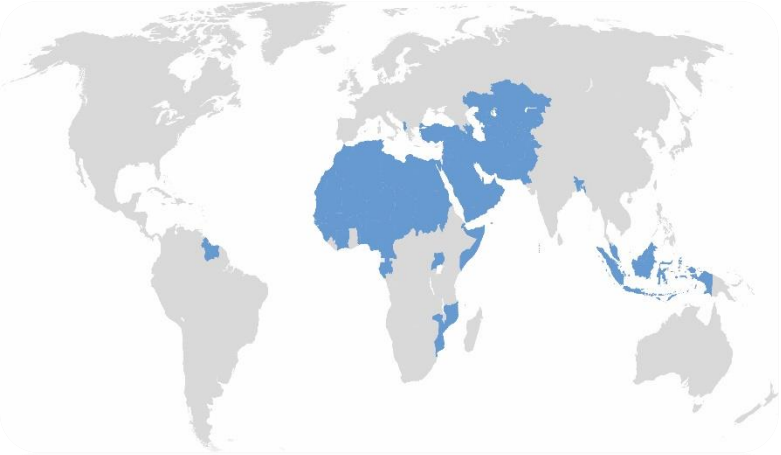
OIC ENVIRONMENT REPORT 2019

Organisation of Islamic Cooperation

Statistical, Economic and Social Research and Training Centre for Islamic Countries



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ORGANISATION OF
ISLAMIC COOPERATION

STATISTICAL, ECONOMIC AND
SOCIAL RESEARCH AND TRAINING CENTRE
FOR ISLAMIC COUNTRIES

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CONTENTS

ACRONYMS

EAP	East Asia and Pacific
ECA	Europe and Central Asia
EPI	Environmental Performance Index
GDP	Gross Domestic Product
GER	Gross Enrolment Rate
GHG	Greenhouse Gases
GPI	Gender Parity Index
HLP	High Level Panel
ICT	Information and Communication Technology
IDP	Internally Displaced People
IEAG	Independent Expert Advisory Group
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LAC	Latin America and the Caribbean
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
OIC	Organization of Islamic Cooperation
SA	South Asia
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
UNCCD	UN Convention to Combat Desertification
UNFCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNOCHA	UN Office for the Coordination of Humanitarian Affairs
WHO	World Health Organization

FOREWORD

The member states of the Organization of Islamic Cooperation (OIC) are well endowed with natural resources, which are inextricably linked to the livelihoods, employment opportunities and well-being of millions of people. Over the years, many OIC member countries have made tremendous progress in mainstreaming 'sustainability' into their national development agendas. However, economic growth has continued to be fuelled by unsustainable use of natural resources. This is particularly true in the least developed member countries that have limited or no sustainable policies and practices in place. Consequently, widespread air and water pollution, land degradation, loss of biodiversity and fragile ecosystems are surfacing in many OIC countries.

As this report underlines, the increase in unsustainable agricultural practices and unchecked land planning for urbanization causes immense stress on the land resources of many OIC countries. Air pollution also remains as one of the most potent threats to the health and well-being of OIC populations due to the inefficient use of energy in the industry and transport sector and the burning of biomass for cooking and heating purposes. Furthermore, around two dozen OIC member countries are currently classified as water stressed with high prevalence of inefficient water use in agriculture and sewerage dumping in rivers. As a result, biodiversity and ecosystems are being threatened across the Islamic world with low coping and adaptive capacities for environmental sustainability in the wake of worsening climatic conditions.

The importance of the environment for sustainable social and economic development is well stipulated in the OIC-2025 Programme of Action, which guides member countries to 'protect and preserve the environment, promote sustainable production and consumption patterns and enhance capacities for disaster risk reduction as well as climate change mitigation and adaptation'. Most of the OIC member countries are also an active party to the global discourse on sustainable management of natural resources with strong national commitments.

The progress towards a sustainable future is only possible if the OIC member countries employ an all-encompassing approach to protect and conserve their natural capital. To this end, it is imperative that OIC countries efficiently utilise the available regional and international platforms to secure the necessary technical and financial support for devising effective policies and upgrading their environmental management capacities.

I believe that this report will prove as an excellent tool to spread awareness about environmental degradation, and promote joint Islamic action for the protection and conservation of natural resources in OIC member countries.

Nebil DABUR
Director General
SESRIC

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This report is prepared by a research team at SESRIC led by Mazhar Hussain and comprised of Cihat Battaloglu and Fadi Farasin. The work was conducted under the leadership and supervision of H.E. Nebil Dabur, Director General of SESRIC.

Introduction and Chapter 3 on Environmental Management were prepared by Mazhar Hussain. Chapter 2 on the State of Environment was jointly prepared by Cihat Battaloglu (Section 2.1 on Air and 2.2 on Land) and Fadi Farasin (Section 2.3 on Water and 2.4 on Biodiversity and Ecosystems).

EXECUTIVE SUMMARY

Air

The quality of the air can either support human and environmental health or detract from it. In the area of environmental protection, air quality is determined by the amount of unwanted, potentially harmful components in our atmosphere. Most of these components are part of what is commonly referred to as air pollution, which comes in many different forms and from many different sources.

The indicators on Air Quality in OIC region show that the performance of OIC countries is higher than the Non-OIC developing countries, but it lags behind that of the global average and developed country groups. A similar situation is also observed in air pollution indicators. While the average scores of OIC countries, in SO2 and NOX emission, are higher than the Non-OIC countries average in 2018, they lag behind the global average and average of developed countries.

The indicators, both in air quality and air pollution, prove that more comprehensive policy objectives are necessary to establish accurate critical loads for ecosystems in OIC region. To tackle knowledge gaps in addressing the effects of air pollution, a variety of research and monitoring networks needs to emerge in the OIC region.

Land

Over the past decades, many agricultural practices have improved; reducing the negative impact on the environment, but the need for further improvement is growing. While improvements have been made, urban expansion continues, and desertification, soil erosion and low vegetation cover remain as significant concerns for many OIC countries. The mass destruction of trees—deforestation—continues, sacrificing the long-term benefits of standing trees for short-term gain.

Globally, around 25% of the total land, or 3.6 billion hectares, is decertified. Every year around 12 million hectares of productive land become infertile and unusable for farming due to desertification and droughts. The OIC region is not immune to these problems and desertification is increasingly having negative impact across the OIC member countries. The risk of desertification is most severe in the OIC countries in Sub-Saharan Africa and Asia, influenced by soil erosion, salinization, loss of soil organic carbon, loss of biodiversity and landslides.

The level of desertification is particularly high in drylands covering over 40% of the Earth's land surface. Among the OIC regions, the situation is particularly alarming in the Sub Saharan African region, which is home to a significant proportion of arid and hyper-arid lands, most of which are unsuitable for agricultural activities. Member countries in MENA region also have

substantial areas of hyper-arid and semi-arid lands. Some member countries are particularly vulnerable due to the high prevalence of dryland systems. At least 90% of the surface area of Burkina Faso, Egypt, Iraq, Kazakhstan, and Turkmenistan is classified as drylands. Therefore, the issue of "land" is of great importance for the OIC countries. Not only to increase its land productivity but also to protect itself from the dangers of land related issues in the coming years.

Combating soil erosion is very critical to the protection of natural environments. Despite the success stories, rates of soil erosion are still very high in OIC countries. Soil erosion by water is problematic in OIC countries, particularly those located in East Asia (EA) and Sub-Saharan Africa (SSA), whereas wind erosion is concentrated mainly in the OIC MENA and ECA regions. Almost all OIC sub-regions are impacted in one way or another by soil erosion and require rapid and effective policies and means to prevent and limit the destruction caused by intense soil erosion in the OIC.

Deforestation is another important problem causing land degradation and harming the environmental media. While forests still cover about 30 percent of the world's land surface, they are disappearing at an alarming rate. Between 1990 and 2016, the world lost 1.3 million square kilometers of forest. Since humans started intruding into forests, 46 percent of trees have been felled. OIC member countries have also witnessed significant losses in total forest area since the 1990s. Between 1990 and 2016, OIC member countries witnessed a significantly higher loss of forest area than other groups.

Water

Factors of natural and human nature affect the annual availability of fresh water. Moreover, water volumes and their distribution over time and space are determined by climate and geomorphological conditions. OIC countries suffer from limited water availability. Complicating things further is the fact that over the past decade and a half, OIC countries, in comparison to other country groups, experienced the sharpest drop in water availability per capita (a drop of 23.3%). The limited water availability per capita and the decrease of water availability overtime has caused many OIC countries to come face to face with the challenge of water scarcity. Almost half of OIC countries face some level of water scarcity. Absolute water scarcity is observed in 14 OIC countries, namely Kuwait, United Arab Emirates, Qatar, Saudi Arabia, Yemen, Maldives, Bahrain, Libya, Jordan, Palestine, Algeria, Djibouti, Oman and Tunisia. Chronic water shortages are observed in six OIC countries, namely Egypt, Syria, Burkina Faso, Morocco, Lebanon and Sudan. Six OIC countries experience regular water stress, namely Pakistan, Somalia, Uganda, Comoros, Nigeria and Uzbekistan.

Limited water availability is compounded by OIC countries using more water resources than countries with comparable development levels. This highlights the need for OIC countries to use their water resources more efficiently and more productively. This is particularly true for the agricultural sector where the majority of water (84%) is used in OIC countries. Case in point is Saudi Arabia which has experienced downward trends in fresh water availability

reflecting agricultural pressures rising from explosive growth of irrigated farmland. Saudi Arabia lost 6.1 gigatons per year of stored groundwater in the period from 2002 to 2016. Another important region in the OIC with dramatic decline of fresh water is the Caspian Sea, where overuse of water resources results in a loss of 23.7 gigatons of fresh water annually. This depletion is a reminder of the sad fate of the disappearing Aral Sea in the same region.

Marine resources have a vital role in human social and economic development and well-being. Unfortunately, at the current rates there is serious deterioration to these resources. One of the major culprits to this deterioration is pollution which changes the physical, chemical, and biological characteristics of the oceans and seas; thus, endangering marine lives and ecosystems and with it the wellbeing of humans. In addition to pollution, over fishing poses a serious threat to marine resources. For these reasons it is no surprise that conserving and suitably using the oceans, seas and marine resources has been included in the 2030 Agenda for Sustainable Development under SDG 14. To achieve SDG 14, it is highly important for OIC countries to safeguard marine sites in order to ensure sustainable long-term use of their precious natural resources. Unfortunately, the coverage of protected areas in relation to marine areas in OIC countries is very limited, a mere 2.4%, which compares very poorly with other country group. Thus, for a suitable future, marine resources in OIC countries must be managed and protected properly.

The report also highlights the climate change- water nexus and its impacts on OIC countries. The top 20 warmest years on record have come since 1995. Due to the delicate balance between climate and water, the globe getting warmer has a direct effect on the water cycle. The changes in water cycle which has resulted in excess in water in some area and shortages in other areas has had devastation impacts on the world and on OIC countries in the form of floods and droughts. To illustrate, the number of floods in the world and in the OIC are on the rise. However, the rate of flood occurrences in OIC is increasing at a sharper rate than the world. In the time-period 1970-1979, OIC countries share in the total world flood occurrences was 24%. This share has since increased to 27% in the time-period 2010-2018

Biodiversity and Ecosystems

Biological diversity forms the foundation of a resilient and sustainable planet. Habitat conservation is important not only for preserving key components of biological diversity, but for maintaining the associated ecosystem services which provide innumerable benefits and protections to humans, such as water provisioning, carbon sequestration, and flood prevention. In contrast, the continuing loss of biodiversity and ecosystems on a global scale presents a direct threat to life. Without a global environment that is healthy and capable of supporting a diversity of life, no human population can exist.

The analysis in the report reveals that over the last decade, the world has witnessed significant success in conserving and protecting biodiversity and habitats. This is reflected in an 8% increase in the world's score on the Environmental Performance Index (EPI) issue category of "Biodiversity and Habitat." OIC countries current score (58) compares poorly with the world

average and the average of other country groups; nonetheless, OIC countries have recorded the largest improvement on the EPI issue category of "Biodiversity and Habitat" since the last decade with its average score increasing from 51.9 to 58 which corresponds to a 12% improvement.

Currently around 1 million animal and plant species are threatened with extinction, many within decades, more than ever before in human history. The culprits are, in descending order: (1) changes in land and sea use; (2) direct exploitation of organisms; (3) climate change; (4) pollution and (5) invasive alien species. The analysis in the report reveals that over the last decade all country groups have recorded better performance in protecting species. The OIC countries average on the Species Protection Index (SPI) is lower than the world average and the average of other country groups; however, OIC countries where able to record the best improvement in protecting species in the last decade, increasing their SPI score from 51.6 to 58.9, a 14% increase.

Environmental Management

Despite the fact that the developing world as a whole is and will be affected by the increasing level of environmental degradation, its negative impacts are and will be more pronounced in OIC member countries. Indeed, the higher environmental vulnerability of OIC members emanates from their geographic locations, high dependence on climate sensitive natural resources and low adaptive capacities.

The majority of OIC member countries are characterized by poor environmental performance and a high level of vulnerability to climate change. According to the World Bank's Country Policy and Institutional Assessments (CPIA) database, the capacity for environmental management (both in terms of policies and institutions) in 30 OIC member countries is averaged at a score of 3.1 for 2017 (6.0 being the maximum score). Given the fact that CPIA scores 1 to 4 describe poor capacity and 5 to 6 quite advanced capacity, majority of these member countries like their developing counterparts elsewhere are characterized by weak capacities.

The environmental management in these member countries is held back by (i) partial coverage of environmental issues in regulations and policies; (ii) limited availability of environmental data and their use for priority setting; (iii) low quality of environmental assessment systems; (iv) weak policy implementation; (v) limited public information; and (vi) minimal consideration of environmental issues in sector ministries.

Adaptation is a key building block of global response to environmental degradation and disasters. However, in spite of their high vulnerability to environmental/natural disasters, the majority of OIC member countries are characterized by low coping and adaptive capacities. According to the latest estimates, lack-of-adaptive-capacity score was recorded above 50 mark for 28 members (1 being the best score). Among the OIC members Mali, Chad Niger, and Guinea have the highest lack of adaptive capacity with score of 70. On the opposite side

of the scale, United Arab Emirates is the most equipped OIC country with a score of 45, followed by Saudi Arabia, Kuwait and Qatar.

OIC members are widely aware of environmental degradation and its negative consequences. They actively participate in the environment related international summits, treaties, events, and projects. Currently, majority of OIC member countries are parties to UNFCC, Kyoto Protocol, Paris Agreement and UNCCD. Furthermore, OIC member countries have also been active in charting out regional action plans like OIC Water Vision and Executive Work Plan for Natural Disaster Risk Reduction and Management to enhance intra-OIC cooperation for environment and sustainable development.

CHAPTER ONE

Introduction

Natural resources contribute substantially to the national economies throughout the world by supporting the manufacturing and services sectors alike. However, in the recent decades, rapid economic growth and urbanization lead to a substantial increase in demand for these resources while neglecting protection and conservation of the environment, particularly in the developing world. Therefore, today the majority of developing countries are facing serious environmental challenges, including desertification, deforestation, air and water pollution, water scarcity, declining wildlife populations and the loss of biodiversity.

In general, environmental degradation is induced by anthropogenic activities related to industry, agriculture, recreation, transport and urbanization. These activities of humans are capable of and most often do introduce dangerous contaminants to the land, water, air and ecosystems. Environmental degradation, therefore, undermines the socio-economic welfare (Hussein, 2007) due to loss of healthy life and well-being of the population (e.g. premature death, pain and suffering from illness, absence of a clean environment, discomfort); economic losses (e.g. reduced soil productivity and reduced value of other natural resources, lower international tourism); and loss of environmental opportunities (e.g. reduced recreational values of lakes, rivers, beaches, forests for the population).

Given the complexity of interdependencies and cross-sectoral interactions, it is very difficult to gauge the real cost of environmental degradation in the monetary terms. Over the years, efforts have been made to quantify and monetize the cost of degradation across a wide range of environmental issues. The latest estimates of the UNCCD (2018) reveal that the cost of land degradation alone could be as much as $23 trillion by 2050 for the group of 21 developing countries, including 8 OIC members from Sub-Saharan Africa (6), Asia (1) and Latin America (1). The average loses in these countries account for around nine percent of their gross domestic product (GDP). On the other hand, the cost of action to conserve, restore and reuse the degraded land is just US$4.6 trillion. The report of UNCCD (2018) also reveals that Asia and Africa, where the majority of OIC members are located, will bear the highest costs of land degradation, estimated at US$84 billion and $65 billion per year, respectively.

OIC member countries, like other developing countries, are disproportionally affected by the most devastating effects of environmental degradation. OIC wide negative impacts vary with

geographic location, degree of reliance on natural resources and adaptive capacities of member countries. In general, land degradation combined with changes in climatic conditions could be a serious threat for the agriculture sector in member countries located in hot regions of Africa and South and East Asia. Similarly, despite being the high emitters of CO2, OIC oil exporting high-income members are less vulnerable to environmental degradation related negative consequences due to more advance coping and adaptive capacities compared to the OIC Least Developed Countries (LDCs).

Sound management of environmental resources is pivotal for the sustainable development across the globe. More environment friendly policy and practices can actually be instrumental in helping OIC member countries and their counterparts elsewhere to achieve the targets set for at least seven Sustainable Development Goals (SDGs), including Goal 15 (Life on land), Goal 6 (Clean water and sanitation), Goal 13 (Climate action), Goal 1 (No poverty), and Goal 2 (Zero hunger).

National and regional efforts to address the environmental degradation can be spearheaded by employing more environment friendly policies and management practices which have been developed during the last couple of decades. Globally, many treaties and conventions have been adopted to chart out strategies for economic growth with low level of environmental externalities and carbon emissions. Majority of OIC member countries are party to these initiatives and have been actively collaborating with relevant regional and international stakeholders to combat environmental degradation by adopting environment-friendly policies and practices.

Nevertheless, like elsewhere in the developing world, natural resources are still poorly managed and environmental degradation is on the rise in many OIC member countries. The gravity of the matter is highest in LDCs with limited financial resources and low coping and adaptive capacities to effectively address environmental degradation. This merits strong cooperation among the member countries to develop an integrated environmental management policy. Such a policy would aim to raise the level of awareness, interaction and cooperation on environmental and socio-economic development related issues among OIC member countries.

In this context, OIC Environment Report 2019 provides an overview of the state of environment in OIC member countries by analyzing the latest available data and statistics on major environmental issues and initiatives. Discussion in Chapter 2 revolves around status of environment by analyzing latest data on indicators related with air quality, land use, water resource management and conservation of biodiversity and eco systems. The Chapter 3 discusses environmental management in OIC countries by dwelling upon their environmental performance, current status of national legislation and institutional arrangements of relevance to environment as well their involvement in regional and international initiatives to cooperate with the relevant stakeholders to improve environmental management and performance. The report concludes with a general discussion and policy suggestions in Chapter 4.

CHAPTER TWO

State of Environment

The following chapter deals with four environmental media in the OIC region. It is firstly dealing with the changes in air quality particularly due to pollutants and their implications for human health and climate change. The following sections then discuss land cover changes in the OIC region due to conversion of arable land and forests to other land uses, soil erosion and degradation and solid waste dumping. The last part dwells upon the water resources availability and consumption along with the issues and challenges related to the management of biodiversity and ecosystems in the OIC member countries.

2.1. Air

Air quality can either promote or harm human and environmental health. In the area of environmental protection, air quality is determined by the amount of unwanted, potentially harmful components in our atmosphere. Most of these components are part of what is commonly referred to as air pollution, and it comes in many different forms and from many different sources. Nature itself plays a role: the carbon dioxide emitted by living things, smoke from forest fires, windblown dust and pollen, salt spray from the ocean, and even the ashes from the eruption of a far-off volcano can affect the quality of air.

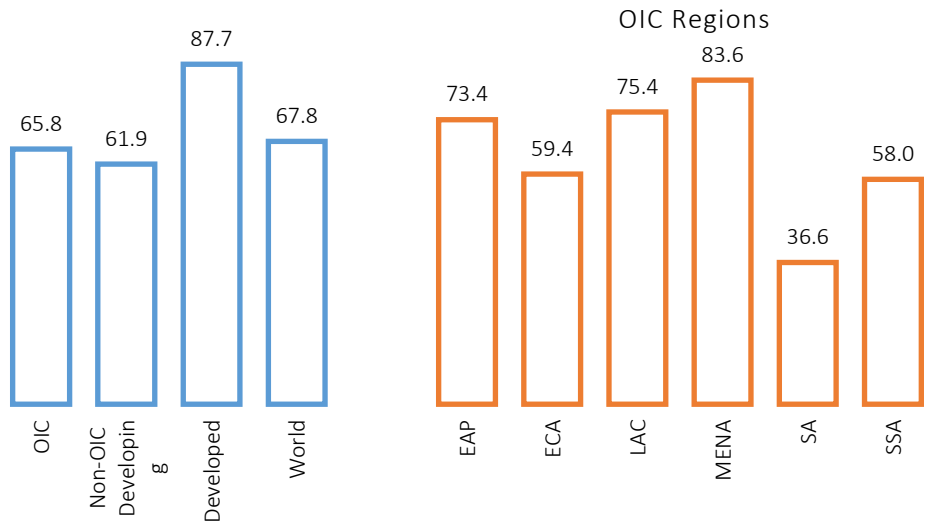
Pollution caused by human activities is of greater concern on a daily basis. In contemporary world, air pollution largely results from human activities such as industry, agriculture and transportation, as well as from domestic household activities such as cooking and heating. Air pollution has detrimental effects on the health of individuals and the environment; therefore, it needs to be measured and tracked in order to manage and reduce these negative impacts.

The Air quality is measured by determining exposure to fine particulate matter, nitrogen dioxide as well as the percentage of the population burning solid fuel indoors. Suspended particulates contribute to acute lower respiratory infections and other diseases such as cancer. They can penetrate the human lung and blood tissue, leading to higher incidences of cardiovascular and lung disease. Cooking with solid fuels over open fires or in simple stoves exposes households to daily pollutant concentrations that lie between those of second-hand smoke exposure and active smoking. Nitrogen dioxide (NO_2) is produced as a result of road

traffic and other fossil fuel combustion processes. Strong associations between NO_2 and mortality have been identified in multi-city studies around the world (Geddes et al., 2015).

OIC countries situation regarding the Air Quality is presented in Figure (2.1). While the performance of OIC countries with a score of 65.8 is higher than the Non-OIC developing countries average, it lags behind that of the global average and groups of developed country. At the OIC regional level, OIC countries in MENA and Latin America perform quite well; whereas the scores reveal that air quality is an area requiring significant improvement in OIC countries located in South Asia and Sub-Saharan Africa.

Figure 2.1: OIC Countries Performance in the Air Quality



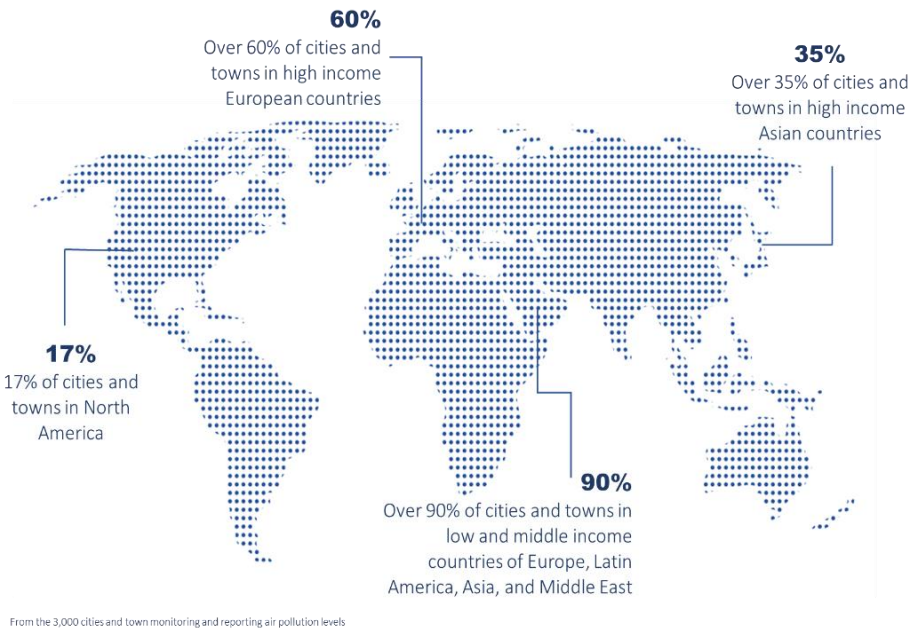
Source: EPI, 2018

The indicators mentioned above demonstrate that air pollution in OIC countries, particularly in South Asia and Sub-Saharan Africa, is a serious challenge that needs to be addressed. For this reason, it is necessary to analyze Air Quality within the OIC in more detail and with greater caution.

Environmental Performance Index employs the distance-to-target technique for air quality indicator construction, which places each country in relation to worst and best performance targets corresponding to scores of 0 and 100, respectively. The EPI Air Quality includes three key sub-indicators: (1) Household Solid Fuel Use measures household air pollution as the health risk posed by the incomplete combustion of solid fuels, using the number of age-standardized disability-adjusted life years (DALYs) lost per 100,000 persons due to this risk; (2) PM2.5 exposure is a measure of the average amount of fine particulate matter in micrograms per cubic meter. PM2.5 average exposure serves as a measure of the amount a person would be exposed to on a typical day in their country; (3) PM2.5 exceedance is a measure of the weighted average of the percentage of the population exposed to elevated

levels of PM2.5, by measuring instances when PM2.5 concentrations exceeded 10, 15, 25, and 35 µg/m3, which are the WHO's air quality guidelines and interim targets (World Health Organization, 2006a).

Figure 2.2: Cities Exceeding WHO Guidelines for Safe Air

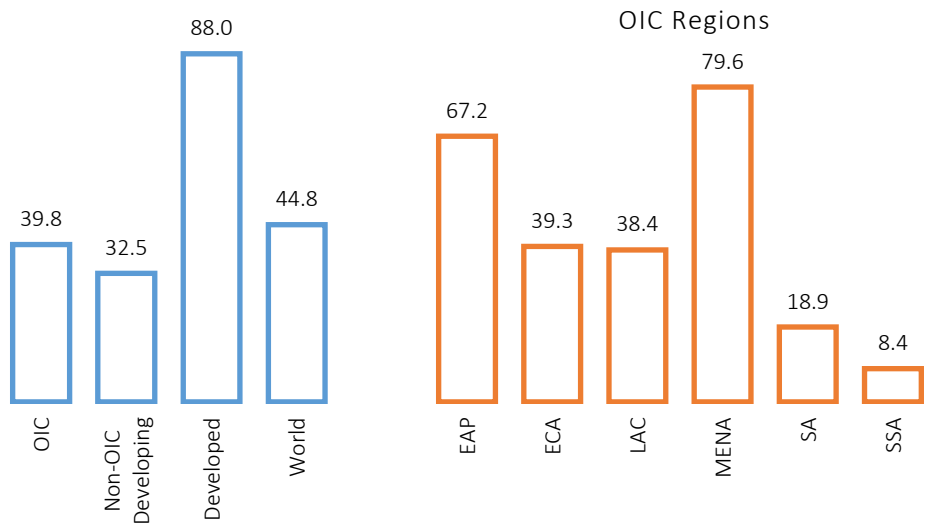


Source: Adapted from UNEP

Household solid fuel use emits significant amounts of particulate matter and it has a direct impact on household air quality. In most cases, household air pollution (HAP) occurs from the incomplete combustion of solid fuels, which is predominantly from biomass burning, such as wood, crop wastes, charcoal, coal, and dung. In poorly ventilated households, the incomplete combustion process produces a substantial amount of particulate emissions, which cause significant amounts of age-standardized disability-adjusted life years worldwide.

OIC countries performance on the household air quality indicator is shown in Figure 2.3. As the figure reveals, OIC countries perform better than the non-OIC developing countries, but they are still lagging behind the global average and developed countries in relation to household air quality (Figure 2.3). At the OIC regional level, the challenge of household air quality is a formidable task in members located in South Asia and Sub-Saharan Africa regions, which have a very low score on this indicator. Conversely, OIC countries in MENA and East Asia & Pacific regions perform quite well and above the world average.

Figure 2.3: Household Air Quality

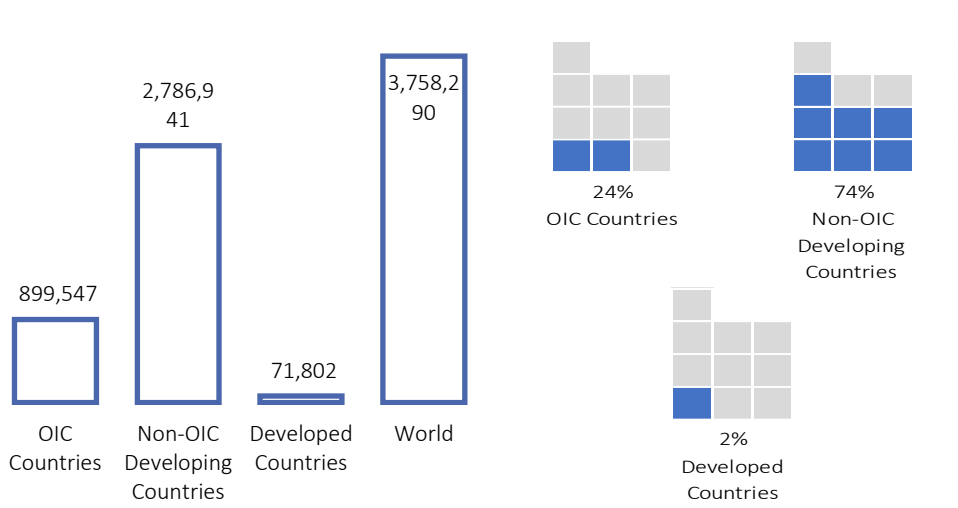


Source: EPI, 2018

Household air pollution is one of the leading causes of disease as well as high number of deaths in the developing world. As shown in Figure 2.4, around 3.8 million deaths were attributable to Household Air pollution in the world. In 2016, 24% (899,547 people) of the 3.8 million deaths were recorded in the OIC region. Exposure to smoke from cooking fires causes millions of premature deaths each year, mostly in low- and middle-income countries. The burning of fuels such as dung, wood and coal in inefficient stoves produces a variety of health-damaging pollutants, including particulate matter (PM), methane, carbon monoxide, Polycyclic aromatic hydrocarbons (PAH) and volatile organic compounds (VOC). Burning kerosene in simple wick lamps also produces significant emissions of fine particles and other pollutants (WHO, 2018).

In addition to the usage of household solid fuels, the particles smaller than 2.5 microns in diameter, known in short as PM2.5, are also important to consider for air quality. As PM2.5 is fine enough to lodge deep into human lung and blood tissue. Exposure to PM2.5 particles places populations at risk of heart and lung diseases and could result in a stroke or lead to lung cancer. In severe cases, PM2.5 pollution contributes directly to fatalities (Goldberg, 2008). Airborne particulates originate from a variety of sources. PM2.5 is generally the product of combustion, whether anthropogenic, like car emissions and coal burning, or through forest fires and volcanoes. For vulnerable populations, including youth and elderly, high concentrations of PM2.5 can be a particularly virulent killer. The leading cause of child mortality for ages one to five worldwide is pneumonia, and fine particulates are a major global contributor to its incidence (WHO, 2016c).

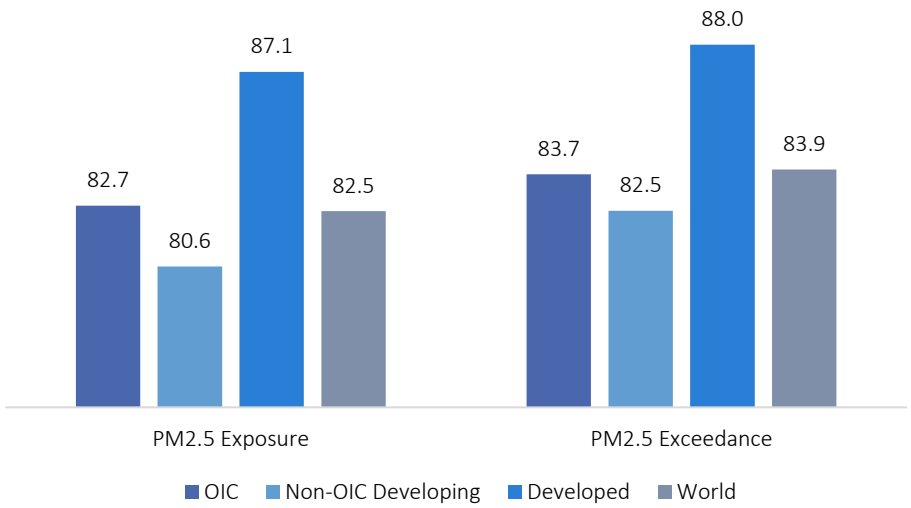
Figure 2.4: Household Air Pollution Attributable Deaths (2016)



Source: WHO

OIC countries performance on the Exposure and Exceedance to PM2.5 indicators are shown in Figure 2.5. Both graphs reveal that the average performances of Exposure/Exceedance to PM2.5 in OIC countries are higher than non-OIC developing countries and almost same level as the global average. Exposure/ Exceedance to PM2.5 remain an important challenge that needs to be addressed in the OIC countries.

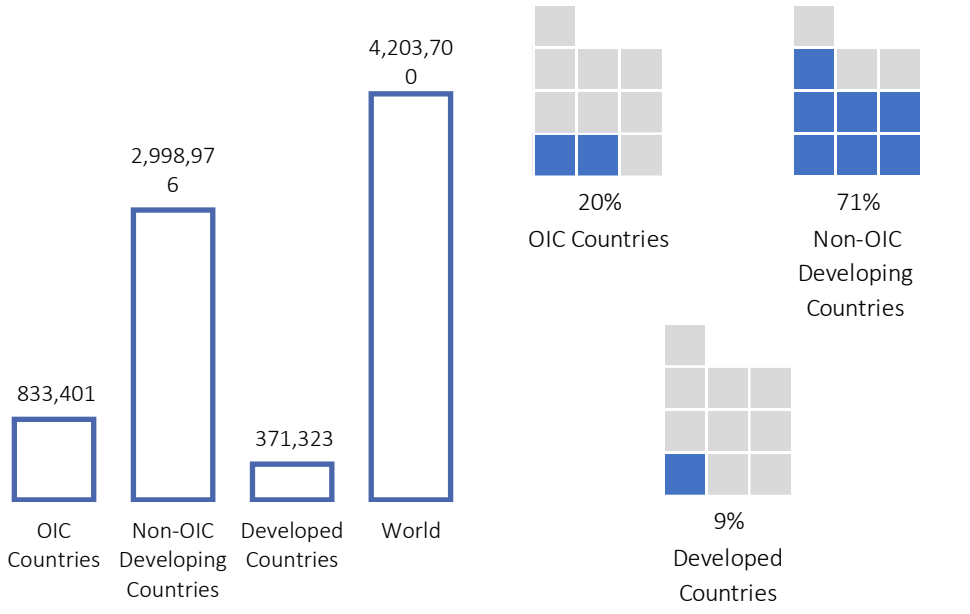
Figure 2.5: Exposure/ Exceedance to PM2.5



Source: EPI, 2018

Understanding the state of the environment and the quality of air indexes related to air pollution requires a thorough examination. Air pollution has a severe impact on people's health and on ecosystems. This makes air pollution one of the major challenges facing humanity today. According to a recent study conducted by the World Bank and the Institute for Health Metrics and Evaluation (IHME), approximately 5.5 million people die prematurely from air pollution every year (World Bank & Institute for Health Metrics and Evaluation, 2016, p. 22). Figure 2.6 also demonstrates that more than 4.2 million of the deaths in 2016 was attributable to ambient air pollution. One out of the five ambient air pollution attributable deaths took place in the OIC region.

Figure 2.6: Ambient Air Pollution Attributable Deaths (2016)



Source: WHO

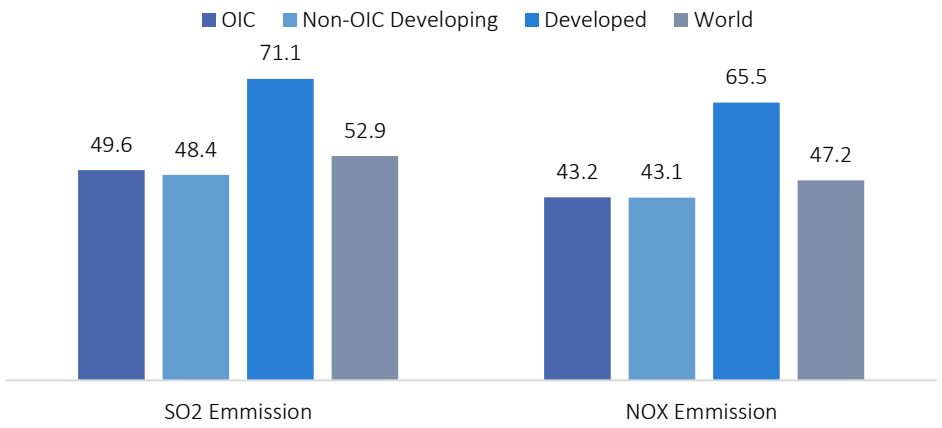
Air pollution can be classified into two categories. The first one is indoor air pollution that is caused by cooking and heating using solid fuels (i.e. wood, crop wastes, charcoal, coal and dung) in open fires and leaky stoves. Such inefficient cooking fuels and technologies produce high levels of household air pollution with a range of health-damaging pollutants, including small soot particles that penetrate deep into the lungs. In poorly ventilated dwellings, indoor smoke can be 100 times higher than acceptable levels for fine particles. Exposure is particularly high among women and young children, who spend the most time near the domestic hearth (WHO, 2016a). According to WHO, millions of people die prematurely from illness attributable to indoor air pollution; more than 50% of premature deaths related to pneumonia among children under 5 are caused by the particulate matter (soot) inhaled from indoor air pollution (WHO, 2016a). Outdoor air pollution can be classified as another aspect of air pollution. WHO estimates that 92% of the world population was living in places where

the WHO air quality guidelines levels were not met; outdoor air pollution in both cities and rural areas was estimated to cause millions of premature deaths worldwide each year; and big proportion of those deaths occurred in low- and middle-income countries (WHO, 2016b).

Just as the health impacts mentioned above, air pollution also has a severe impact on ecosystems. Ground-level ozone damages agricultural crops, forests and plants, reducing their growth rates. Air pollutants negatively affect ecosystem integrity and function. Both sulfur oxides (SOX) and nitrogen oxides (NOX) can cause acidification, which can degrade soil and water quality. NOX deposition can further cause eutrophication, the excessive enrichment of nutrients. The addition of reactive nitrogen to a system can further trigger a cascade of ecological effects that reduce plant biodiversity. As a result, these pollutants are very harmful to both natural vegetation and agricultural crops. Acidification and eutrophication driven by atmospheric pollutants can be difficult or impossible to reverse; persisting long after emission reduction policies are implemented. It is therefore imperative, especially in industrializing nations, to reduce emissions of long-range air pollutants to protect the health of global ecosystems (EPI, 2018).

Air pollutants emission in OIC countries is displayed in Figure (2.7). As implemented in Air Quality index, the EPI employed the distance-to-target technique for SO2 and NOX emissions indexes situating each country relative to targets for worst (score of 0) and best (score of 100) performances. Although the average scores of OIC countries, in both indicators, are higher than the Non-OIC developing countries average, they lag behind the global average and that in developed countries. SO2 and NOX emission levels are also alarming in some OIC country groups, particularly East Asia & Pacific and Middle East and North Africa region.

Figure 2.7: SO2 and NOX Emission



Source: EPI, 2018

Many OIC countries have addressed the negative effects of SOX and NOX by defining critical loads or levels of deposition that, when exceeded, can harm ecosystems. To protect their environments, policymakers have developed regulations to limit atmospheric deposition

levels (Burns et al., 2016, p. 3). Yet, more comprehensive policy objectives are necessary to establish accurate critical loads for ecosystems in the OIC region. To tackle knowledge gaps in addressing the effects of air pollution, a variety of research and monitoring networks needs to emerge in the OIC region.

At the global level, a new approach should be developed and implemented. As, there is no specific Sustainable Development Goal (SDG) for air pollution, although the problem is mentioned in two targets under SDG3 (Good Health and Well-Being) and SDG11 (Sustainable Cities and Communities). The impacts of air pollution on ecosystems are also related to Goal 7 (Affordable and Clean Energy), Goal 14 (Life below Water) and Goal 15 (Life on Land). On the other hand, while there are a number of regional and bilateral agreements to control SOX and NOX emissions, a comprehensive international agreement needs to be created to control global SOX emissions and regulate human inputs of reactive nitrogen into the atmosphere.

2.2. Land

The soils, landforms and vegetation in OIC countries have co-evolved over millions of years. Their health and condition are inextricably linked. Most importantly, their health and condition fundamentally support the way of life, wellbeing, and agriculture and industry in OIC countries. Soil type, depth and condition have an influence on the growth and condition of all types of vegetation. At the same time, changes to vegetation caused by fire, clearing, grazing and harvesting affect the condition of the soils.

Over the past decades, many agricultural practices have improved; reducing the negative impact on the environment, but the need for further improvement is growing. While improvements have been made, urban expansion continues, and desertification, soil erosion and low vegetation cover remain as significant concerns for many OIC countries. The mass destruction of trees—deforestation—continues, sacrificing the long-term benefits of standing trees for short-term gain, whereas forests and trees make vital contributions to both people and the planet, bolstering livelihoods, providing clean air and water, conserving biodiversity and responding to climate change (FAO, 2018).

2.2.1. Desertification

Desertification is one of the major environmental challenges and threats for sustainable development across the world. According to the UN Convention to Combat Desertification (UNCCD), desertification is a form of land degradation in arid, semi-arid and dry sub-humid areas. It is primarily triggered by the removal of vegetation from the land surface. A significant proportion of the vegetation loss is due to human activities (like cutting down trees, over grazing by farmed animals etc.) and climatic changes (like heat, droughts etc.). As a result, the soil loses important nutrient, thus making land infertile and unusable for farming.

Globally, around 25% of the total land, or 3.6 billion hectares, is decertified. Every year around 12 million hectares of productive land become infertile and unusable for farming due to

desertification and droughts. With over one billion people affected, desertification costs about US$42 billion in lost incomes (UNCCD, 2014). According to the UNCCD, 169 out of 194 members of the UNCDD are affected by the desertification. In case of business as usual scenario, an estimated 60 million people will be permanently displaced from the desertified areas to North Africa and Europe. By considering its magnitude and intensity, in 2007, the UN General Assembly has declared 2010-2020 as the United Nations Decade for Deserts and fight against Desertification.

As many parts of the world, the OIC region is also increasingly affected by desertification. The risk of desertification is most serious in OIC countries located in Sub-Saharan Africa and Asia, influenced by soil erosion, salinization, loss of soil organic carbon, loss of biodiversity and landslides. The increasing impact of climate change and human activities is present in these areas with rising levels of desertification compared to other areas in the world.

Human activities are the prominent cause of increasing desertification in the developing world including the OIC region. Overuse or inefficient use of water, e.g. through poor irrigation techniques, reduces the overall water supply in an area, potentially leading to vegetation loss and eventually desertification. Overgrazing and deforestation can also lead to desertification because both remove or damage the vegetation that protects the land and keeps it moist and fertile. Studies have found that land abandonment can be a factor making land more vulnerable to land degradation and desertification. However, lack of human activity can also bring benefits, such as soil recovery, increased biodiversity or active reforestation (Beneyas, 2007).

Climate change also plays an important role on desertification. As average temperatures rise, droughts and other severe weather events increase in frequency and intensity leading to land degradation (and thus desertification). When land is extremely dry, it is susceptible to erosion mainly during flash floods, when topsoil is quickly swept away, further degrading the land surface (ECA, 2018).

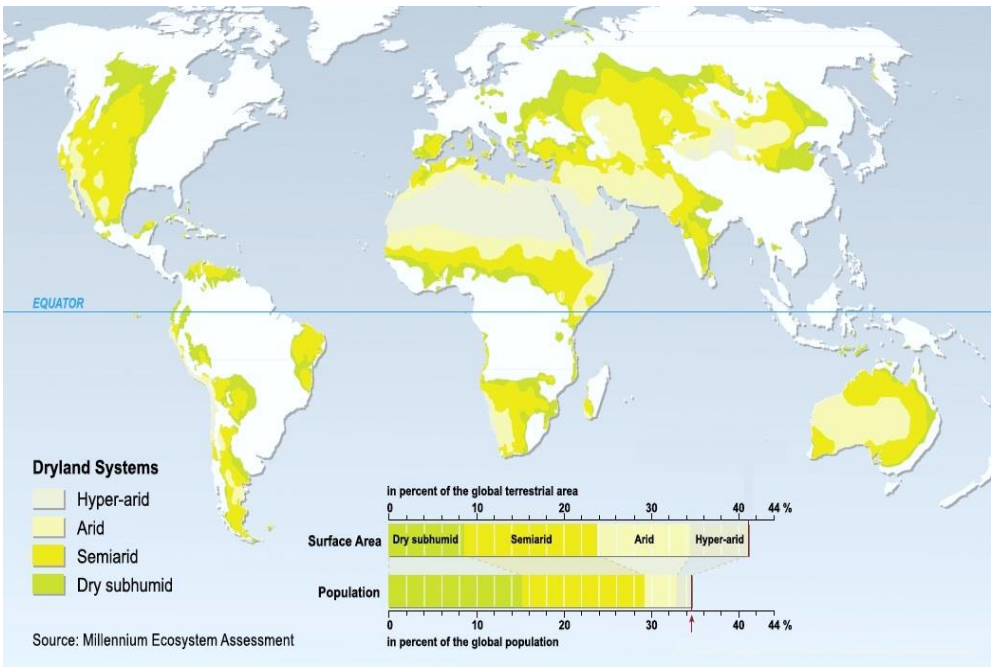
Desertification, in turn, also affects climate change. Soil degradation emits greenhouse gases into the atmosphere, risking further climate change and biodiversity loss. Biomass and soil carbon stocks are vulnerable to loss to the atmosphere as a result of projected increases in the intensity of storms, wildfires, land degradation and pest outbreaks (ECA, 2018). In addition, soil restoration gradually absorbs greenhouse gases from the atmosphere, allowing trees and vegetation to grow. These plants can then absorb more carbon. In areas where the soil is degraded, this process cannot function – and carbon is not absorbed from the atmosphere (ECA, 2018).

The level of desertification is particularly high in drylands covering over 40% of the earth's land surface, including 15% of Latin America, 66% of Africa, 40% of Asia and 24% of Europe. Dryland systems cover a substantial portion of land area in OIC countries (Figure 2.8). Desertification is a huge problem especially in arid and semi-arid areas where most of the member countries are facing severe pressures on land and water resources. These pressures

are expected to increase in the face of expanding populations and urbanization associated with economic development. Furthermore, climate change is likely to shift and expand the drylands. According to the findings of some climate model simulations for Africa, dryland area will shift and expand in several OIC member countries located in SSA region, including Benin, Burkina Faso, Mali, Nigeria and Senegal (Cervigni and Morris, 2016).

Among the OIC regions, the situation is particularly alarming in Sub Saharan Africa region with a significant proportion of hyper-arid and arid lands, which are mostly unsuitable for agricultural activities. Member countries in MENA region also have substantial coverage of hyper-arid and semi-arid areas. Some member countries are particularly vulnerable due to high prevalence of dryland systems. At least 90% of the surface area of Burkina Faso, Egypt, Iraq, Kazakhstan, and Turkmenistan is classified as drylands. As shown in figure 2.8, vulnerability to desertification is largely high and very high especially among the OIC countries located in Central Asia and Sub-Saharan Africa. The majority of member countries located in high vulnerability regions are facing multiple challenges related with climate variability, poor infrastructure, wide spread land degradation, and conflicts.

Figure 2.8: Dryland Systems



2.2.2. Soil Erosion

Erosion is the process by which soil is removed from a certain region due to the action of natural factors (wind, water, ice), of living organisms, and of gravity. Soil erosion by water and wind are among the most common land degradation processes. Water erosion occurs mainly when overland flow entrains soil particles detached by drop impact or runoff, often leading

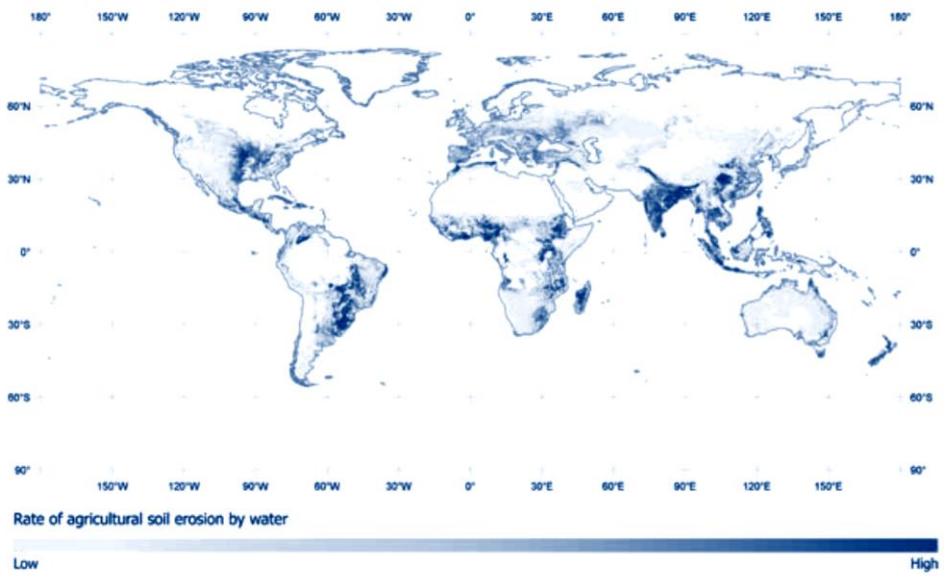
to clearly defined channels such as rills or gullies. Wind erosion occurs when dry, loose, bare soil is subjected to strong winds. Wind erosion is common in semi-arid areas where strong winds can easily mobilize soil particles, especially during dry spells (FAO, 2015).

Erosion is a natural process, but human activities can greatly influence its rate, especially through agriculture and deforestation. Undisturbed by man, soil is usually covered by a canopy of shrubs and trees, by dead and decaying leaves or by a thick mat of grass. The vegetation protects the soil when the rain falls or the wind blows. The leaves and branches of trees and the cushion of grass absorb the force of raindrops, and root systems of plants hold the soil together. Even in drought, the roots of native grasses, which extend several meters into the ground, help tie down the soil and keep it from blowing away (Kelley, 1990)

Combating soil erosion is very critical to protect the environmental media. It requires targeted investment to critical areas, comprehensive knowledge on erosion processes and conventional methods for measuring soil erosion. Thanks to the advances in policymaking, erosion rates have been significantly reduced in several areas of the world over the last decade. The best documented example is the reduction of erosion rates on cropland in the United States. Average water erosion rates on cropland were reduced from 10.8 to 7.4 tones (ha-1 yr-1) between 1982 and 2007, while wind erosion rates reduced from 8.9 to 6.2 tones (ha-1 yr-1) over the same time span (FAO, 2015).

Despite the success stories, rates of soil erosion are still very high in many developing regions including OIC countries. As shown in figure 2.9, soil erosion by water is problematic in some OIC countries, located in East Asia (EA) and Sub-Saharan Africa (SSA). Almost 2/3 of SSA is affected by erosion. Among OIC countries, Sierra Leone, Guinea, Senegal, Mauritania, Nigeria, Niger, Sudan and Somalia can be marked as the most serious erosion areas located in SSA. Among East Asian members of OIC, major threats of soil erosion by water are found in the hilly and mountainous landscapes of Indonesia. Natural conditions, anthropogenic influences on land cover and intensive land use make the steep and densely populated islands of Java, Sumatra and Sulawesi the most threatened areas (FAO,2015).

Figure 2.9: Spatial variation of soil erosion by water



Source: Van Oost et al., 2007

* High rates (>ca. 20 t ha-1y-1) mainly occur on cropland in tropical areas. The map gives an indication of current erosion rates and does not assess the degradation status of the soils.

Figure 2.10 shows the location of active and fixed aeolian deposits to draw a picture of the effects of wind erosion at the regional and global scales. According to the map, in OIC region wind erosion is concentrated mainly in OIC MENA and ECA regions.

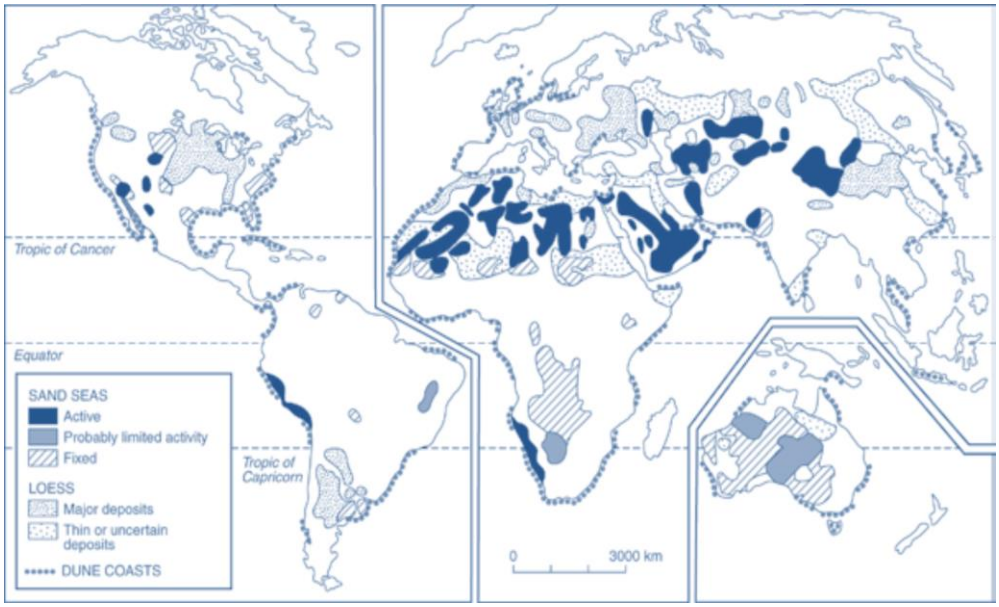
In MENA region, the resulting wind erosion is the most common environmental problem and accounts for approximately 60 percent (135 million ha) of soil degradation (FAO, 2015). Countries differ in the extent they are affected, with Saudi Arabia, the most affected (Table 2.1). Wind erosion has resulted in detrimental effects on land quality by removing the fertile top soils. In addition, the accumulation of eroded materials in irrigation canals, agricultural fields (sand encroachment) and water harvesting points affects the cropped areas in the region severely (FAO, 2015).

Table 2.1: Soil Degradation caused by wind erosion in the MENA (1000ha)

Country	Area	Country	Area	Country	Area
Algeria	12,000	Kuwait	300	Saudi.Arabia	50,000
Egypt	1,400	Libya	24,000	Sudan	71,000
Iran	20,000	Morocco	600	Tunisia	4,000
Iraq	3,000	Oman	4,000	UAE	1,100
Jordan	3,000	Qatar	200	Yemen	6,000

Source: Abahussain et. all. (2002)

Figure 2.10: Location of Active and Fixed Aeolian Deposit



Source: Thomas and Wiggs, 2008

2.2.3. Vegetation cover

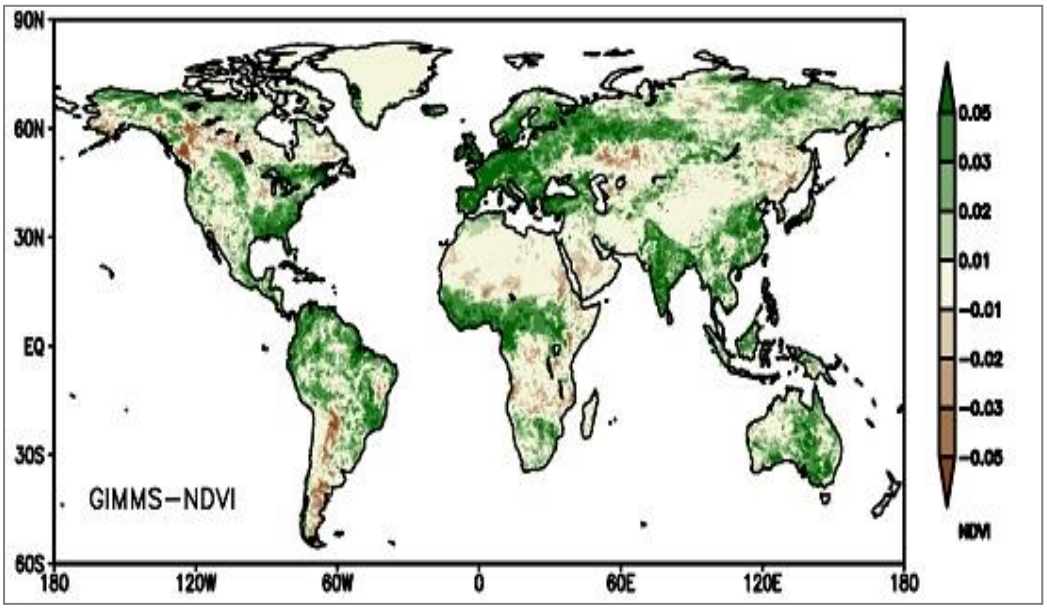
Vegetation is one of the key components of our ecosystem. It reduces soil erosion, generates soil organic carbon and helps maximize the water-holding; therefore, it restores the landscape and re-green the ecosystem. As mentioned earlier, desertification is primarily caused by loss of vegetation. Therefore, the vegetation cover is an important indicator to analyze the desertification vulnerability of a country/region. Normalized Difference Vegetation Index (NDVI) is used in remote sensing measurement to determine the density of green on a patch of land. The following figure shows the spatial distribution of the NDVI trends for the period of 1982–2012 (Figure 2.11). According to the results, around 67% of the global land area has positive NDVI values for this period (Rafique et al., 2016).

The regions with greatest increase in NDVI are predominantly located in the Northern Hemisphere (e.g., Western Europe, India, China and South Sahel region), followed by those in the Southern Hemisphere (e.g., Amazonian region and Eastern Australia). Despite these general increasing trends, some regions of Northern Hemisphere also showed significant decrease in NDVI such as northern Sahel region, Boreal region of North America, Northern China. The major decrease in the Southern Hemisphere was found in South America (e.g., Argentina, and Chile).

Among the OIC member countries, the Sahel region is facing a kind of vicious cycle generated from both human and natural factors. The occurrence of droughts in the Sahel has been catastrophic causing reduced productivity, leading to low vegetation cover that increased albedo, reducing water recycling and monsoon circulation, and soil erosion (Millennium

Ecosystem Assessment, 2005). On the other hand, human activities such as unsustainable land use practices, including overstocking, overgrazing, and deep ploughing and mono-cropping also led to a loss of vegetation and desertification.

Figure 2.11: NDVI Trends for the Period of 1982–2012



Source: Rafique et.al, 2016

2.2.4. Deforestation

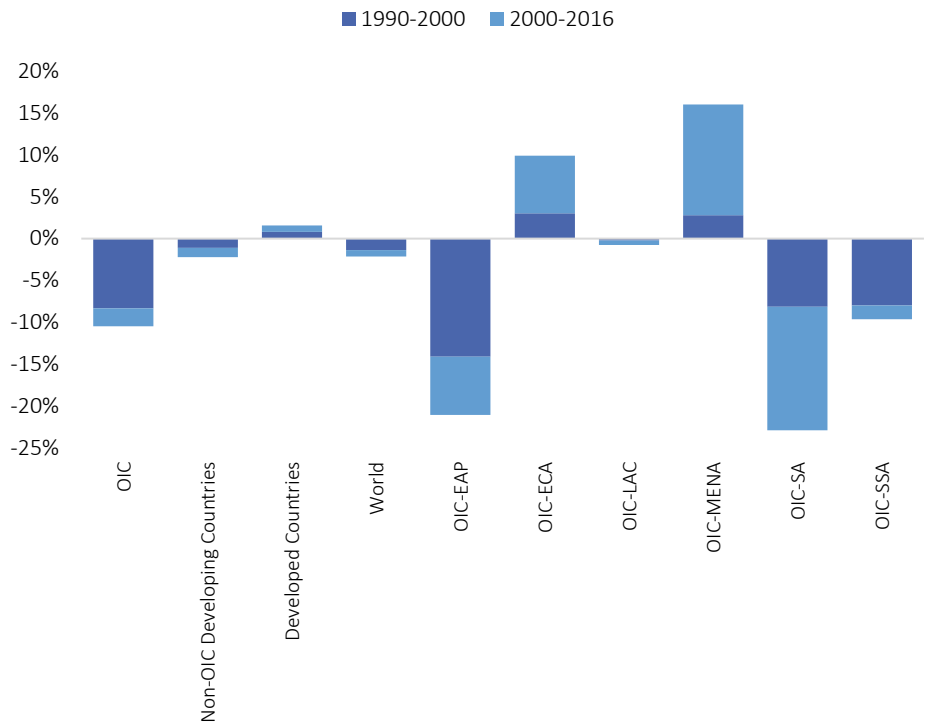
Technically, deforestation means the conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10% threshold (FAO, 2015). Deforestation is one of the main drivers of land degradation. Caused mainly by the human activities, deforestation has been happening throughout human history with substantial increase during the last couple of decades. Major deforestation activities are related to agriculture, fuel use (firewood, charcoal), timber harvesting, growing human populations, war, and animal husbandry. Forest area can be increased through afforestation or by the natural or manmade expansion of forests.

Forests still cover about 30 percent of the world's land area, but they are disappearing at an alarming rate. Between 1990 and 2016, the world lost 1.3 million square kilometers of forest, according to the World Bank. Since humans started cutting down forests, 46 percent of trees have been felled, according to a 2015 study in the journal Nature. About 17 percent of the Amazonian rainforest has been destroyed over the past 50 years, and losses recently have been on the rise (Nunez, 2019).

OIC member countries have also incurred significant losses in forest area since 1990. Between 1990 and 2016, OIC member countries witnessed significantly higher loss of forest area compared to other groups (Figure 2.12). During the same period, member countries in SA region reported the largest net loss of forests followed by EAP and SSA. Forest loss is driven mainly by the rapid urbanization and socio-economic transformation in those regions.

On the contrary, MENA and ECA regions reported forest gain of around 16% and 10%, respectively. Among the MENA countries, Morocco, Tunisia and Algeria reported substantial forest gains whereas; the forest area remained unchanged in 10 countries. In the ECA region, Turkey, Azerbaijan and Uzbekistan recorded substantial forest gains whereas Kyrgyzstan and Kazakhstan recorded high rates of deforestation. Among these countries, Turkey was the most successful with 21,954 sq km of forest area gained during the last 26 years attributed mainly to large-scale afforestation schemes and activities.

Figure 2.12: Forest Area Gain/Loss, 1990-2016

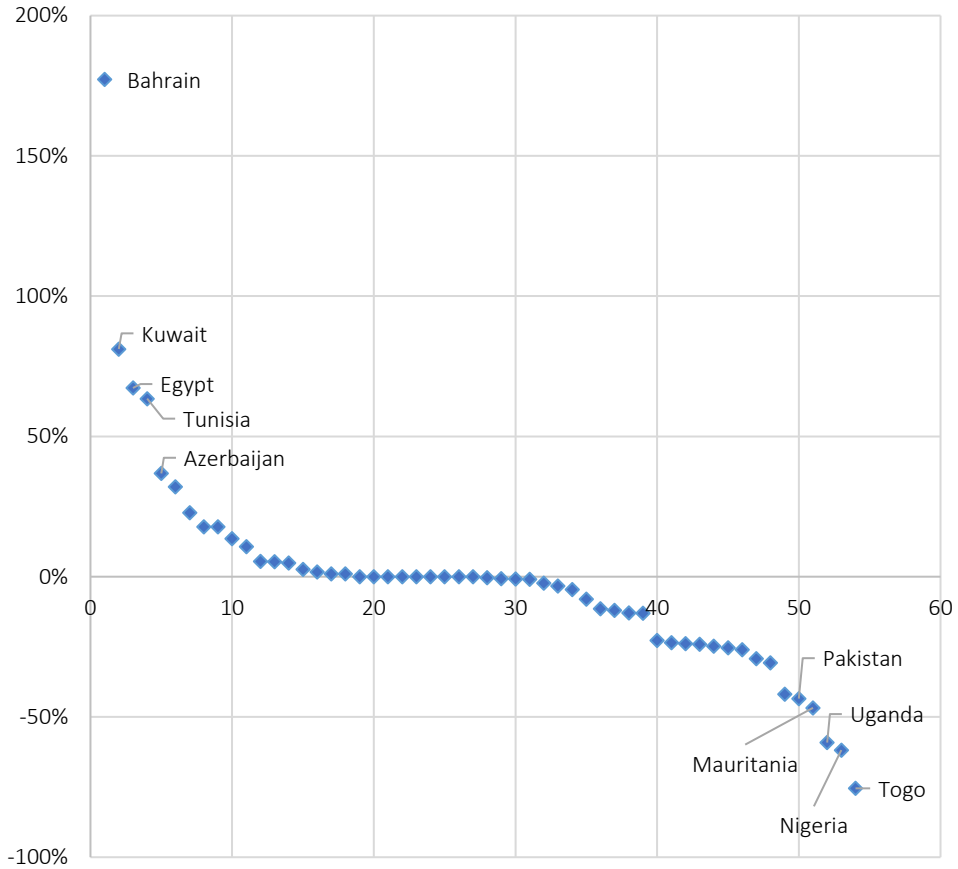


Source: World Bank, WDI Database, 2019

At the individual country level, since 1990, 26 OIC members recorded forest losses ranging from 1% in Suriname, Guyana and Malaysia to 76% in Togo (Figure 2.13). Among these countries, more than a quarter (25%) of forest area was lost in ten member countries namely: Togo, Nigeria, Uganda, Mauritania, Pakistan, Niger, Mali, Chad Benin and Comoros. Majority

of these countries are from the SSA region. On the opposite side of the scale, 19 member countries witnessed expansion in the forest area. Among these countries, a substantial gain of over 60% was recorded in four countries namely: Bahrain, Kuwait, Egypt and Tunisia.

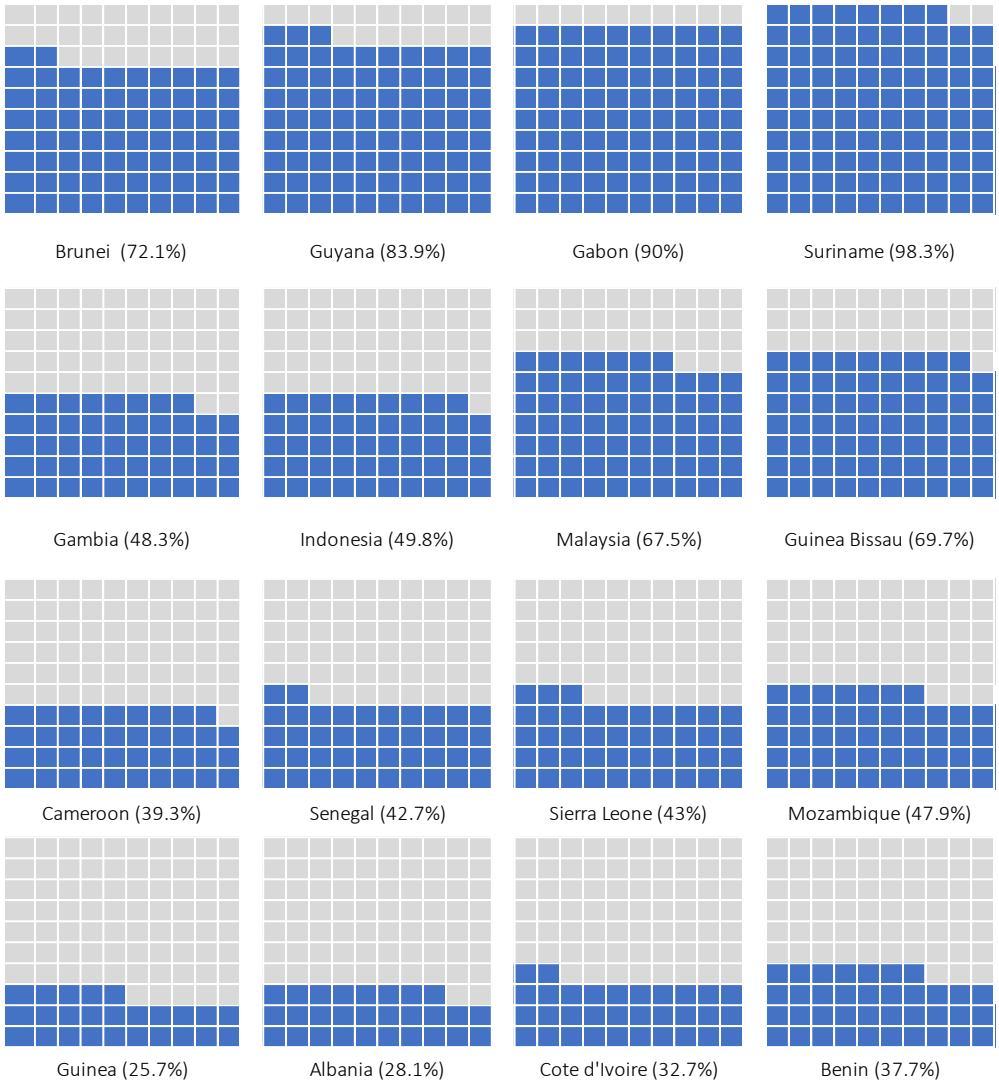
Figure 2.13: Growth of Forest Area (%of land area), 1990-2016



Source: World Bank, WDI Database, 2019

As of 2016, only 16 OIC member countries have forest covering more than a quarter (25%) of their land area (Figure 2.14). Among these countries, more than half of the total land area is covered by forest in 7 countries, namely Suriname, Gabon, Guyana, Brunei, Guinea-Bissau, Malaysia and Indonesia. These top 7 OIC countries are also characterized by low deforestation and are ranked among the top High Forest Cover Low Deforestation (HFLD) countries in the world. According to the definition of HFLD, a developing country with more than 50% forest cover and a deforestation rate below 0.22% per year is classified in this category. On the opposite side of the scale, less than a quarter (25%) of land area is covered by the forest in 40 OIC member countries for which there is available data.

Figure 2.14: OIC Countries with Most Forest Coverage (> 25% of land area), 2016



Source: World Bank, WDI Database, 2019

While the numbers on forest coverage indicate a grim picture in many OIC countries, there are reasons for hope. The OIC needs a more compressive policy framework to preserve the existing forest ecosystems and restore lost tree cover. Actions on forests, agriculture, food, land use, rural and national development also need to be synchronized in the OIC region. There is also a need to raise awareness about the important benefits of forests and trees, and their potential role in contributing to the sustainable development of OIC countries.

2.3. Water

With over 70% of Earth's surface covered by water, the assumption would be that water is in abundance. However, 97.5% of all water on earth is salt water, leaving only 2.5% as fresh water – water that can theoretically be used for drinking, hygiene, agriculture and industry. Most of the remaining fresh water (nearly 70%) is frozen in glaciers and ice caps in Antarctica and Greenland, thus rendering it inaccessible by humans. This shows that water is a precious resource that should be wisely used and properly protected. Given the insecurities related to water resources shown in figure 2.15, the subjects of fresh water availability, use, and pollution are of high importance and are the subject of discussion in the subsequent sections.

Figure 2.15: Seven Aspects of Water Insecurity

	**Water shortage** leading to temporary or long term impacts on supply. 2/3rds of the world's population will be living in water-stressed countries by 2025.
	**Poor water quality** for human consumption and within the wider environment. More than 500,000 children under five died of diarrhea in 2013 due to water contamination by human and livestock waste, fertilizers and pesticides, parmaceuticals and heavy metals.
	**Rising number of extreme climatic events** including floods and droughts. Droughts which are often associated with migration and conflicts.
	**Disruption of natural flows** in a growing number of rivers and inland bodies. 1/5th of the planet's remaining free flowing rivers will be reduced due to hydropower.
	**Land degradation** as a result of altered hydrology and poor irrigation management. 20% of irrigated land area suffered from crop yield reductions due to salinity.
	**Climate change impacts** due to release of greenhouse gases from water systems and wetlands could create snowball effect.
	**Loss of biodiversity** and water related ecosystem services. One in three freshwater fish species is threatened with extinction.

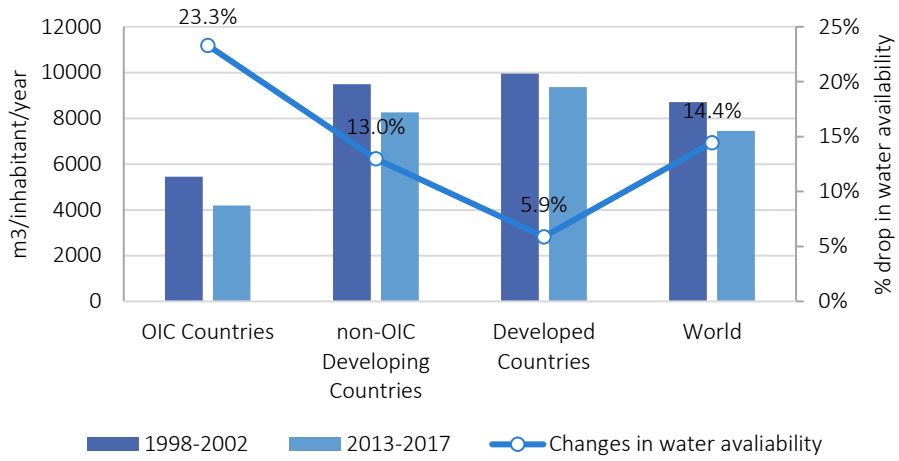
Source: Adapted from UNCCD Global Land Outlook 2017

2.3.1. Fresh Water Availability and Use

Factors of natural and human nature affect the annual availability of fresh water. Moreover, water volumes and their distribution over time and space are determined by climate and geomorphological conditions. The availability of water is significantly lower than the water flowing into the system, and it fluctuates from time to time.

Renewable water resources are regenerated by precipitation. To measure changes in fresh water availability, this report uses the indicator Total Renewable Water Resources (TRWR) per capita (Figure 2.16).

Figure 2.16: Total Renewable Water Resources (TRWR) per capita

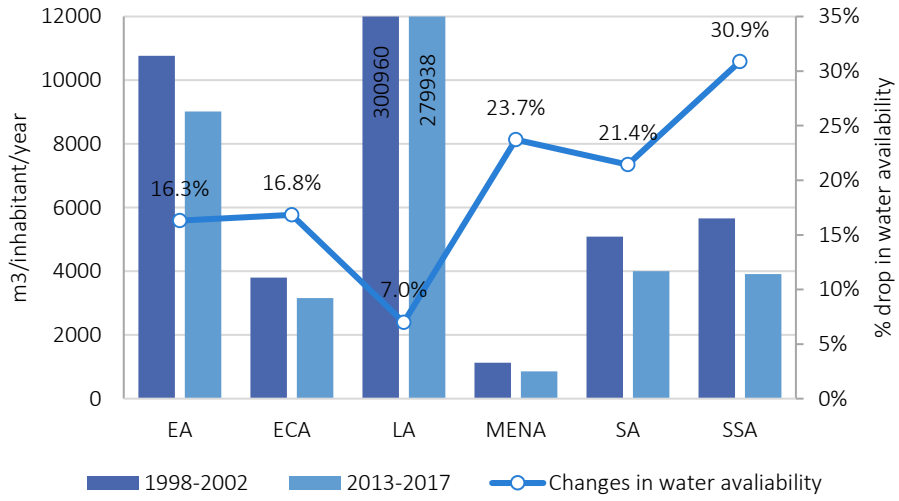


Source: SESRIC Staff Calculations based on FAO AQUASTAT Online Database

This indicator provides the long-term average water availability for a country in cubic kilometers (billion m^3 per capita) of precipitation, recharged ground water, and surface inflows from surrounding countries. As the figure shows, OIC countries face limited water availability; moreover, over the past decade and a half, OIC countries experienced the sharpest drop in water availability per capita (a drop of 23.3%).

OIC countries have a large range of climates with high variability in rainfall. The result is that fresh water availability is unevenly distributed among the OIC regions as shown in Figure 2.17.

Figure 2.17: Total Renewable Water Resources (TRWR) per capita in OIC regions



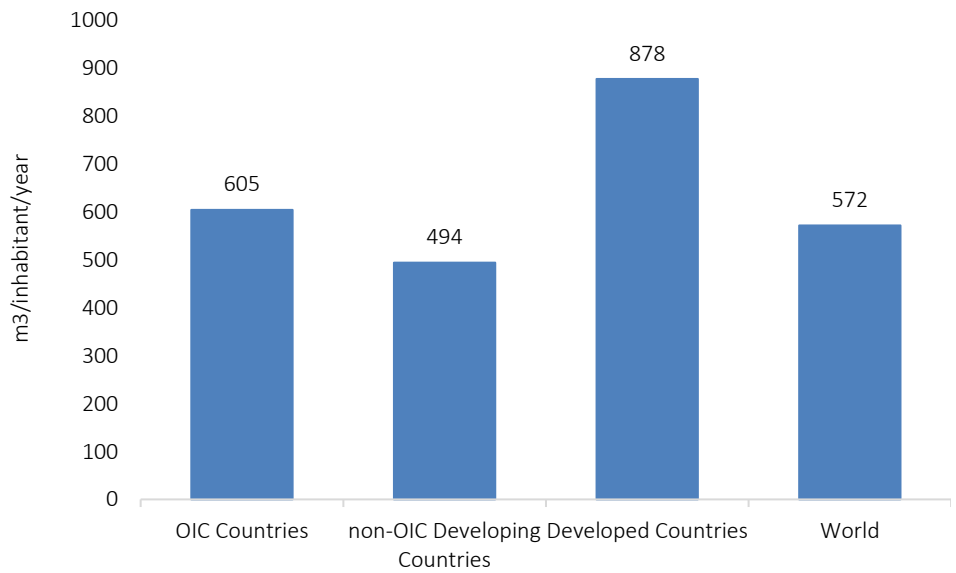
Source: SESRIC Staff Calculations based on FAO AQUASTAT Online Database. Figure drawn not to scale

OIC regions in Latin America and in East Asia have high precipitation, while the Middle East and North Africa region has a very arid climate with closed hydrologic systems. Thus, water availability per capita is the highest in the OIC regions of Latin America and the lowest in the Middle East and North Africa. The figure also shows the largest drop in water availability per capita, in the last decade and a half, has occurred in the OIC regions of Sub-Saharan Africa and the Middle East and North Africa.

The limited water availability per capita and the decrease of water availability has caused many OIC countries to come face with the challenge of water scarcity. Almost half of OIC countries face some level of water scarcity. Absolute water scarcity is observed in 14 OIC countries, namely Kuwait, United Arab Emirates, Qatar, Saudi Arabia, Yemen, Maldives, Bahrain, Libya, Jordan, Palestine, Algeria, Djibouti, Oman and Tunisia. Chronic water shortages are observed in six OIC countries, namely Egypt, Syria, Burkina Faso, Morocco, Lebanon and Sudan. Finally, six OIC countries experience regular water stress, namely Pakistan, Somalia, Uganda, Comoros, Nigeria and Uzbekistan (SESRIC, 2018).

Total water withdrawal reflects the annual quantity of water withdrawn for agricultural, industrial and municipal purposes. Figure 2.18 shows annual total water withdrawal per capita in COIC countries in comparison with other country groups.

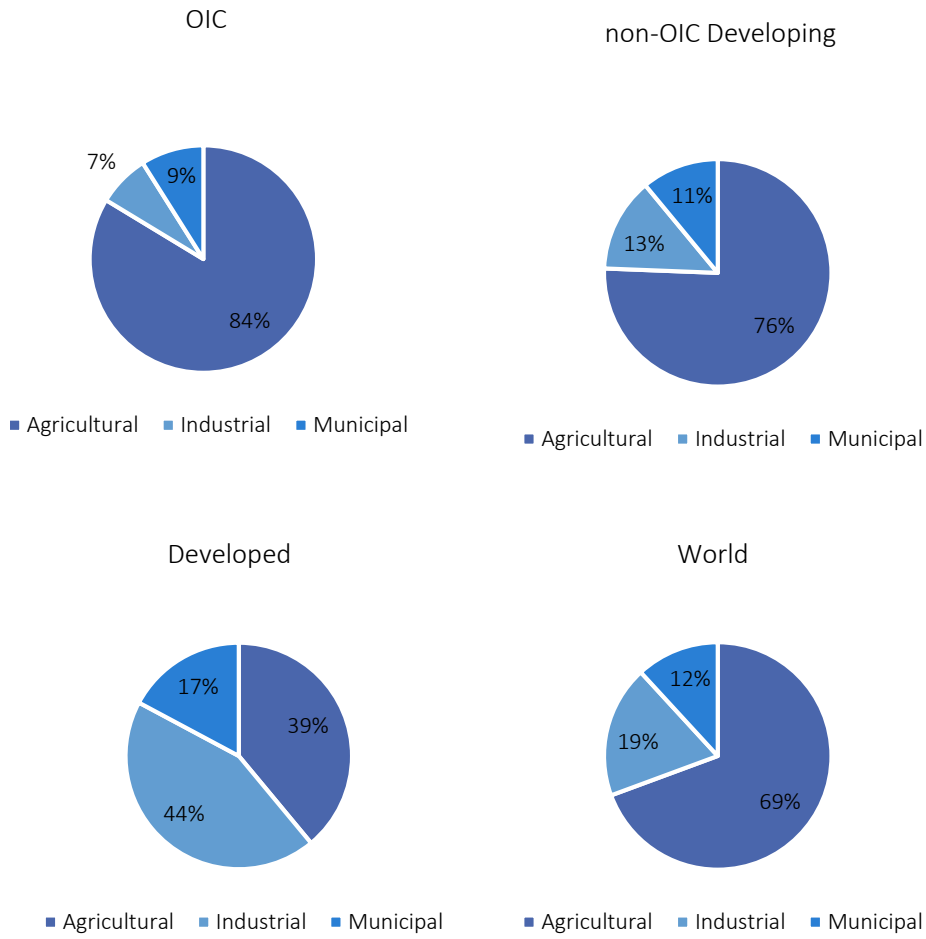
Figure 2.18: Annual Total Water Withdrawal per capita, latest available data since 2000



Source: SESRIC Staff Calculations based on FAO AQUASTAT Online Database

The figure reveals that OIC countries are using more water resources than countries with comparable country levels; thus, pointing to the need for OIC countries to use their water resources more efficiently and more productively. This is particularly true for the agricultural sector where most of the water is used in OIC countries (Figure 2.19).

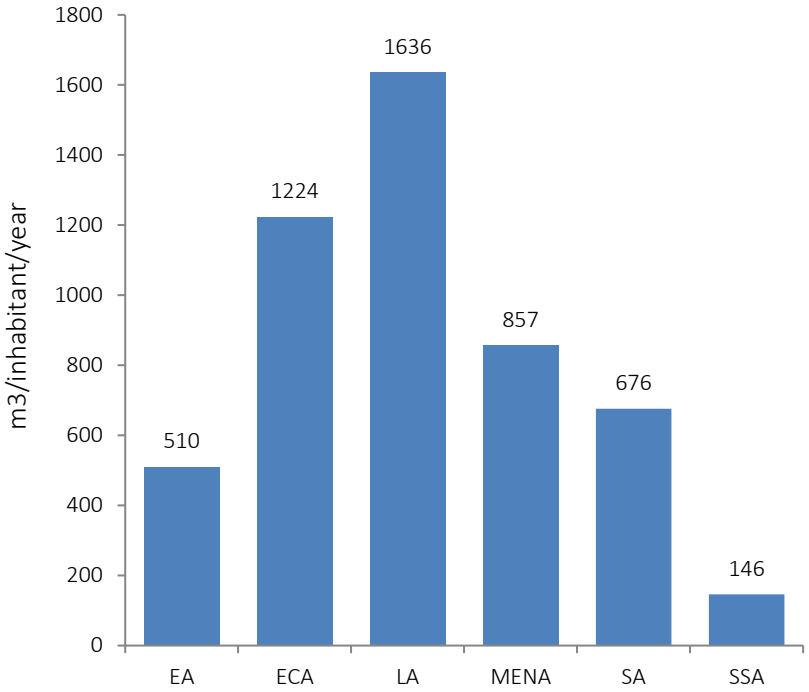
Figure 2.19: Water Withdrawal by Sector, latest available data since 2000



Source: SESRIC Staff Calculations based on FAO AQUASTAT Online Database

OIC regions show large variances in their annual total water withdrawal per capita (Figure 2.20) and this is a reflection of many factors such as income level, economic development level, availability of water resources and consumption behaviors.

Figure 2.20: Annual Total Water Withdrawal per capita in OIC Regions, latest available data since 2000

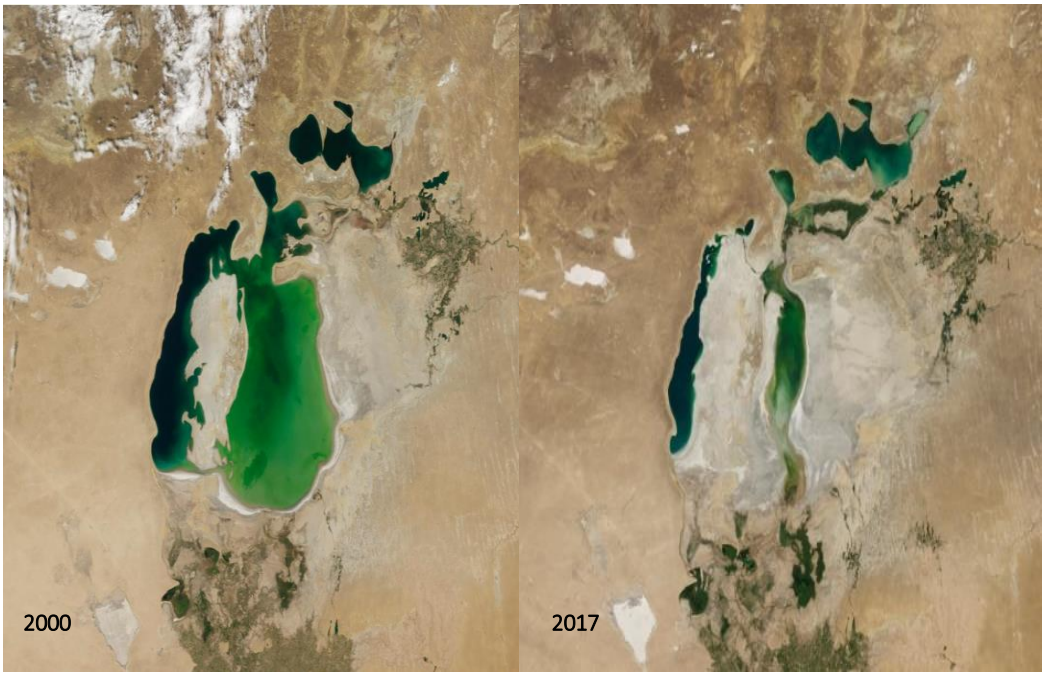


Source: SESRIC Staff Calculations based on FAO AQUASTAT Online Database

Excessive water use has put tremendous pressure on water resources in many OIC countries. Case in point is Saudi Arabia. Data from NASA's Gravity Recovery and Climate Experiment reveals that Saudi Arabia has experienced downward trends in fresh water reflecting agricultural pressures rising from explosive growth of irrigated farmland. Saudi Arabia lost 6.1 gigatons per year of stored groundwater in the period from 2002 to 2016 (NASA Earth Observatory, n.d.).

Another important region in the OIC with dramatic decline of fresh water is the Caspian Sea, where overuse of water resources results in a loss of 23.7 gigatons of fresh water annually (Rodell M. et al, 2018). This depletion is a reminder of the well-known fate of the disappearing Aral Sea in the same region (Figure 2.21). Without better management of water resources, the situation in many OIC countries is likely to worsen in the future.

Figure 2.21: Shrinking Aral Sea



Source: NASA

2.3.2. Marine Resources

The global systems that make the earth habitable for humans is shaped by the oceans and seas, which control rainfall, fresh water, food, agriculture, weather, climate, coastlines where large numbers of people live, and even the air that we breathe. For this reason, marine resources have a vital role in human social and economic development and well-being (see Box 2.1).

Box 2.1: Marine Resources Facts & Figures

- Oceans cover three quarters of the Earth's surface, contain 97 per cent of the Earth's water, and represent 99 per cent of the living space on the planet by volume.
- Over three billion people depend on marine and coastal biodiversity for their livelihoods.
- Globally, the market value of marine and coastal resources and industries is estimated at $3 trillion per year or about 5 per cent of global GDP.
- Oceans contain nearly 200,000 identified species, but actual numbers may lie in the millions.

- Oceans absorb about 30 per cent of carbon dioxide produced by humans, buffering the impacts of global warming.
- Oceans serve as the world's largest source of protein, with more than 3 billion people depending on the oceans as their primary source of protein
- Marine fisheries directly or indirectly employ over 200 million people.
- Subsidies for fishing are contributing to the rapid depletion of many fish species and are preventing efforts to save and restore global fisheries and related jobs, causing ocean fisheries to generate US$50 billion less per year than they could.
- Open Ocean sites show current levels of acidity have increased by 26 per cent since the start of the Industrial Revolution.
- Coastal waters are deteriorating due to pollution and eutrophication. Without concerted efforts, coastal eutrophication is expected to increase in 20 percent of large marine ecosystems by 2050.

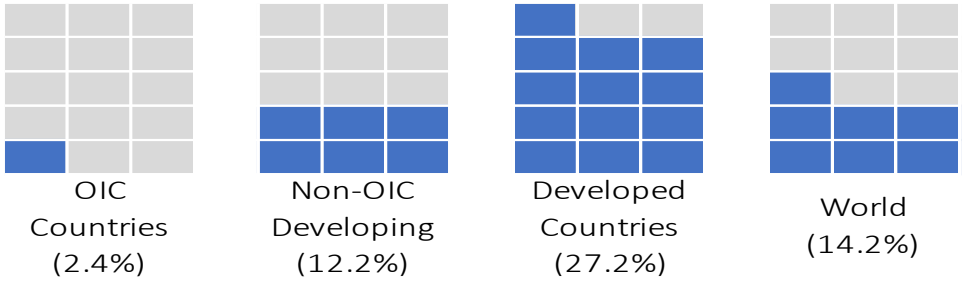
Source: UN

For a suitable future, marine resources must be managed and protected properly. Unfortunately, at the current rates there is serious deterioration to these resources. One of the major culprits to this deterioration is pollution. Marine pollution occurs when harmful elements enter the seas and oceans. Many of these harmful elements are a result of human activity such as toxic chemical; industrial, agricultural and residential waste; discarded plastic; radioactivity and oil spells. These pollutants change the physical, chemical, and biological characteristics of the oceans and seas; thus, endangering marine lives and ecosystems and with it the wellbeing of humans.

In addition to pollution, over fishing poses a serious threat to marine resources. For these reasons it is no surprise that conserving and suitably using the oceans, seas and marine resources has been included in the 2030 Agenda for Sustainable Development under SDG 14.

To achieve SDG 14, it is highly important for OIC countries to safeguard marine sites in order to ensure sustainable long-term use of their precious natural resources. Unfortunately, the coverage of protected areas in relation to marine areas in OIC countries is very limited, a mere 2.4%, which compares very poorly with other country group (Figure 2.22).

Figure 2.22: Coverage of Protected Areas in Relation to Marine Area, 2017

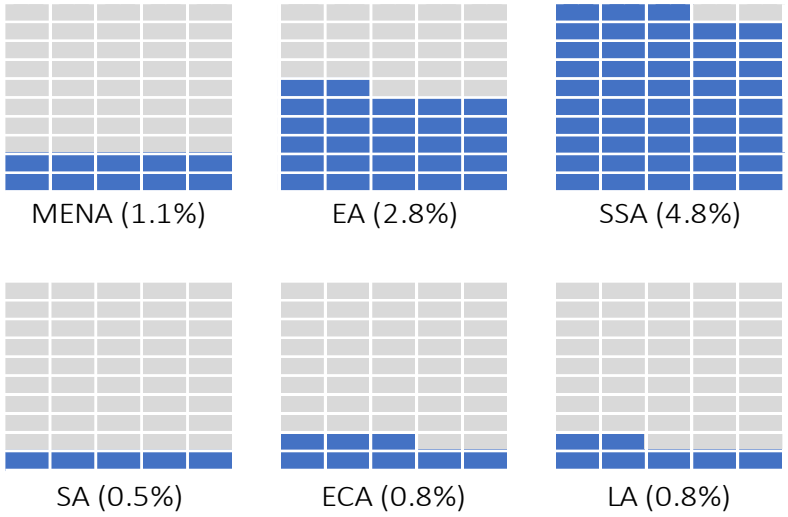


Source: UN Global SDG Database

Note: Data is exclusive of economic zones

Protection of marine areas varies in OIC regions from a high 4.8% in OIC countries located in Sub-Saharan Africa to a low of 0.5% in OIC countries located in South Asia (Figure 2.23). However, even the best performing OIC region seriously lag behind the world average and the average for non-OIC developing countries.

Figure 2.23: Coverage of Protected Areas in Relation to Marine Area in OIC Regions, 2017



Source : UN Global SDG Database

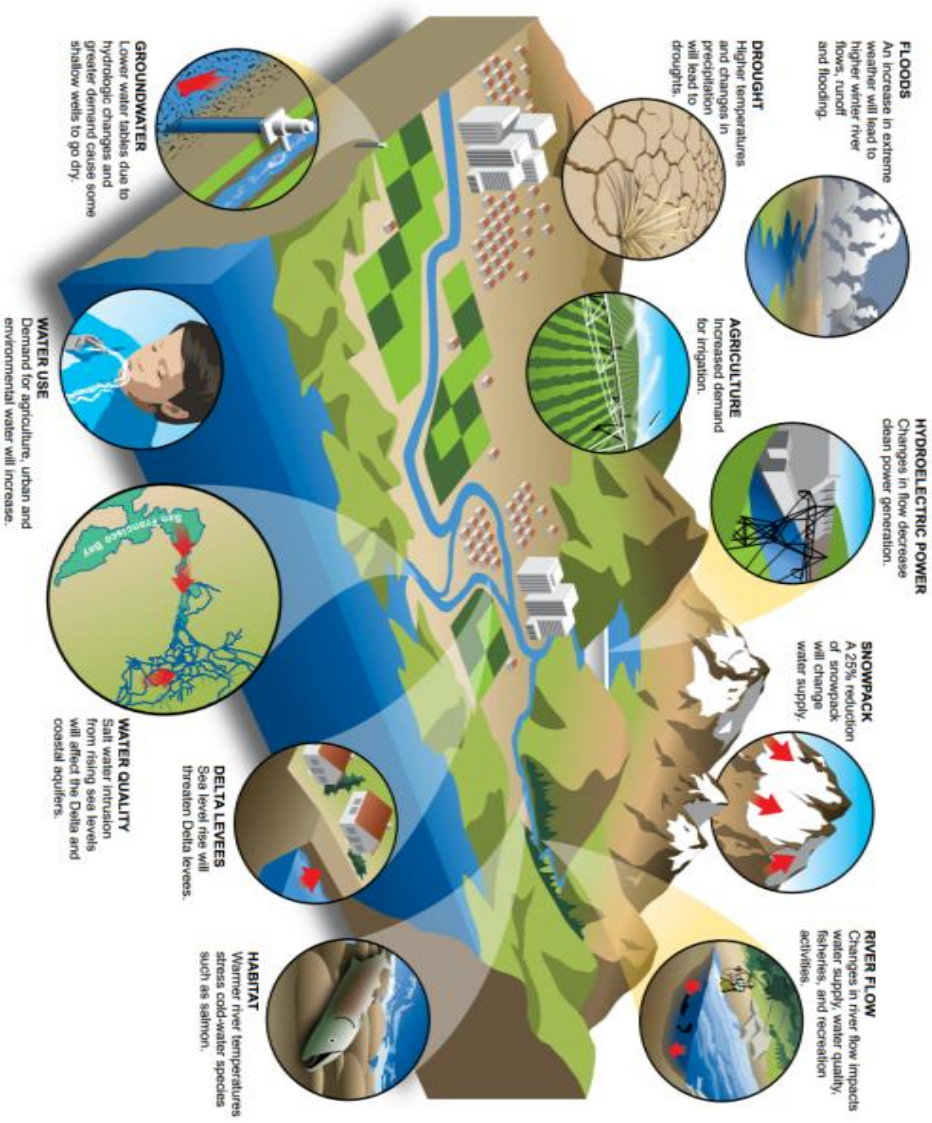
Note: Data is exclusive of economic zones

2.3.3. Climate Change Impacts on Water

The top 20 warmest years on record have come since 1995. The year 2017, according to the NOAA State of the Climate in 2017 report, was the third hottest year since the mid-1800s, and the hottest year ever without El Niño warming the world's waters (American Meteorological Society, 2018). The globe getting warmer has a direct effect on water (Figure 2.24). This is due to the delicate balance between climate and water. Changes to the climate disrupt the water cycle. Warmer temperatures increase the rate of evaporation of water into the atmosphere, which in effect increases the ability of the atmosphere to "hold" water. Increased evaporation may dry out some areas and fall as excess precipitation on other areas. In addition, warming winter temperatures

cause more precipitation to fall as rain rather than snow. Furthermore, rising temperatures are melting the snow earlier in the year. This alters the timing of streamflow in rivers that have their sources in mountainous areas (USGCRP, 2014).

Figure 2.24: Climate Change Impacts on Water

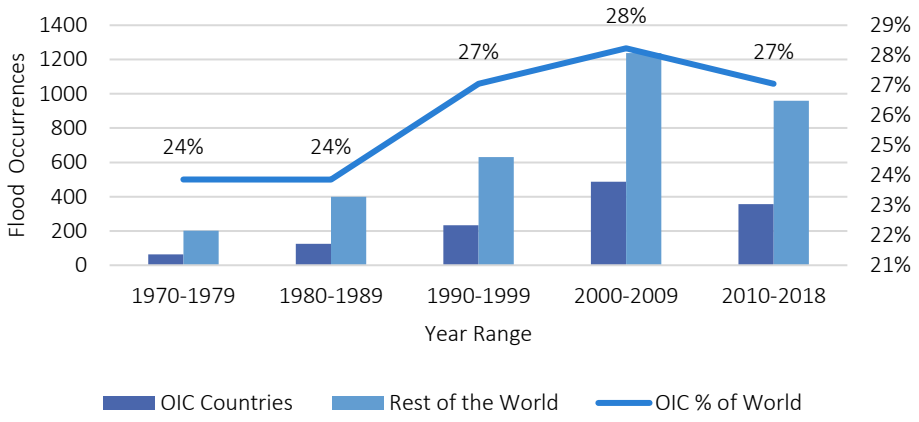


Source: American Meteorological Society (2018)

Changes in the water cycle which have led to excess water in some areas and shortages in others have had devastating effects on the world and on OIC countries in the form of floods and droughts.

Figure 2.25 shows flood trends in OIC countries and in the rest of the world. As the figure revels, the number of floods in the world and in the OIC is on the rise. However, the rate of flood occurrences in the OIC region is increasing at a faster rate than in the rest of the world. In the time-period 1970-1979, OIC countries share in the total world flood occurrences was 24%. This share has since increased to 27% in the time-period 2010-2018.

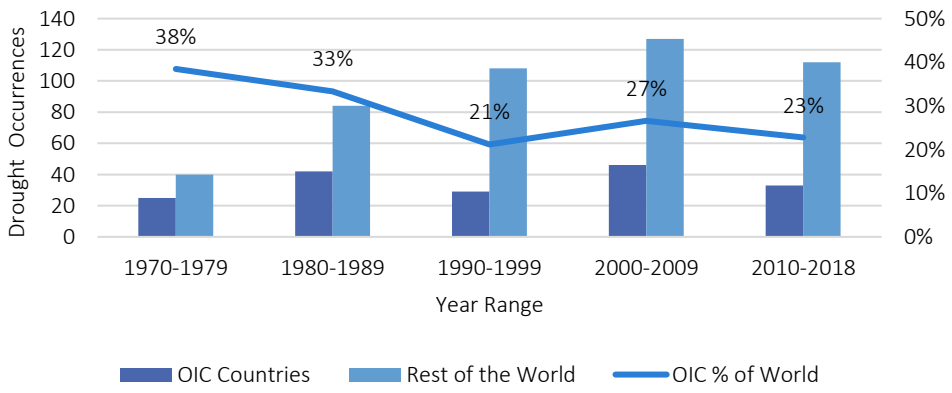
Figure 2.25: Flood Trend (1970-2018)



Source: EM-DAT, The International Disasters Database

When it comes to the total number of occurrences, drought trends over the last four decades show similarities to flood trends as shown in Figure 2.26. There is an increasing trend of drought occurrence since 1970 in the world and in the OIC countries. However, the rate of increase of droughts has increased more sharply in the rest of the world than in the OIC countries. Whereas, the share of OIC countries in droughts was 38% in the period 1970-1979. This share has dropped significantly to 23% in the period 2010-2018.

Figure 2.26: Drought Trend (1970-2018)



Source: EM-DAT, The International Disasters Database

2.4. Biodiversity & Ecosystems

Biological diversity forms the foundation of a resilient and sustainable planet. Habitat conservation is important not only for preserving key components of biological diversity, but for maintaining the associated ecosystem services which provide innumerable benefits and protections to humans, such as water provisioning, carbon sequestration, and flood prevention (United Nations Environment Programme World Conservation Monitoring Centre & International Union for Conservation of Nature, 2016). Diversity of species and habitats emerge as critical factors in enabling resilience and enhanced recovery to environmental disturbance. Ecosystems and habitats serve important roles in mediating the effects of weather events and climate-related stressors and are thus important components of climate mitigation strategy (McLeod, Salm, Green, & Almany, 2009).

The social dimension of biodiversity and ecosystem is also critical. Food security, human health, and cultural values are often deeply rooted in the natural environment. Careful analysis also suggests that biodiversity will be integral to many economic activities. Ensuring the provisioning of natural resources and the ecosystem services they support can help sustain or bolster economies (Secretariat of the Convention on Biological Diversity, 2016).

In contrast, the continuing loss of biodiversity and threats to ecosystems on a global scale represents a direct threat life. Without a global environment that is healthy and capable of supporting a diversity of life, no human population can exist." It is therefore not surprising that the protection, restoration and promotion of the sustainable use of terrestrial ecosystems and the fight against biodiversity loss have found their place in the 2030 Agenda for Sustainable Development under SDG 15.

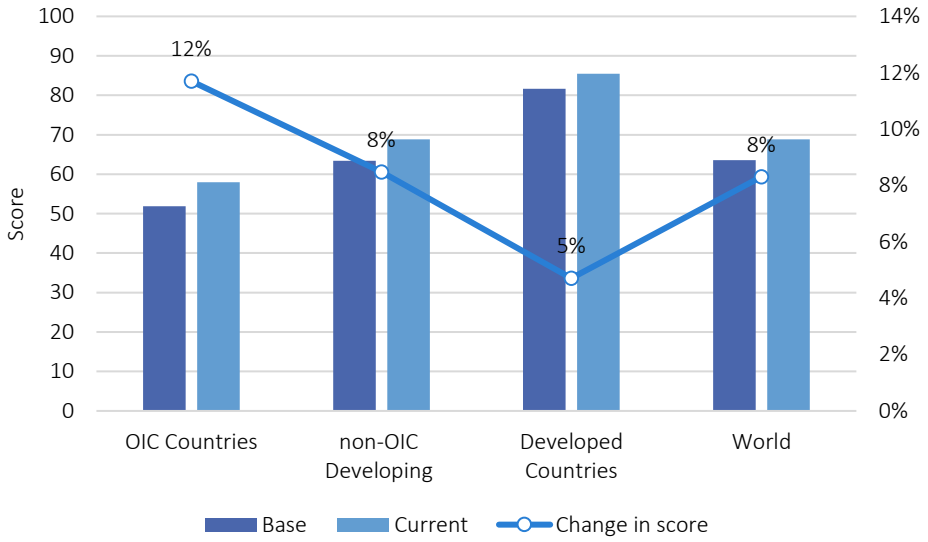
2.4.1. Biodiversity and Habitat

To evaluate the current state of biodiversity and habitat in OIC countries, this report uses the issue category of "Biodiversity and Habitat" of the 2018 Environmental Performance Index (EPI). The Biodiversity & Habitat issue category seeks to evaluate a country's performance in biodiversity and habitat conservation and protection. The EPI issue category of "Biodiversity and Habitat" provides a gauge at a national scale of how close countries are to establish environmental policy goals.

For scoring, the EPI uses the distance-to-target technique, which places each country in relation to the worst and best performance targets –corresponding to scores of 0 and 100, respectively. In this section, the report presents score from the current and base years. The current year presents the most recent data as of 2018. Changes over time can be discerned by comparing these scores to a baseline score. The baseline uses data from 10 years prior to the most recent year.

Figure 2.27 shows OIC countries performance on the issue category of "Biodiversity and Habitat".

Figure 2.27: Biodiversity & Habitat Score, current and base years



Source: SESRIC Staff Calculations based on EPI 2018

The figure reveals three main insights:

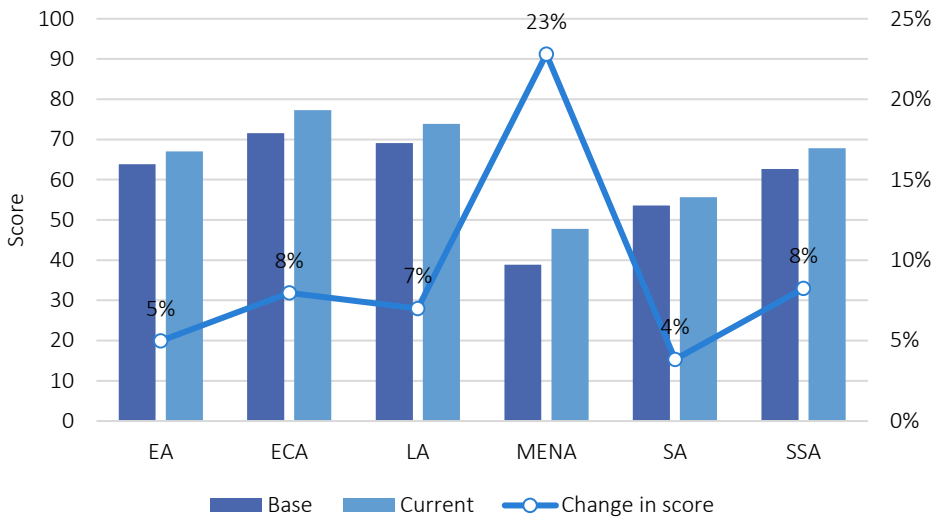
1- Over the last decade, the world has witnessed significant success in conserving and protecting biodiversity and habitats. This is reflected in an 8% increase in the world's score on the EPI issue category of "Biodiversity and Habitat";

2- The OIC countries current score (58) compares poorly with the world average and the average of other country groups; nonetheless,

3- OIC countries have recorded the largest improvement on the EPI issue category of "Biodiversity and Habitat" since the last decade with its average score increasing from 51.9 to 58 which corresponds to a 12% improvement.

OIC countries are a heterogeneous group with variances across geographies. The highest average score on the EPI issue category of "Biodiversity and Habitat" is witnessed in OIC countries located in Europe and Central Asia, a score of 77.3; while, the lowest score is observed in OIC countries located in the MENA region, a score of 47.8. A silver lining for the OIC countries located in the MENA region is that they are achieving the best improvement in their score over the past decade rising from 38.9 to 47.8, an increase of 23%.

Figure 2.28: Biodiversity & Habitat Score in OIC regions, current and base years



Source: SESRIC Staff Calculations based on EPI 2018

2.4.2. Threatened Species

Nature is declining globally at rates unprecedented in human history – and the rate of species extinctions is accelerating, with grave impacts on people around the world (IPES, 2019). Around 1 million animal and plant species are now threatened with extinction, many within decades, more than ever before in human history (See Box 2.2). The culprits are, in descending order: (1) changes in land and sea use; (2) direct exploitation of organisms; (3) climate change; (4) pollution and (5) invasive alien species (IPES, 2019).

Box 2.2 Threatened Species Facts & Figures

- **8 million**: total estimated number of animal and plant species on Earth (including 5.5 million insect species)
- **Tens to hundreds of times**: the extent to which the current rate of global species extinction is higher compared to average over the last 10 million years, and the rate is accelerating
- **Up to 1 million**: species threatened with extinction, many within decades
- **More than 500,000 (+/-9%)**: share of the world's estimated 5.9 million terrestrial species with insufficient habitat for long term survival without habitat restoration
- **More than 40%**: amphibian species threatened with extinction

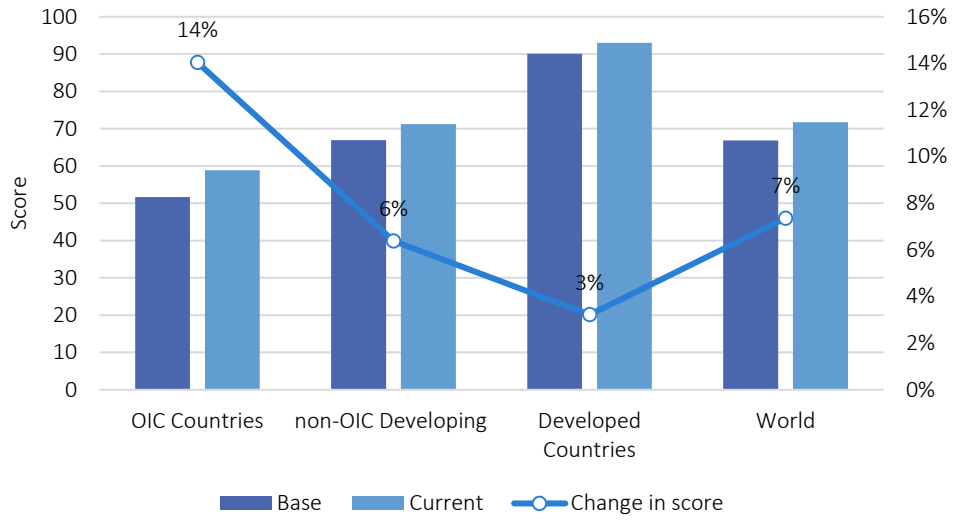
- **Almost 33%**: reef forming corals, sharks and shark relatives, and >33% marine mammals threatened with extinction
- **25%**: average proportion of species threatened with extinction across terrestrial, freshwater and marine vertebrate, invertebrate and plant groups that have been studied in sufficient detail
- **At least 680**: vertebrate species driven to extinction by human actions since the 16th century
- **+/-10%**: tentative estimate of proportion of insect species threatened with extinction
- **>20%**: decline in average abundance of native species in most major terrestrial biomes, mostly since 1900
- **+/-560 (+/-10%)**: domesticated breeds of mammals were extinct by 2016, with at least 1,000 more threatened
- **3.5%**: domesticated breed of birds extinct by 2016
- **70%**: increase since 1970 in numbers of invasive alien species across 21 countries with detailed records
- **30%**: reduction in global terrestrial habitat integrity caused by habitat loss and deterioration
- **47%**: proportion of terrestrial flightless mammals and 23% of threatened birds whose distributions may have been negatively impacted by climate change already
- **>6**: species of ungulate (hoofed mammals) would likely be extinct or surviving only in captivity today without conservation measure

Source: Summary Report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

The Species Protection Index (SPI) measures how much suitable habitat for a country's species is under protection, thus making it an excellent measure for species conservation. Data for the index are available for a rapidly growing list of more than 30,000 species of terrestrial vertebrates, invertebrates, and plant species (Group on Earth Observations Biodiversity Observation Network, 2015)

Figure 2.29 show OIC countries performance in comparison to other country group on the SPI. The figure reveals that over the last decade, all country groups have recorded better performance in protecting species. The OIC countries average on the SPI in the base and current years is lower than the world average and the average of other country groups; however, OIC countries were able to record the best improvement in protecting species in the last decade, increasing their SPI score from 51.6 to 58.9, a 14% increase.

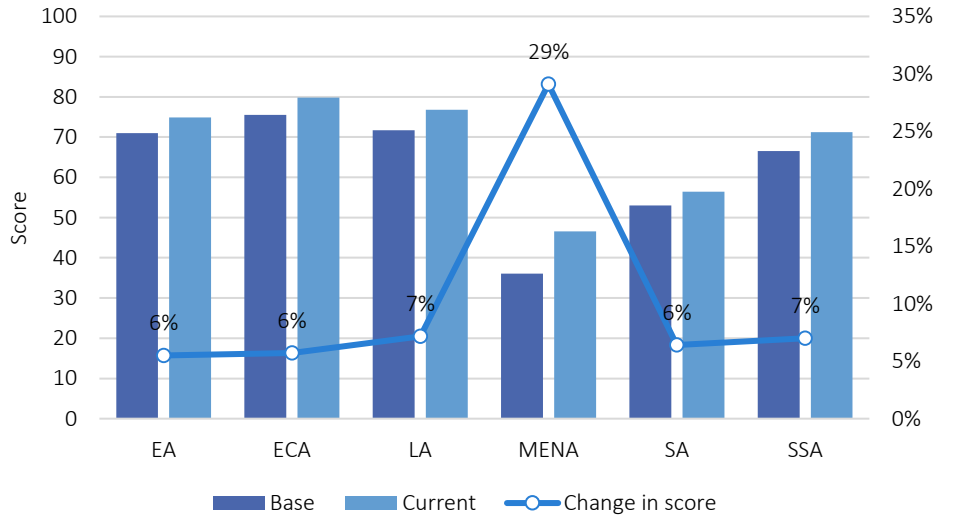
Figure 2.29: Species Protection Index (SPI), current and base years



Source: SESRIC Staff Calculations based on EPI 2018

At the OIC regional level, OIC countries in Europe and Central Asia, East Asia and Latin America score the highest on the SPI, while OIC countries in the MENA score the lowest. However, OIC countries in the MENA have been able to improve their performance the most in the last decade, elevating their score from 36 to 46.5, a 29% increase.

Figure 2.30: Species Protection Index (SPI) in OIC regions, current and base years

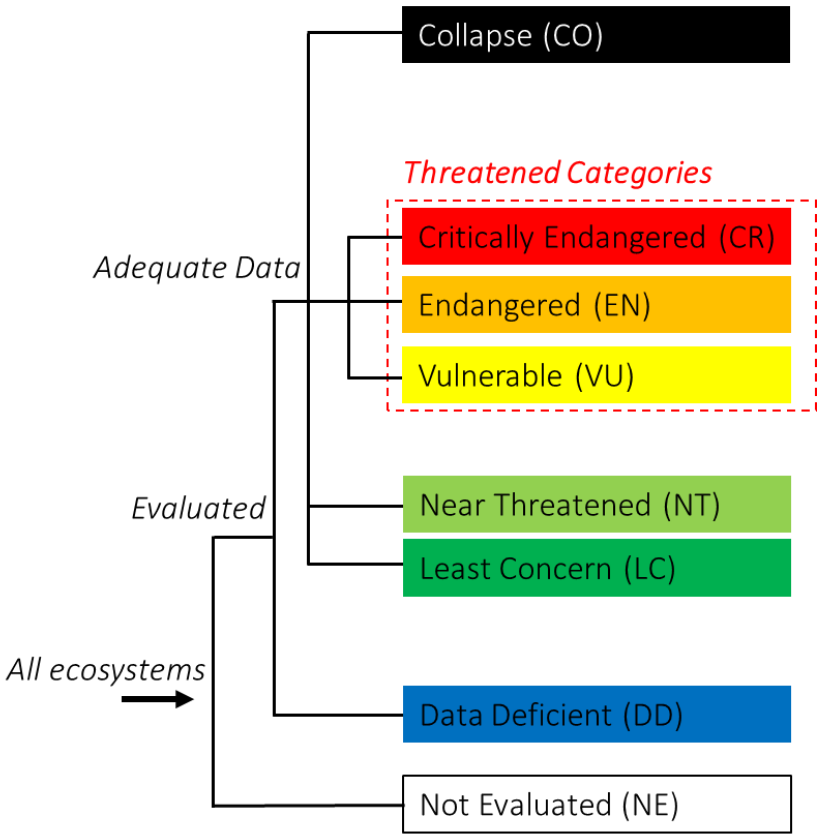


Source: SESRIC Staff Calculations based on EPI 2018

2.4.3. Threatened Ecosystems

An ecosystem includes all of the living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun, soil, climate, atmosphere). Ecosystems are the foundations of the biosphere and they determine the health of the entire earth system. Unfortunately, many of these ecosystems are under threat mostly to manmade reasons. To draw attention to threatened ecosystems, the International Union for Conservation of Nature (IUCN) has developed the Red List of Ecosystems (RLE). RLE assesses to which degree an ecosystem is under threat and consequently categorizes threatened ecosystems in eight categories (Figure 2.31).

Figure 2.31: Structure of the IUCN Red List of Ecosystems Categories



Source: Adapted from IUCN (2016)

As the Figure shows, three categories are assigned on the basis of quantitative thresholds: Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) – together, these categories are described as threatened. These are complemented by several qualitative categories that accommodate: 1) ecosystems that fail to meet the quantitative criteria for the threatened ecosystem categories (NT, Near Threatened); 2) ecosystems that unambiguously meet none of the quantitative criteria (LC, Least Concern); 3) ecosystems for which too few data exist to apply any criterion (DD, Data Deficient); and 4) ecosystems that have not yet been assessed

(NE, Not Evaluated). An additional category (CO, Collapse) is assigned to ecosystems that have collapsed throughout their distribution (IUCN, 2016).

The threatened ecosystem at the global level are shown in Table 2.2. The table highlights one collapsed ecosystem and this ecosystem in located in the OIC region (Aral Sea). A collapsed ecosystem is a system beyond recovery and this category is reserved for an ecosystem that has lost its defining environmental or natural features or has been replaced by a different type of ecosystem. In addition, the table shows 11 threatened ecosystems with one of these ecosystems located in the OIC region; the Gonakier forests of Senegal river floodplain located in Senegal and Mauritania.

Table 2.2: Red List of Ecosystems

Ecosystem	Country	Category
Aral Sea	Uzbekistan and Kazakhstan	CO
Coorong lagoons and Murray Mouth inverse estuary, south Australia	Australia	CR
Gnarled mossy cloud forest, Lord Howe Island	Australia	CR
Gonakier forests of Senegal river floodplain	Senegal and Mauritania	CR
Southern Benguela upwelling ecosystem	South Africa	EN
Coolibah - Black Box woodlands	Australia	EN
Giant kelp forests, Alaska	United States of America	EN
Tapia forest	Madagascar	EN
Tidal flats of the Yellow Sea	China, North Korea and South Korea	EN
European reedbeds	Various	VU
Antarctic shallow invertebrate-dominated ecosystems	Various	NT
Tepui shrublands	Venezuela	LC

Source: IUCN

CHAPTER THREE

Environmental Management

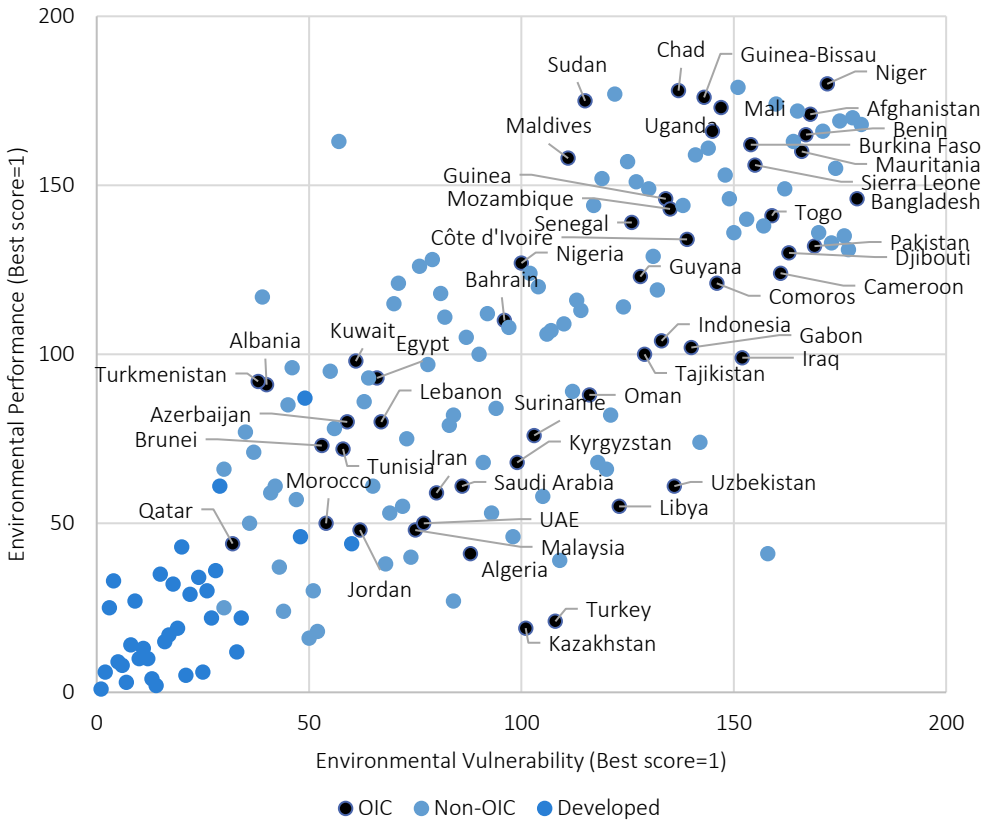
Since the first Rio Earth Summit in 1992 which put environmental management in developing countries on the global development agenda, many countries have made tremendous progress in mainstreaming environmental sustainability in their national policies and development plans. Nevertheless, the increasing level of environmental degradation, associated with air pollution, water contamination, land degradation, deforestation and loss of biodiversity, remained a potent threat to the very survival of millions of people in the developing world. The situation is particularly alarming for poor populations which rely heavily on the natural resources, such as land, water and forests, to earn their livelihood.

3.1. Environmental Performance and Vulnerability

Despite the fact that the developing world as a whole is and will be affected by the increasing level of environmental degradation, its negative impacts are and will be more pronounced in OIC member countries. Indeed, the higher environmental vulnerability of OIC members emanates from their geographic locations, high dependence on climate sensitive natural resources and low adaptive capacities. Existing climate models predict worsening of environmental and climatic conditions in many OIC countries; posing serious social and economic consequences especially for the disadvantaged and poor populations.

The majority of OIC member countries are characterized by poor environmental performance and a high level of vulnerability to climate change (Figure 3.1). With respect to the overall position of members based on Environmental Performance Index (EPI) ranking in relation to Gains Index's Climate change vulnerability ranking, Qatar is the best performing and most environmentally sustainable country, followed by Turkmenistan, Albania and Brunei. On the other hand, 24 OIC member countries are ranked among the most vulnerable and lowest performing countries in the world. Bangladesh is ranked at the bottom with EPI score (179) followed by Niger, Pakistan and Afghanistan. In general, these countries are lagging behind in environmental sustainability, planning and governance.

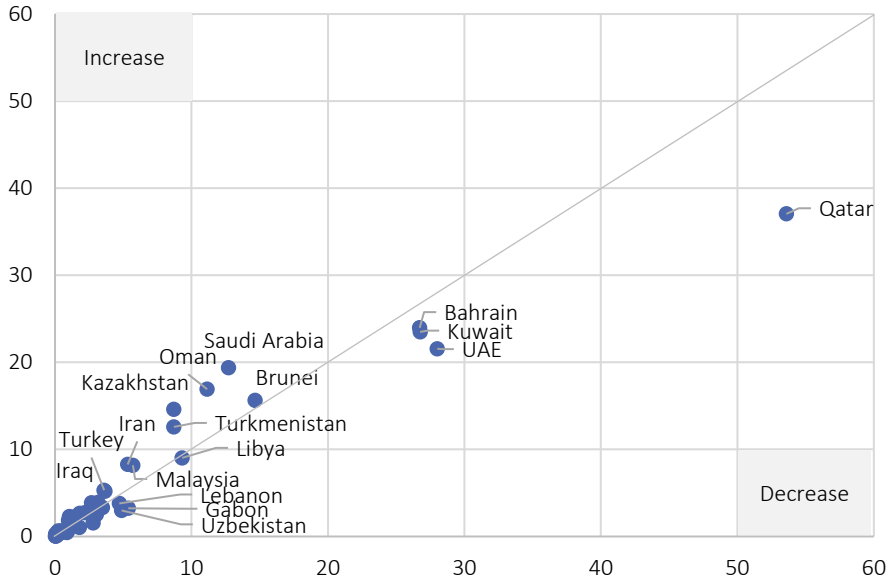
Figure 3.1: Environmental Performance and Vulnerability



Source: Environmental Performance Index 2016 and GAIN Index 2016

Though OIC member countries are the least polluters, their Green House Gas (GHG) emissions are on the rise coupled with limited mitigation efforts. During 2000-2017, 38 out of 54 OIC countries with data have witnessed increase in CO_2 emissions per capita. As shown in Figure 3.2, Saudi Arabia recorded the highest increase of 6.7 metric tons per capita in CO_2 emission followed by Kazakhstan (5.9 metric tons), Oman (5.8 metric tons), Turkmenistan (3.9 metric tons) and Iran (3.0 metric tons). On the other hand, Qatar recorded the highest decline (16.5 metric tons per capita) in CO_2 emissions followed by United Arab Emirates (6.4 metric tons), Kuwait (3.3 metric tons) and Bahrain (2.8 metric tons). In general, per capita emissions remained comparatively very high in fuel exporting members like Qatar, Bahrain, Kuwait, United Arab Emirates and Saudi Arabia. On the other hand, per capita CO_2 emissions remained well below half of the metric tons (0.5) in 16 member countries, most of them from the Sub-Saharan Africa region.

Figure 3.2: CO_2 Emissions per Capita (Metric Tons), 2000 vs 2017



Source: Carbon Dioxide Information Analysis Centre (CDIAC), July 2019

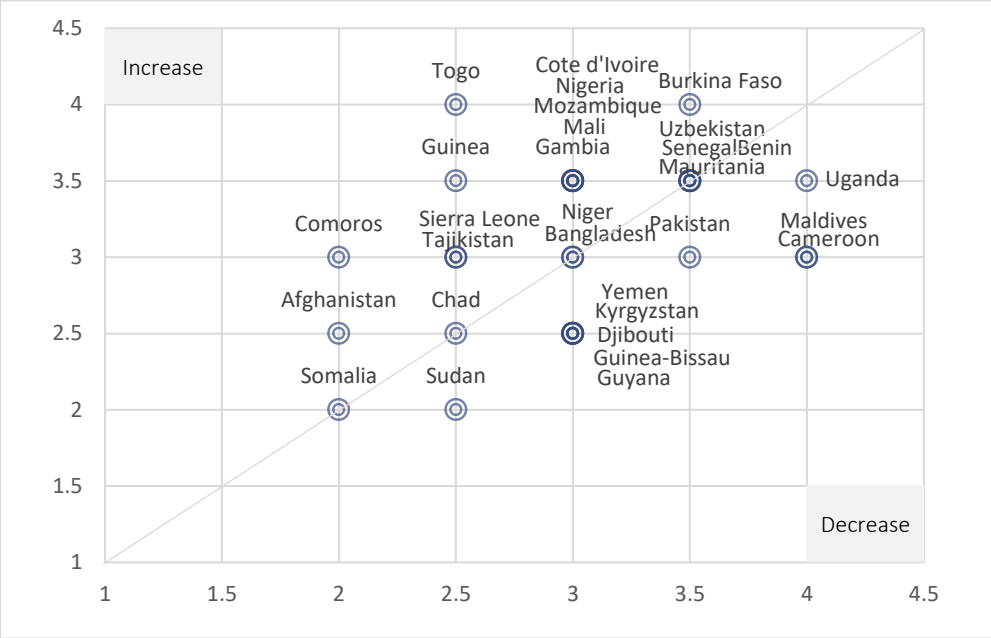
3.2. Policies and Institutional Capacities

Although, the natural resource base continued to be the main stay of economic and social development in the majority of developing countries, environmental management remained very poor in these countries. Degraded forests, freshwater and land resources continued to be the reality of life with catastrophic consequences for the livelihood and welfare of millions. The poor environmental performance of many developing countries is linked to weak regulatory/management capacities, fewer financial resources and lack of political stewardship on environmental matters.

According to the latest data on the Country Policy and Institutional Assessments (CPIA) released by the World Bank (2019), the capacity for environmental management (both in terms of policies and institutions) in 82 low and middle income countries is relatively stable at a score of 3.1 since 2005. This database also includes 30 OIC member countries. The capacity for environmental management for these member countries is averaged at a score of 3.1 for 2017 (6.0 being the maximum score). Given the fact that CPIA scores 1 to 4 describe poor capacity and 5 to 6 quite advanced capacity, majority of these member countries like their developing counterparts elsewhere are characterized by weak capacities.

As shown in Figure 3.3, for 20 out of these 30 member countries CPIA scores either increased or remained stable between 2005 and 2017. In general, CPIA scores in OIC countries range from 2 to 4, indicating very low environmental management capacities across the 30 OIC member countries with data. According to the World Bank, environmental management in these countries, is held back by (i) partial coverage of environmental issues in regulations and policies; (ii) limited availability of environmental data and their use for priority setting; (iii) low quality of environmental assessment systems; (iv) week policy implementation; (v) limited public information; and (vi) minimal consideration of environmental issues in sector ministries.

Figure 3.3: CPIA Scores for Environmental Management Capacity, 2005 vs 2017



Source: World Bank, Country Policy and Institutional Assessment Database, 2019

As discussed in previous sections, the most common environmental risks include flooding, drought, water scarcity, heatwaves and desertification. With high concentration of people, infrastructure and commercial activities, urban areas are particularly exposed to such extreme events and anomalies. Therefore, focusing on environmental sustainability and resilience of urban areas is critical for effective environmental management. Nevertheless, national urban plans and policies in majority of OIC members do not pay due attention to environmental sustainability and resilience.

According to the latest available information, so far, only 34 member countries have reported on the development of national urban plans (UN Habitat & OECD, 2018). Most of these plans do not pay much attention to the issues related to environmental sustainability and resilience to climate change. As shown in Table 3.1, urban development plans in only 5 member

countries have extensive focus on environmental sustainability whereas; climate resilience is the center of attention in the case of only two member countries. While only four member countries have moderate level of focus on environmental sustainability in urban areas, 11 member countries have low focus at this dimension. This number climbs up to 14 in case of Climate Resilience theme.

Table 3.1: National Urban Policies and Environmental Sustainability and Resilience

Focus/Theme	Environmental Sustainability	Climate Resilience
Extensive	**[5]** Bahrain, Bangladesh, Malaysia, Qatar, Turkey	**[2]** Maldives, Morocco
Moderate	**[4]** Algeria, Indonesia, Kyrgyzstan, Morocco	**[4]** Malaysia, Qatar, Turkey, Uganda
Low	**[11]** Brunei, Comoros, Cote d'Ivoir, Djibouti, Mali, Maldives, Mauritania, Nigeria, Senegal, Togo, Uganda	**[14]** Bahrain, Bangladesh, Brunei, Comoros, Cote d'Ivoir, Djibouti, Indonesia, Kyrgyzstan, Mali, Mauritania, Nigeria, Senegal, Somalia, Togo
Insufficient Information	**[6]** Albania, Chad, Libya, Oman, Somalia, UAE	**[6]** Albania, Algeria, Chad, Libya, Oman, UAE

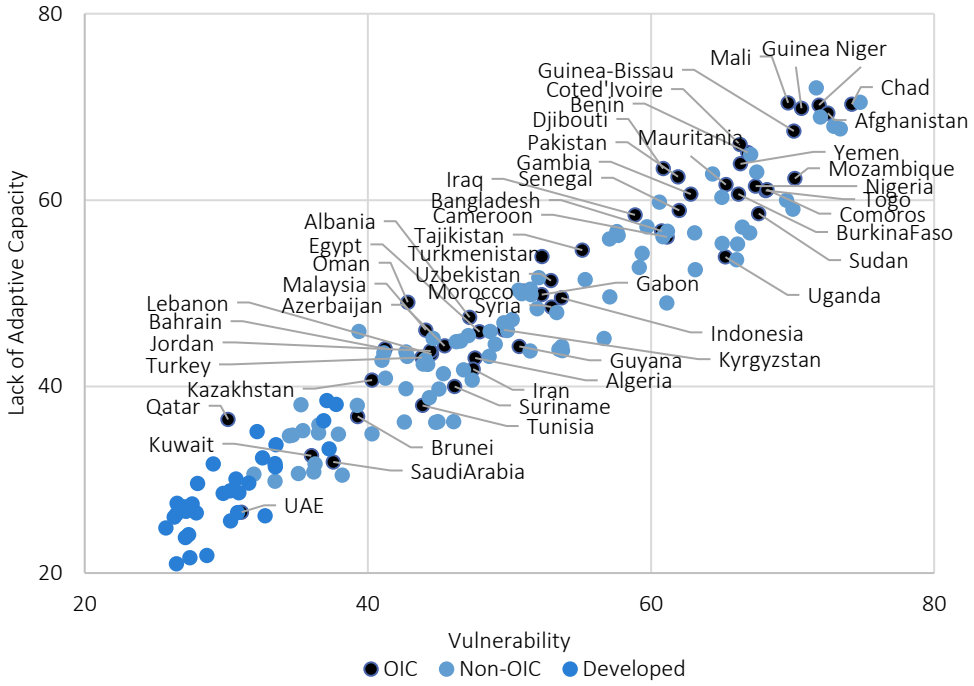
Source: UN Habitat and OECD, 2018

Adaptation is a key building block of global response to environmental degradation and disasters. However, in spite of their high vulnerability to environmental/natural disasters, majority of OIC member countries are characterized by and low coping and adaptive capacities (SESRIC, 2016b).

According to the latest available estimates, lack of adaptive capacity score were recorded above 50 mark for 28 members. In general, there is a huge disparity among the OIC countries in this regard, ranging from 26 to 70 (Figure 3.4). Among the OIC members Mali, Chad Niger, and Guinea have the highest lack of adaptive capacity with score of 70. On the opposite side of the scale, United Arab Emirates is the most equipped OIC country with a score of 45, followed by Saudi Arabia, Kuwait and Qatar. In general, most of the OIC countries still rely on the traditional disaster management systems based on reactive approach of post-disaster response and relief, and lack the capacities for effective risk mitigation and preparedness for environmental disasters.

Furthermore, the latest data on the implementation of Sendai Framework for Disaster Risk Reduction 2015-2030 reveals that only 23 member countries have adopted and implemented national disaster risk reduction strategies in line with this Framework. On the other hand, 11 member countries have reported no policy development in line with the Sendai Framework whereas; there is no sufficient information available for the rest of member countries.

Figure 3.4: Environmental Disaster Vulnerability and Adaptive Capacities



Source: UNU-EHS, 2016

This state of affairs necessitates more leadership at both national and local level to mainstream the environmental management into every aspect of socio-economic development. In fact, environment-change sensitive planning will lead to urban areas that are more resilient and successful in ensuring access to civic amenities while enhancing safety and well-being of their inhabitants. Several global initiatives like Sendai Framework for Disaster Risk Reduction, 2030 Agenda for Sustainable Development, Paris Agreement on Climate Change, New Urban Agenda and Addis Ababa Action Agenda provide opportunities and resources to enhance urban resilience by adopting sustainable urban development practices.

3.3. International/Regional Cooperation

OIC members are widely aware of environmental degradation and its negative consequences. And they actively participate in the environment related international summits, treaties, events, and projects. According to the latest information (Table 3.2), 42 OIC countries have ratified the UNFCC convention whereas; 14 members are in state of accession, most of them are fuel exporting countries as the concept of 'using low-carbon technology' implies reduction in oil use for transportation and industry. In the case of the Kyoto Protocol, only 10 OIC member countries have ratified it whereas; 46 members are in the state of accession. The latest international deal on climate change 'Paris Agreement' is, by far, the most popular global initiative with 196 signatories, of which 166 have ratified it. Among the OIC countries, 43 members have ratified it whereas; 13 members have status of signatory.

Table 3.2: Status of Joining Multilateral Environmental Agreements

Country	UNFCCC	Kyoto Protocol	Paris Agreement
Afghanistan	R	R	A
Albania	A	A	A
Algeria	R	A	A
Azerbaijan	R	A	A
Bahrain	R	A	A
Bangladesh	R	A	A
Benin	R	A	A
Brunei Darussalam	A	A	A
Burkina Faso	R	A	A
Cameroon	R	A	A
Chad	R	A	A
Comoros	R	A	A
Cote d'Ivoire	R	A	A
Djibouti	R	A	A
Egypt	R	R	A
Gabon	R	A	A
Gambia	R	A	A
Guinea	R	A	A
Guinea-Bissau	R	A	S
Guyana	R	A	A
Indonesia	R	R	A
Iran	R	A	S
Iraq	A	A	S
Jordan	R	A	A
Kazakhstan	R	R	A
Kuwait	A	A	S
Kyrgyzstan	A	A	S
Lebanon	R	A	S
Libya	R	A	S
Malaysia	R	R	A
Maldives	R	R	A
Mali	R	R	A
Mauritania	R	A	A
Morocco	R	A	A
Mozambique	R	A	S
Niger	R	R	A
Nigeria	R	A	A
Oman	R	A	S
Pakistan	R	A	A
Qatar	A	A	A
Saudi Arabia	A	A	A
Senegal	R	A	A
Sierra Leone	R	A	A

Somalia	A	A	A
Sudan	R	A	A
Suriname	R	A	S
Syria	A	A	A
Tajikistan	A	A	A
Togo	R	A	A
Tunisia	R	A	A
Turkey	A	A	S
Turkmenistan	A	R	A
Uganda	R	A	A
United Arab Emirates	A	A	A
Uzbekistan	A	R	S
Yemen	R	A	S

Source: UNFCCC, 2019. Key: A=Accession, R=Ratified, S=Signatory

Adaptation is a key building block of global response to climate change. It involves many dimensions, including: capacity building, disaster risk management, research and assessment, and economic diversification. In this regard, all countries are expected to prepare their vulnerability assessments, prioritization of action, financial needs assessments, capacity building and response strategies, and integration of adaptation actions into sectoral and national planning. Adaptation is particularly important for the developing countries especially due to their high vulnerability to the climate change.

All Least Developed Countries (LDC) are supposed to prepare their national adaptation plans of action (NAPA) and submit their priority projects to the UNFCCC secretariat for financing. As of September 2017, 50 countries had completed and submitted their NAPAs to the UNFCCC secretariat. Among the OIC countries, 22 LDCs have submitted their list of priority adaptation activities/projects to get financing for the implementation of their NAPAs. In general, priority sectors/areas addressed in the NAPAs are agriculture and food security, water resources, coastal zones, and early warning and disaster management.

According to the UNFCCC's NAPA priorities database, 48 LDCs have submitted over 500 projects. Around half (49%) of these projects were submitted by the 21 OIC countries (Table 3.3). Among these OIC countries, Mauritania, Guinea and Sierra Leon submitted more than 20 projects. The implementation of these 248 projects in OIC countries required around 250 million US$. Most of these funds are expected to be spent in five OIC countries: Bangladesh (18% of total financing), Senegal (14%), Mali (11%), Sierra Leon (7%) and Yemen (7%).

Table 3.3: NAPA Priority Projects

Country	Number of Projects		Cost of Projects (Million US$)	
	Total	Share of Total OIC-LDC	Total	Share of Total OIC-LDC
Afghanistan	2	1%	4.4	1%
Bangladesh	19	8%	77.3	18%
Benin	5	2%	15.6	4%
Burkina Faso	12	5%	5.9	1%
Chad	10	4%	14.0	3%
Comoros	13	5%	4.5	1%
Djibouti	8	3%	7.4	2%
Gambia	10	4%	15.1	3%
Guinea	25	10%	8.2	2%
Guinea Bissau	14	6%	7.2	2%
Maldives*	11	4%	23.0	5%
Mali	19	8%	49.8	11%
Mauritania	26	10%	20.2	5%
Mozambique	4	2%	9.2	2%
Niger	15	6%	N/A	N/A
Senegal	4	2%	59.2	14%
Sierra Leone	24	10%	30.1	7%
Somalia	3	1%	18.7	4%
Sudan	5	2%	15.1	3%
Togo	7	3%	19.1	4%
Yemen	12	5%	29.9	7%

Source: UNFCCC, 2019

CHAPTER FOUR

Concluding Remarks and Policy Suggestions

The OIC member countries as a group are highly vulnerable to environmental degradation induced by the increasing anthropogenic activities. The situation is particularly alarming in low income and least developed member countries. Despite all progress in adaptation and mitigation process, a significant number of member countries remained exposed to major environmental challenges like air pollution, water contamination, land degradation, deforestation and loss of biodiversity and ecosystems. This state of affairs necessitates more leadership at both national and local level to mainstream the climate resilience into every aspect of implementation of OIC-2025.

Improving air quality

According to the findings of the relevant chapter, major air pollution issue in OIC countries is related to indoor air pollution and to biomass burning. This conclusion is supported by the literature review which points out that while air pollution in developed countries is primarily the product of industrialization and urbanization, air pollution in many developing countries commonly has a different source: biomass burning. The combustion of organic refuse, charcoal, wood, animal dung, and agricultural waste, such as straw, nut shells, and rice husks, is prevalent in rural and urban areas of the developing world, and the consequences may be felt far from the burn sites.

The policy focus in OIC countries should be on addressing indoor (household) air pollution. As shown in Table 4.1, cooking and heating requirements should be met while emissions are reduced through the use of modern stoves; cleaner fuels, such as liquid petroleum gas and electricity; improved ventilation; and reducing exposure (Table 4.1). To make these interventions effective public awareness is a prerequisite. Households should be made aware of the health risks of indoor pollution and the available solution to address the issue. Involving women and providing them with solutions that meets their needs is paramount if interventions are to succeed. Committing financial resources in the form of aid or micro-credit are needed in order to overcome the financial barriers faced by poor people.

Table 4.1: Advocate for Better Air Quality

Source: Adapted from UNEP

The focus on indoor air pollution should not divert the attention of OIC countries from addressing out door air pollution. High rates of urbanization and industrialization in many OIC countries has resulted in outdoor air pollution becoming a serious issue similar to the case in the industrialized world. Carbon emissions constitute the highest portion of GHG emissions and this issue in different OIC countries is specific to their own local conditions. The sectorial GHG emissions profile can be used as a tool to know which sectors emitted more, thus finding the bottlenecks.

To reduce air pollution and increase air quality, the OIC countries should make an integrated approach towards energy conservation and adoption of renewal energy technologies, including hydropower, by appropriately linking efforts to improve conversion, transmission, distribution, and end-use efficiency. Furthermore, there is also need for strengthening the monitoring and enforcement of emission standards and preparing and implementing appropriate and effective action plans to reduce emissions.

Box 4.1: The World's Largest Concentrated Solar Farm in Morocco

Renewable energy sources are the least expensive options in boosting electricity access, reducing air pollution and cutting carbon dioxide emissions worldwide. The sun is an inexhaustible energy resource to generate electricity without toxic pollutants or effects on global warming. Following the 2015 Paris Agreement, there has been a surge in the number of solar farms being built as governments all over the world strive to reach their national clean energy targets and contribute to reducing global carbon emissions by 2020.

Universal access to affordable, reliable, sustainable and renewable energy is key to the 2030 Agenda for Sustainable Development. Over the recent years, many OIC countries achieved remarkable progress towards using renewable energy by implementing long-term policies to remove subsidies from conventional energy sources and promote renewables. Among them, Morocco has one of the most ambitious energy targets in the OIC and the world. The goal is to have 42% of its power from renewable sources by 2020. The country is well on track to hit its target of 35% renewable energy thanks to solar power sites such as Noor Ouarzazate.

Built on an area of more than 3,000 hectares, the Noor-Ouarzazate Complex produces enough electricity to power a city the size of Prague, or twice the size of Marrakesh. Situated at the gateway to the Sahara Desert, the whole complex provides 580 megawatts electricity -- saving the planet from over 760,000 tonnes of carbon emissions.

Source: Climate Home News & CNN

Addressing land degradation

Land degradation is widespread across the OIC member countries and elsewhere in the developing world. There is a need for national level acknowledgement to internalize the issue of land degradation into the decision-making process whereby land degradation is considered as part of all policy and planning. In this regard, establishment of a novel database with new classifications of land use statistics, could be instrumental in facilitating the analysis of land degradation and its impacts to garner the political support and action.

There is a strong need to develop appropriate national and local mechanisms that can monitor rapid changes in soil and water quality in order to move toward sustainable practices such as integrated pest management and land-conserving crop rotations. In this regard, OIC member countries need to develop and implement holistic approaches and policies to tackle land degradation by linking agriculture and environment to the proper use of land.

The expansion of agricultural land is the major driver of the depletion of primary tropical and sub-tropical forests. Around 70 to 80 % of expansion of cropland leads to deforestation. That expansion is driven by poorly-designed agricultural practice, changes in consumption patterns and population dynamics. It is found that, net depletion of forests is higher in Sub-Saharan African member countries. Therefore, improved land management practices should be taken into consideration during the expansion of arable land.

Though there are global biosphere rehabilitation activities in different sectors, an integrated large scale restoration/rehabilitation movement is highly needed in this regard. This movement based on reforestation, desertification control, sustainable agriculture and using agroforestry and permaculture can reduce the degraded ecosystems to mitigate floods, droughts, erosion and other effects of extreme weather conditions at a large scale.

Among the OIC member countries, SSA and MENA region countries should give priority to developing their carbon sink potentials through afforestation and reforestation programs, climate resilient technologies and other related activities to sequest sufficient carbon dioxide into biomass and soils. It will not only help in dryland restoration but also address various socio-economic problems stemming from unsustainable use of natural resources in these countries.

Box 4.2: Land Restoration Efforts in OIC Member Countries

Globally, 169 countries are affected by land degradation and/or draught, which could cost as much as US$23 trillion by 2050 if no action is taken. The Bonn Challenge is an international initiative to bring 150 million hectares of deforested and degraded land into restoration by 2020 and 350 million hectares by 2030. Many OIC member countries are actively participating in the Bonn Challenge to achieve their international climate change, biodiversity and land degradation commitments.

As of August 2019, 14 OIC member countries have submitted their pledges to the Bonn Challenge secretariat. These members have collectively committed to restore 34.1 million hectares of degraded land with economic benefits equaling to US$ 9889 million along with sequestration of 2.98 gigatones of CO_2 by the end of 2030. These efforts are also instrumental for national and regional priorities in other sectors such as water resource management, food security and rural development.

Country	Pledged Million Hectares	Economic Benefits Million US$	Climate Benefits GtCO2 Sequestered
Cameroon	12	3787	1.14
Cote d'Ivoire	5	1570	0.47
Nigeria	4	1256	0.38
Niger	3.2	1005	0.3
Uganda	2.5	785	0.24
Guinea	2	628	0.19
Kazakhstan	1.5	-	-
Mozambique	1	3.14	0.09
Bangladesh	0.8	236	0.07
Pakistan	0.7	151	0.05
Benin	0.5	157	0.05
Uzbekistan	0.5	-	-
Kyrgyzstan	0.3	-	-
Tajikistan	0.1	-	-
14 OIC Countries	34.1	9889	2.98

Source: The Bonn Challenge Commitment Database

Integration of land and water management is a key method for the prevention of desertification. Local communities play a central role in the adoption and success of effective land and water management policies. They can play role in aridity reduction, pastoral and agricultural land use and so on. Therefore, by increasing institutional and technological capacity of the local communities and enhancing their access to markets and financial capital can lead to sustainable use of land use.

It is well known that prevention is a much more effective way to cope with desertification, because subsequent attempts to rehabilitate the desertified areas are costly and tend to deliver limited results. In order to enhance the local institutional capacities, SESRIC has

organized a number of training courses in several member countries within the framework of its Environmental Capacity Building Programme (Environment-CaB). This type of training program should give priority to the African member countries to enhance their local institutional and technological capacities.

Collaborative Partnership on Forests (CPF) is a policy forum and partnership on all types of forests, including dry forests. OIC countries can control the problems of desertification and deforestation by implementing internationally agreed actions on forests in collaboration with the Intergovernmental Forum on Forests (IFF) and the Intergovernmental Panel on Forests (IPF). The UNCCD's 10-year strategic plan is an important platform for galvanizing common actions to highlight drylands as indispensable, yet exhaustible capital. Cooperation within the UN system regarding mainstreaming drylands and related issues of desertification, land degradation and drought can be useful from developing a structured approach with a clear understanding of the contributions and expectations from different member countries and institutions.

Attaining water security

The OIC Water Vision is an excellent framework for addressing the major water challenges facing OIC countries including the challenge of climate change. Successfully implementing the OIC water vision will require the full participation of the member countries and the support of the OIC General Secretariat and the relevant OIC institutions. In this regard, SESRIC, COMSTECH, IDB and ISESCO have a big role to play.

In the arid areas of the Middle East and North Africa, groundwater is a source of life and is used for both urban water supply and for irrigated agriculture. However, unplanned depletion of non-renewable groundwater reserves can undermine, and potentially erode, the economic and social vitality of OIC countries in the Middle East and North Africa. The challenge for these countries is to find a balance between preservation and use. Thus, the need to plan the utilisation of non-renewable water resources and the preparation for dealing with water stress as aquifer storage depletion becomes paramount.

The linkages between water, peace and security are becoming very critical for OIC countries. Demand for fresh water is expected to increase in the next few decades, in combination with factors that are negatively affecting countries' fresh water supply capacities. Providing enough fresh water for people and different sectors will remain as a critical issue for many OIC Member States. This means that for ensuring water security, investing more and more effectively in water-related infrastructure is necessary. Otherwise, water insecurity can lead to the consequences such as food and energy shortages, poverty, biodiversity loss and an increased threat of conflict. By investing in sustainable water infrastructure and capitalizing on advances in science, technology and engineering that have improved effectiveness in areas such as water harvesting, desalination and wastewater treatment, the OIC Member States can significantly improve their water security. Still, for this to happen, major shifts in water management are required, including securing and protecting water resources through

adapting a cross-sectoral approach and implementation of integrated water resources management. An important aspect of this is to ensure that decision-making is done transparently in an accountable and inclusive manner, while engaging different levels of governance (local, basin, regional and national) and enabling consultations across public and private institutions and civil society. Otherwise, failures in water management may pave the way for more dramatic water shortages.

Human activities introduce materials and elements that pollute water such as organic matter, heavy metals, and fertilizers. Therefore, the mind-set used in water resources management needs to seriously consider the issue of pollution control as an important element of water management strategies. In this regard, wastewater treatment is essential. Unfortunately, the percentage of wastewater that is treated in OIC countries is limited. OIC countries need to increase their wastewater treatment capacity. By doing so, OIC countries can increase water availability. Also, the practice of wastewater treatment reduces pollution to the environment; contributes to the health of aquatic systems and provides health benefits for local residents. In addition, there are different old and new methods that can help reduce the pollution at source and treat polluted water before it enters waterbodies. For example, through environmental biotechnology, it became possible to use microorganisms from wastewater, to clean up pollution in contaminated waters.

Protecting biodiversity and ecosystems

As the report points out, the coverage of protected areas in relation to marine areas in OIC countries is very limited. There is a need for OIC countries to increase the number and size of protected and conserved areas that are effectively and equitably managed. In addition, there is a need for the evaluation and understanding of the effectiveness of marine protected areas operating in the OIC. The Protected Area Management Effectiveness (PAME), and in particular the Management Effectiveness Tracking Tool (METT) are useful tools in this regard.

OIC countries need to focus on collaborative design and implementation of biodiversity strategies and action plans; the use evidence-informed planning tools to design conservation area networks and ecosystem connectivity; as well as biodiversity conservation. These are vital elements for integrated ecosystem management and for properly respond to climate change and the resulting environmental disasters such as floods and droughts.

Plastics in the marine environment are widely recognized as a global issue. Single-use plastics are a significant source of this pollution. OIC countries need to put in place strategies and policies to reduce single-use plastics. Turkey for example has instituted a new policy starting January 1st 2019 where shopping-markets must charge customer for plastic bags rather than giving them away for free. As a result of this policy a 70% reduction in the use of plastic bags has been witnessed. OIC countries implementing such policies need to conduct research to evaluate the effectiveness of bans and levies to ensure policies are having positive impacts on marine environments. In addition, education and outreach to reduce consumption of plastic bags are needed.

A range of agriculture, forestry, fiscal, and other policy initiatives are needed to preserve a significant proportion biologically diversity in OIC countries. Case in point is the challenge of deforestation in some OIC countries. Protection of forest is a priority however, solutions to deforestation will have to come from outside the forestry sector. In this regard, there is a need to increase agricultural productivity and provide people living adjacent to the forests with an alternative to further forest encroachment. Increasing agricultural productivity requires support for land reform and land-titling programs that address the issues of inequitable land distribution and encourage a more permanent and sustainable agriculture which will relieve pressure on forest land. Government assistance program are important to achieve this.

Enhancing environmental policies and management practices

Environmental conservation, climate change adaptation and disaster mitigation are closely associated. Global studies indicate that more than 80% of the natural disasters are hydro-meteorological; e.g. floods, droughts, desertification, cyclones, storms etc. Therefore, environmental degradation and climate change intensify the frequency and severity of hydro-meteorological hazards. Given the fact that climate change is expected to intensify disaster risks significantly in many members, there is a serious need for adopting prudent environmental management practices to reduce disaster risks and the adverse effects of climate change. This involves following key dimensions: sustainable water resources management, sustainable land-use management, and integrated coastal zone management.

Another main determinant of the success in disaster risk management is the level of awareness and participation. A lack of awareness of hazards and vulnerability can build complacency, leading to ignorance for risk reduction. Social protection of vulnerable communities also plays a key role. In this context, to promote public awareness, participation and social protection, OIC countries can organize public awareness campaigns on risk reduction related to specific hazards and risks regularly, at least once a year, for example during the International Day for Disaster Reduction.

Preparing capacities for environmental risk reduction also requires a sound analysis of existing capacities and gaps, risks, well-developed early warning systems, contingency planning, stockpiling of equipment and supplies, coordination mechanisms, public information, and associated training and field exercises. The policies to establish national and local databases to collate developmental and disaster risk information and to produce analysis of hazards, risks and vulnerabilities are highly essential for OIC countries to promote information, knowledge sharing and capacity development in those countries

The private sector should be encouraged to manage the environmental impacts resulting from their activities. In this regard, environmental management systems (EMS) are a powerful tool. Environmental Management Systems help organisations to reduce their environmental impact in a systematic way. OIC countries can encourage companies operating in their countries to get certified to the ISO 14001 which is an international environmental management system developed by ISO (International Organization for Standardization).

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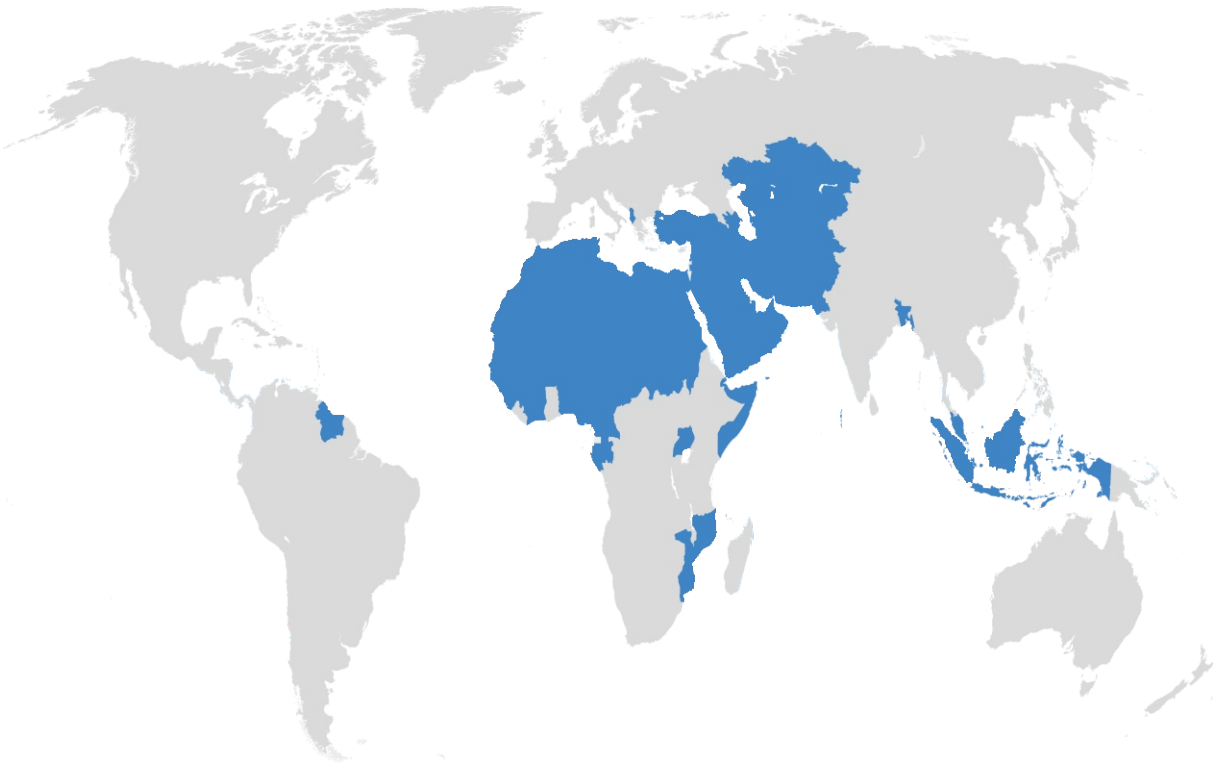

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