OIC WATER REPORT 2025

OPTIMIZING WATER RESOURCES FOR SUSTAINABLE FOOD SECURITY



ORGANISATION OF ISLAMIC COOPERATION

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

OIC WATER REPORT 2025

Optimizing Water Resources for Sustainable Food Security



Organization of Islamic Cooperation

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

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CONTENTS

ACRONYMS v

FOREWORD vi

EXECUTIVE SUMMARY viii

INTRODUCTION 1

PART I: 4

WATER RESOURCES AND HUMAN WELL-BEING 4

Chapter 1: STATE OF WATER RESOURCES AND USE 5

1.1. Exploring Water Distribution and Availability 6

1.2. Understanding Water Demand and Use 15

1.3. Water Security in a Changing World 23

Chapter 2: PROGRESS IN WATER, SANITATION, AND HYGIENE SERVICES 27

2.1. Access to Water, Sanitation and Hygiene (WASH) Services 28

2.2. Inequalities in WASH Coverage 35

2.3. Consequences of Inadequate WASH Conditions 41

PART II: 44

WATER, AGRICULTURE, ENVIRONMENT AND SUSTAINABLE FOOD SECURITY SYSTEMS 44

Chapter 3: WATER, AGRICULTURE, AND FOOD SECURITY 45

3.1. Water Security for Food Security: Integrated Perspectives 46

3.2. Agricultural Water Demand and Utilization 49

3.3. Enhancing Agricultural Productivity and Efficiency for Food Security 53

Chapter 4: CLIMATE CHANGE IMPACTS ON THE WATER SECTOR 58

4.1. Climate Change, Natural Hazards and Water Resources 59

4.2. Water Resources in the Face of Climate Change 62

4.3. Vulnerabilities and Readiness in the Face of Climate Change 64

4.4. Adapting to Climate Change in the Water Sector 68

Chapter 5: MANAGEMENT OF WATER FOR SUSTAINABLE FUTURE 71

5.1. Water Resources Management Approaches 72

5.2. Water Governance and Cooperation 78

5.3. Advancing the Use of Unconventional Water Resources 85

5.4. Successful Practices in OIC Countries: Selected Examples 86

Chapter 6: CONCLUDING REMARKS AND POLICY RECOMMENDATIONS 90

6.1. Concluding Remarks 91

6.2. Policy Recommendations 92

REFERENCES 96

ANNEXES 103

ACRONYMS

AM	Adaptive Management
BaU	Business-as-Usual
CEDAW	Committee on the Elimination of Discrimination against Women
CEP	Coastal Eutrophication Potential
DEWA	Dubai Electricity and Water Authority
EBA	Ecosystem-based Approaches
ECA	Europe and Central Asia
ERRA	Earthquake Reconstruction & Rehabilitation Authority
GHG	Greenhouse Gas
GMMR	Great Man-Made River
GW	Ground Water
GWP	Global Water Partnership
ICWC	Interstate Commission for Water Coordination
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
LAC	Latin America
MENA	Middle East and North Africa
MW	Mega Watts
NbS	Nature-based Solutions
ND-GAIN	Notre Dame Global Adaptation Initiative
NSAS	Nubian Sandstone Aquifer System
ODA	Official Development Assistance
OIC	Organisation of Islamic Cooperation
OIC-2025: PoA	OIC-2025: Programme of Action
RO	Reverse Osmosis
RWH	Rain Water Harvesting
SA	South Asia
SDGs	Sustainable Development Goals
SEA	Southeast Asia
SLR	Sea-Level Rise
SSA	Sub-Saharan Africa
STPs	Sewage Treatment Plants
SV	Seasonal Variability
TRWR	Total Renewable Water Resources
TWS	Terrestrial Water Storage
TWW	Treated Waste Water
UNFCCC	United Nations Framework Convention on Climate Change
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
WRI	World Resources Institute
WUE	Water Use Efficiency
WWAP	World Water Assessment Programme

FOREWORD

Water is the foundation of life and a cornerstone of socio-economic development—yet its greatest strategic value lies in its role as the lifeblood of food security. Across the Organisation of Islamic Cooperation (OIC) countries, sustainable water management is essential to ensuring stable food supplies, resilient livelihoods, and long-term prosperity. This importance has been consistently recognised in the OIC fora. The OIC-2025: Programme of Action identifies agriculture and food security, environment, climate change, and sustainability as strategic priority areas for cooperation, within which water resources management play a vital role. To this end, the OIC Water Vision, adopted in 2012, provides a dedicated framework for collective action toward achieving water security and the sustainable management of water resources.

It is with great pleasure that I present the OIC Water Report 2025: Optimising Water Resources for Sustainable Food Security, launched at a time when pressures on water systems are intensifying and food insecurity is worsening. Hunger and malnutrition remain persistent challenges in many low- and middle-income OIC countries. Between the 2014–2016 and 2021–2023 periods, the number of undernourished people in the OIC region rose from 192 million to 263 million, increasing the OIC share of the world's undernourished from 34.4% to 36.4%. Over the same period, the prevalence of undernourishment grew from 11.9% to 14.9%—a sharper rise than the global average, which increased from 7.5% to 9.1%.

The report examines the state of water resources in OIC countries, their management, and their central role in ensuring food security. It reviews trends in water availability, withdrawal, and Water, Sanitation, and Hygiene (WASH) services, while analysing the interconnections between water, food security, and environmental preservation.

The findings are sobering: agriculture accounts for nearly 86% of water withdrawals in OIC countries, placing heavy demands on limited resources and worsening water scarcity that is already high and critical in many OIC countries primarily located in arid and semi-arid regions. Climate change is worsening these pressures, disrupting rainfall patterns, and intensifying seasonal variability—threatening agricultural productivity and the stability of food systems. Persistent challenges, including underinvestment, inefficient use, and gaps in governance, continue to hinder progress toward sustainable water management and universal WASH coverage.

At the same time, there are clear opportunities for action. Strengthening intra-OIC cooperation, scaling up efficient irrigation, diversifying water sources—including unconventional ones such as desalination and wastewater reuse—and integrating water policies with agricultural and energy strategies can help safeguard resources and build resilience. These steps are fully aligned with the OIC Water Vision and the broader goals of OIC-2025: Programme of Action.

As the OIC's statistics, research, and training centre, SESRIC remains committed to supporting Member States in their efforts to achieve water and food security. Through evidence-based analyses, statistical work, technical cooperation, and capacity building, we aim to help develop and implement effective, inclusive, and sustainable strategies.

I extend my sincere appreciation to the SESRIC team for their dedication in preparing this report, and I trust that its findings will inform renewed collaboration, stronger policy action, and tangible progress toward a water-secure and food-secure future for all.

Zehra Zümrüt SELÇUK
Director General
SESRIC

EXECUTIVE SUMMARY

State of Water Resources and Use

Geographically, OIC countries are spread across the globe, encompassing diverse climates, topographies, and ecological systems. As a result, some regions experience abundant precipitation and water resource availability, while others face water scarcity. Generally, OIC countries in Southeast Asia (SEA) and Latin America (LAC) have greater access to renewable water resources compared to those in Europe and Central Asia (ECA), the Middle East and North Africa (MENA), Sub-Saharan Africa (SSA) and South Asia (SA). To address the scarcity of renewable freshwater, several OIC countries rely on alternative sources such as deep aquifers or employ unconventional methods like seawater desalination.

In 2022, the combined annual renewable water resources in OIC countries were 7,261 billion m^3/year, equivalent to 13.3% of the world's total renewable water resources. When assessing renewable water availability per capita, OIC countries fall below the global average. Each person in OIC countries had access to approximately 3,575 m^3 of renewable water annually, in contrast to the world average of 6,830 m^3. By 2050, the demand for water in most OIC countries is projected to increase significantly. Several factors contribute to this rising demand, including population growth, urbanization, and intensification of economic activities. While the share of water consumed by the agriculture sector may decrease slightly, it is still expected to remain the largest consumer. Conversely, economic development and urbanization will likely elevate the demand for water in the municipal and industrial sectors.

Increasing water demand raises concerns about water security, which can be measured using the concept of water stress. Water stress becomes problematic for countries when it reaches 25% (low stress), and levels above 75% are classified as high stress. In 2022, 28 OIC countries were estimated to have no water stress. Four countries exhibit 'low' levels, six have 'medium' levels, and two face 'high' levels of water stress. Additionally, there are 16 OIC countries experiencing 'critical' stress on their freshwater resources. Notably, many of the countries with critical and high water stress have implemented operational water desalination plants to offset the strain on available freshwater basins. These member countries facing water stress are primarily located in arid and semi-arid regions, characterized by limited and scarce water resources, particularly in the MENA and ECA regions.

The increasing pressure on water availability is also accompanied by a decline in water quality. Since the 1990s, many rivers across OIC regions have experienced deteriorating water quality due to persistent pollution, often caused by untreated connected wastewater and increased coastal eutrophication potential. As a result, wastewater from human activities is frequently discharged directly into water bodies, further exacerbating this decline. This heightened pressure on water resources has made OIC countries vulnerable to significant water-related hazards, such as drought and declining food production. Many OIC countries already face such risk conditions. If unsustainable water use and environmental degradation continue, the

economy, food and water security, and overall societal well-being in OIC countries could be at serious risk by 2050, with vulnerable groups suffering the most and existing inequalities and socio-economic disparities worsening.

Progress in Water, Sanitation, and Hygiene Services

Water, Sanitation, and Hygiene (WASH) services are essential for promoting individual health, well-being, and socio-economic development within a country. However, the effectiveness of the WASH sector heavily depends on the availability, quality, and management of water resources. In OIC countries, there has been significant progress in improving access to WASH services in recent years. The proportion of the population with access to basic drinking water increased from 80.2% in 2010 to 87.0% in 2022, and access to basic sanitation rose from 58.4% to 70.1% during the same period. Moreover, access to basic handwashing facilities with soap and water has improved, with 57.7% of the population in OIC low-income and lower-middle-income countries now having access to these services. Despite these improvements, there is still room for further progress, particularly in provision of basic sanitation and hygiene services in rural communities of the OIC.

Access to WASH services varies significantly across the OIC region, with South Asia and Sub-Saharan Africa regions facing greater challenges in obtaining adequate services. These inequalities stem from various factors, including geographical location (urban/rural divide), socio-economic status, and individual context-specific features like gender. For example, in several OIC countries, women and girls bear the primary responsibility for managing WASH services and water resources. In some countries, more than half of the burden of water collection falls on women, particularly in Mozambique, Burkina Faso, Guinea-Bissau, Chad, Togo, Somalia, Niger, Sierra Leone, and Gambia.

Inadequate WASH conditions remain a critical public health threat, particularly in rural communities, contributing to preventable deaths from diseases like diarrhoea, cholera, and typhoid in many OIC countries. With 27 deaths per 100,000 people, OIC countries face higher mortality rate than the global average of 18.5 deaths. Within the OIC, the Sub-Saharan Africa region—with 57.7 deaths per 100,000 people—and South Asia—with 29 deaths per 100,000—suffer the most. Mortality rates in 21 OIC countries in the Sub-Saharan Africa region exceed the OIC averages. Beyond health, poor WASH undermines food security and economies, demanding urgent investment to close gaps and save lives.

Water, Agriculture, and Food Security

Food security in OIC countries has generally improved in recent years, as reflected by growth in gross food production, indicating better food availability. Despite these positive trends, significant challenges remain. Approximately 263 million people in the OIC region are undernourished, representing 36.4% of the world's total undernourished population and reflecting ongoing hunger. The prevalence of undernourishment affects 14.9% of the OIC population. Additionally, 23 OIC countries were classified among the 45 countries globally in the 'Crisis Requiring External Assistance' category (FAO, March 2025).

The increasing demand for food has significant implications for the water sector in OIC countries, as their agricultural land makes up about a quarter of the total global agricultural land. On the other hand, agricultural water withdrawal in OIC countries accounts for 85.6% of all water withdrawal compared to the world average of 71.5%, with South Asia having the highest share (93.4%) and Sub-Saharan Africa the lowest (80.9%).

In terms of area equipped for irrigation, the OIC region covers approximately 80 million hectares (21% of the world total). Various irrigation techniques are employed across OIC countries. The most commonly used technique is 'surface irrigation,' which consumes the largest volume of water. While this technique is widely used globally, it is considered wasteful as a significant amount of water diverted for surface irrigation is lost through deep percolation or surface runoff. In 2022, 89.5% of the total area equipped for irrigation in OIC countries utilized surface irrigation, compared to 86% in non-OIC developing countries, 42.9% in developed countries, and 80.8% worldwide.

Effectively addressing challenges related to food security and water use efficiency in the OIC can be achieved through improving productivity. The way water is utilized has critical implications for economic productivity, environmental sustainability, and long-term water security—making Water Use Efficiency (WUE) a key metric for sustainable development. Between 2015 and 2022, the average agricultural WUE in OIC countries increased from US$0.34 to US$0.42 per cubic metre, a gain of only US$0.08. This remains below the global average, which rose from US$0.50 to US$0.70—a gain of US$0.20. While WUE and total agricultural production have steadily increased in the majority of OIC countries, the gross per capita food production index reveals that many member states still lack sufficient production capacity to meet the domestic demand of their growing populations. As a result, several continue to rely heavily on food imports. In 2023, 29 out of the 57 OIC countries recorded a negative percentage change in their gross per capita agricultural production index compared to the 2014-2016 base period.

Concerning progress towards productive and sustainable agriculture—a proxy indicator for measuring countries' performance in sustainable agricultural productivity— Lebanon led among OIC countries as of 2023 with a score of 4.57, the only OIC country to have achieved productive and sustainable agriculture. It was followed by eight Member States: Türkiye (4.29), Palestine (4.17), Jordan (3.86), Albania (3.83), Cameroon (3.57), Suriname (3.57), Malaysia (3.5), and Tajikistan (3.5), all classified as close to achieving productive and sustainable agriculture. Most (36) OIC countries were categorized as having a moderate gap to reach productive and sustainable agriculture. The remaining 10 OIC countries with available data were categorized as far from productive and sustainable agriculture. Despite generally low levels of agricultural development and limited per capita availability of agricultural products, 24 OIC countries rank among the world's top 20 producers of major agricultural commodities.

To effectively address challenges related to water's role in food security, OIC countries must prioritize both infrastructure development and policy frameworks. It is essential to adopt a comprehensive approach to managing land and water resources while investing in modern, sustainable technologies. Agriculture, which is often the dominant water user in OIC countries, offers significant potential for efficiency gains, particularly through improved irrigation techniques and crop selection.

Climate Change Impacts on the Water Sector

Changing climate significantly impacts water resources, as it plays a vital role in regulating the hydrological cycle within the biosphere. Numerous studies have found that climate change will lead to greater variability and unpredictability in future water supply due to increased fluctuations. OIC countries, particularly those in the SSA, MENA, and SA sub-regions, are projected to experience high to medium-high seasonal water variability by 2050. Some member countries in these regions already face high water stress, which climate change is likely to exacerbate.

As global average temperatures rise, the frequency and intensity of climate hazards such as heatwaves, heavy rainfall, storms, and droughts are expected to increase due to greater climate variability. Alongside these impacts, thermal expansion has caused sea levels to rise, resulting in saline water intrusion and coastal flooding. These climate change effects have significant repercussions on freshwater availability and quality. Reduced freshwater availability and quality further impact agricultural output, thus threatening food security.

Compared to the world average, the water sector in OIC countries is more vulnerable and less prepared to cope with the impacts of climate change, exposing them to higher risks and jeopardizing livelihoods. In 32 OIC countries, vulnerability to climate impacts exceeds the global average, while 43 countries lack adequate preparedness for adaptation. This lack of readiness highlights an urgent need to scale up national adaptation efforts to strengthen adaptive capacities.

Adapting to climate change impacts in the water sector is crucial for OIC member countries to build resilience against future hazards. Achieving this requires following an iterative adaptation cycle: thoroughly assessing impacts, vulnerabilities, and risks to guide decision-making; planning; implementing adaptation measures; and monitoring, evaluation, and learning. Adaptation efforts will not only reduce stress on the water sector but also yield economic and social benefits such as increased food production and enhanced resilience. Additionally, effective adaptation provides environmental co-benefits and reduces the economic and social costs of extreme climate events.

Management of Water for Sustainable Future

Responsive interventions are essential to address the multitude of water-related challenges faced by OIC countries. These interventions must effectively combine technical expertise, prescriptive governance, and efficient management. Modern water resources management emphasizes the importance of meeting the water needs of both current and future generations by incorporating sustainable development approaches into the water sector. Achieving this requires multi-sector integration, involving a broader range of stakeholders, and raising awareness about the economic, social, and ecological values of water (Schoeman et al., 2014). Moreover, the water management system should be adaptable to future shocks and uncertainties, including the impacts of climate change.

There are three emerging approaches to tackle water-related problems: Integrated Water Resources Management (IWRM), Ecosystem-based Approaches (EBA), and Adaptive

Management (AM). IWRM recognizes the intricate connections between water and other sectors, especially agriculture and food security. Thus, involving various stakeholders in the formation of water policies is seen as crucial. In practice, IWRM involves basin-scale water resource management, establishing water rights, implementing water pricing for allocation, and promoting participatory decision-making. EBA adopts a natural conservation principle to address water-related issues. For example, preserving upstream water catchment areas can safeguard the quantity and quality of water for downstream users. EBA not only ensures water quantity and quality but also reduces water-related risks and provides social, economic, and environmental co-benefits, enhancing water security. AM is characterized as a "learn-by-doing" approach, with a formal iterative process that evolves based on the outcomes of interventions. The main idea is to establish a management system that continuously adapts to new situations based on pre-defined evaluation criteria. AM is particularly suitable for solving complex problems where future uncertainties are high.

Concerning the status of IWRM implementation, countries can be classified into six categories based on their progress: very low, low, medium-low, medium-high, high, and very high. As of 2023, most OIC countries were categorised as either "medium-high" (25 countries) or "medium-low" (19 countries) categories, indicating that they have already institutionalized many aspects of IWRM. Six OIC countries—Afghanistan, Suriname, Guinea-Bissau, Djibouti, Comoros, and Guyana—were classified as "low," suggesting that they have started developing elements of IWRM but with limited uptake across the country and potentially low engagement of stakeholder groups. No OIC country was categorized as having a very low level of implementation. In contrast, Kuwait, with a 95% degree of implementation, was categorized as "very high," second only to Monaco globally. Only nine countries in the world were placed in this category. Following Kuwait, six OIC countries—Qatar (90%), Saudi Arabia (83%), United Arab Emirates (83%), Oman (80%), Malaysia (73%), and Türkiye (72%)—were placed in the "high" category.

Another critical aspect to address in global water management efforts is the presence of 153 countries sharing 286 transboundary rivers, lakes, and aquifers. Globally, around 59% of transboundary basins—including river and lake basins and aquifers—had operational arrangements in place as of 2023. This proportion was 56% in the OIC region as a group, based on data available for 41 OIC countries out of 57. As of 2023, several OIC countries demonstrated strong water cooperation by having operational arrangements for nearly all of their transboundary basins. Top performers with 100% coverage include Senegal, Sierra Leone, and Guinea-Bissau, each effectively managing 3 to 4 basins. Close behind were Nigeria, Uganda, Libya, Togo, Gambia, and Burkina Faso. Overall, proportions were above the global average in 18 OIC countries. In contrast, 12 OIC countries had no operational water cooperation arrangements, indicating significant gaps in formal water cooperation for their transboundary basins.

The OIC Water Vision lays the groundwork for policy frameworks on promoting water security and water governance in OIC countries. This is partly why 45 OIC countries currently have procedures in their laws or policies for the participation of service users/communities in water resources planning and management. However, such procedures are not defined in six OIC countries: Afghanistan, Gabon, Guyana, Iraq, Senegal, and Somalia. As for the level of

participation in such programs, available data shows that it was high in 19 OIC countries, moderate in 22, low in 6, and not applicable in 4.

Another important area in the management and use of water resources is the introduction of innovative approaches and the development of unconventional water resources. Unconventional water resources are expected to play a critical role in meeting society's water needs and fulfilling the mandates of the OIC Water Vision and the Sustainable Development Goals (SDGs). Among these sources, desalinated water, along with the reuse of municipal wastewater and agricultural drainage water, are the most commonly used in practice. For OIC countries—particularly those located in water-scarce regions—tapping into unconventional water resources is crucial for achieving sustainable development. It is estimated that over 27.2 km^3 of water is produced from the three primary unconventional sources listed above in OIC countries, accounting for 3.1% of total water withdrawal in the OIC region.

INTRODUCTION



Water resources and their sustainable management are of paramount importance for OIC countries as they confront complex developmental challenges, including poverty, gender inequality, economic disparity, and particularly food insecurity. Ensuring a sustainable water supply is vital for food security, agricultural production, and reducing hunger, which remains alarmingly high in many OIC countries. Between 2021 and 2023, an average of 263 million people in OIC countries experienced food insecurity, with undernourishment rates surpassing global averages, posing serious threats to public health, economic stability, and social development.

Access to water is a fundamental human right and its preservation relies on effective and sustainable management supported by adequate infrastructure and sound policy frameworks. Water security is intrinsically linked to food security, as agriculture accounts for the largest share of water use in the OIC region. The availability and quality of water resources directly impact crop yields, livestock health, and ultimately the ability to feed growing populations. Given mounting global challenges—including population growth, water scarcity, natural hazards, and the intensifying impact of climate change on food systems—the imperative for resilient water systems has become more pronounced than ever.

Recognizing the urgency of the issues, the OIC-2025: Programme of Action (OIC-2025: PoA) prioritizes the improvement of water infrastructure and the adoption of modern technologies, particularly to support sustainable agriculture and food production. This focus is reflected in three key priorities: Environment, Climate Change, and Sustainability (Priority 5); Agriculture and Food Security (Priority 8); and Health (Priority 12). Additionally, the Programme emphasizes minimizing the destructive impacts of water and strengthening cooperation in water resource management to enhance food security.

In response to a specific request from the OIC Water Ministers, the OIC General Secretariat initiated the development of a unified strategy to address water concerns through 2025. Through deliberations at Advisory Panel of Experts sessions in Dubai (2010) and Astana (2011), a preliminary vision was formulated and later endorsed by the broader OIC community. At the OIC Water Ministers meeting in Istanbul in 2012, the OIC Water Vision was adopted, emphasizing collaboration among OIC countries to pursue a “water secure future.” The vision recognizes that sustainable access to water is essential not only for improving water security and human health but also for strengthening agricultural productivity and achieving food security across the OIC region. These strategic initiatives align with the Sustainable Development Agenda 2030, which underscores the need for integrated water resource management, wastewater treatment, and ecosystem preservation to ensure universal access to safe drinking water, sanitation, and sufficient food.

Accordingly, this report a focuses on "Optimizing Water Resources for Sustainable Food Security." It explores innovative, context-specific solutions to enhance water governance, infrastructure, and technology while promoting integrated water resource management that balances water demand and supply. The report also investigates nature-based solutions and green infrastructure to bolster resilience and promote sustainable practices essential for long-term food security.

The analysis primarily examines data across OIC countries, with further insights by region and individual members, often comparing against developed and non-OIC developing countries and global averages. The report consists of six chapters: following the Introduction, Chapter 1 reviews the current state and trends of water resources; Chapter 2 analyses progress in Drinking Water, Sanitation, and Hygiene (WASH) services; Chapters 3, 4, and 5 delve into critical water management issues, including climate change impacts, the nexus between water and food systems, and sustainable water management approaches. Finally, Chapter 6 presents recommendations for sustainable water management policies to enhance food security and resilience in OIC countries.

PART I:

WATER RESOURCES AND HUMAN WELL-BEING

Chapter 1: STATE OF WATER RESOURCES AND USE



With over 70% of Earth's surface covered by water, one might assume that water is abundant and that the issue of water availability is of little relevance. However, 97.5% of all water on Earth is salt water, leaving only 2.5% as freshwater—water that can theoretically be used for drinking, hygiene, agriculture, and industry. Of this limited share, nearly 70% is locked in glaciers and ice caps in Antarctica and Greenland, rendering it inaccessible to humans (SESRIC, 2018). Both natural and human-induced factors affect the annual availability of water. Moreover, the volume and distribution of water over time and space are largely determined by climatic and geomorphological conditions. The availability of water is considerably less than the total volume flowing through the hydrological system, and it fluctuates over time.

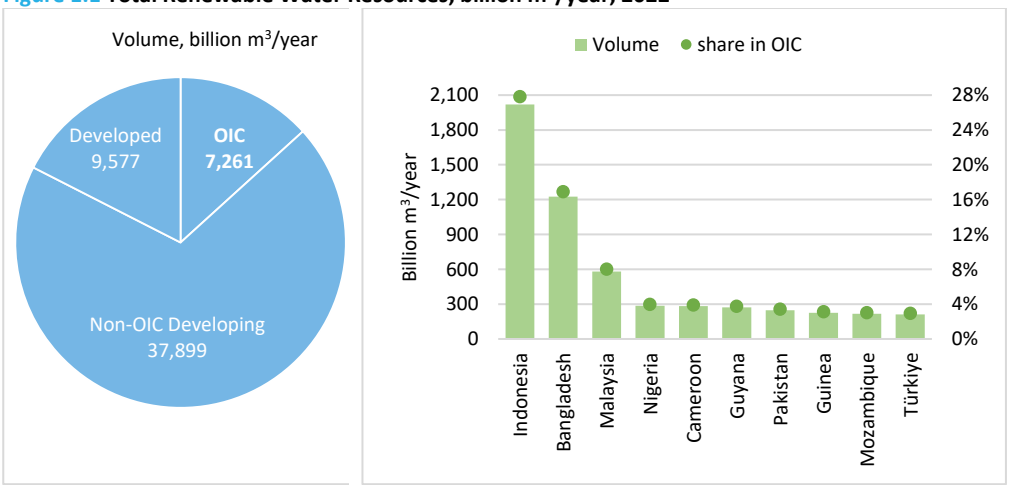
This situation underscores the importance of addressing water availability. Accordingly, this chapter examines water resources, their availability and use, as well as the means to meet the growing demand for freshwater resources in OIC countries. Water availability is therefore a fundamental determinant of sustainable food security, in addition to its critical role in domestic and industrial use—an interconnection that will be examined in depth in Part II of this report.

1.1. Exploring Water Distribution and Availability

Freshwater Resources

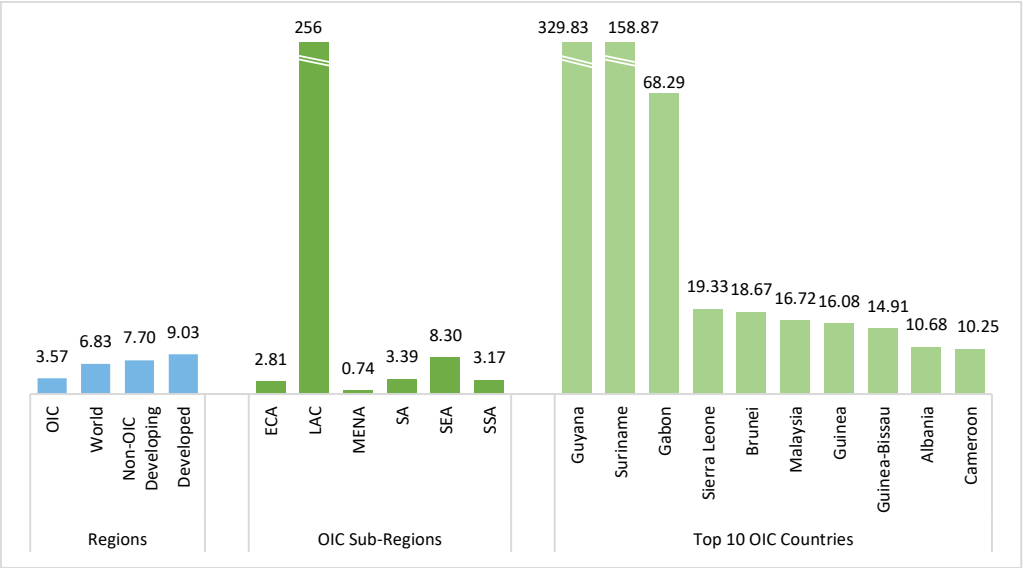
As of 2022, total renewable water resources (TRWR) in OIC countries amounted to 7,261 billion m^3 per year, accounting for 13.3% of the world's total renewable water resources. There is significant diversity among OIC countries in terms of TRWR availability. Indonesia holds the largest share with 2,019 billion m^3 annually, representing 28% of the OIC total, followed by Bangladesh with 1,227 billion m^3 (17%) and Malaysia with 580 billion m^3 (8%). Together, Indonesia, Bangladesh and Malaysia account for over half of the OIC's total renewable water resources, highlighting a significant concentration of availability in just a few countries. Nigeria, Cameroon, and Guyana each account for about 4%, while Pakistan, Guinea, Mozambique, and Türkiye contribute around 3% each. (**Figure 1.1**).

Figure 1.1 Total Renewable Water Resources, billion m^3/year, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

Figure 1.2 Total Renewable Water Resources, thousand m³/person/year, 2022



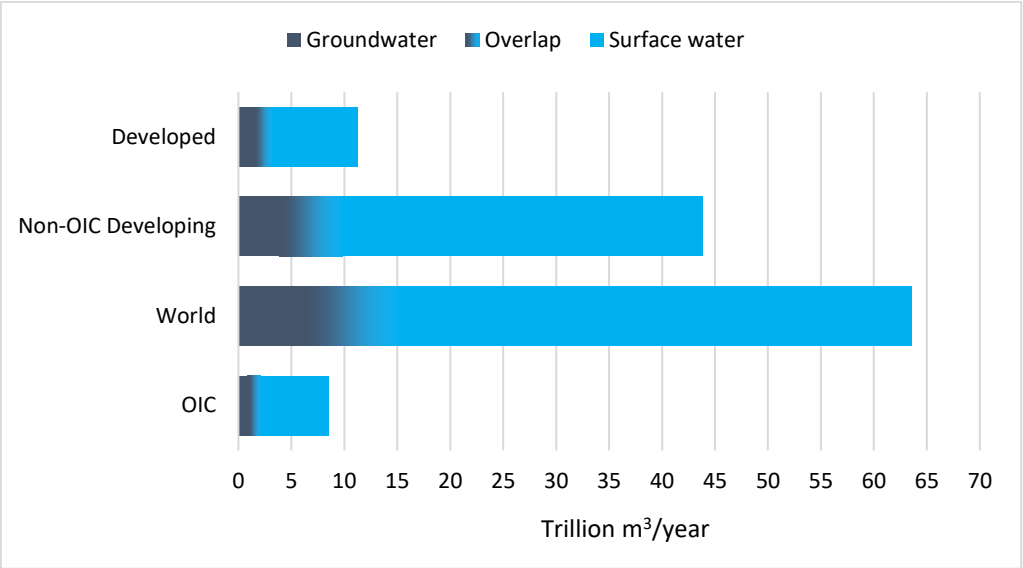
Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

While total renewable water resources in OIC countries are substantial, their adequacy becomes more nuanced when viewed in relation to population size. When considering the water resources relative to the population, OIC countries exhibit significantly lower levels compared to the world average. On average, OIC countries had only 3,575 m³/ person/year of renewable water resources, whereas the world average stood at 6,830 m³/person/year, non-OIC developing countries at 7,699 m³/person/year, and developed countries at 9,031 m³/person/year (**Figure 1.2**).

The distribution of water resources across OIC countries also displays distinct regional variations, with some regions having significantly more abundant water resources than others. Specifically, the Latin America (LAC) region of the OIC have the highest availability of renewable water resources owing to the low population density, amounting to 256,091 m³/person/year, followed by the Southeast Asia (SEA) region with 8,304 m³/person/year. In contrast, the MENA and ECA regions had the lowest resources, with 737 m³/person/year and 2,808 m³/person/year, respectively (**Figure 1.2**).

Total renewable water resources consist of both surface water and groundwater. Surface water resources include various bodies of water found on Earth's surface, such as rivers, lakes, streams, wetlands, reservoirs, and creeks. Although surface water represents the smallest share of freshwater in the hydrosphere, it is of significant importance due to its easy accessibility for human use and its vital role in sustaining ecosystems. As a renewable resource, surface water is replenished relatively quickly through the hydrological cycle, which restores both its quantity and quality, making it a crucial component of the biosphere. Globally, surface water accounts for the majority of renewable water resources, comprising approximately 83% of the total, with the remaining 17% attributed to groundwater. Similarly, in OIC countries, renewable surface water availability reaches 6,987 billion m³/year, renewable groundwater 1,501 billion m³/year and overlap between the two was 1,226 billion m³/year.

Figure 1.3 Renewable Groundwater and Surface Water, 2022



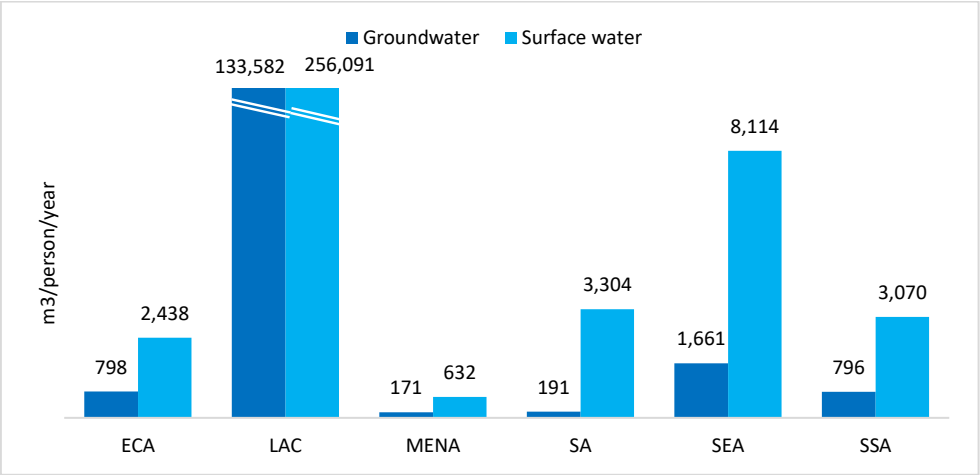
Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

On the other hand, groundwater is another essential water resource meeting human needs. It can be categorized into two types based on its replenishment properties: renewable groundwater and non-renewable groundwater, also known as fossil water. Renewable groundwater is located in upper aquifers and is replenished relatively quickly through the water cycle. In contrast, non-renewable groundwater, found in deeper aquifers, accumulated thousands of years ago during more humid climatic conditions.

Renewable water resources refer to freshwater that can be replenished through the hydrological cycle, including surface water and upper-aquifer groundwater. These are the most commonly utilized for human activities. Renewable surface water is easier to access due to its proximity to the Earth's surface. In OIC regions, renewable surface water availability is estimated at 6,987 billion m³/year, compared to 1,501 billion m³/year of renewable groundwater resources, with an overlap between ground and surface water estimated at 1,226 billion m³/year (**Figure 1.3**). Although renewable groundwater is limited in quantity, it plays a crucial role, particularly in arid and semi-arid regions such as MENA, where surface water is scarce. Moreover, groundwater provides a reliable source of water during dry periods when surface resources are unavailable.

By region, Latin America (notably Guyana and Suriname) stands out with by far the highest per-capita water availability—over 133,000 m³ from groundwater and 256,000 m³ from surface water—reflecting both its rich natural resources and relatively low population density. Southeast Asia follows, though with significantly lower figures: around 1,660 m³ of groundwater and 8,100 m³ of surface water per person. Sub-Saharan Africa and South Asia show modest levels of surface water availability (around 3,000 m³ per person per year), but very limited groundwater resources. Europe and Central Asia report relatively low availability across both sources. The Middle East and North Africa face the most severe water scarcity, with only 171 m³ of groundwater and 632 m³ of surface water per person annually (**Figure 1.4**).

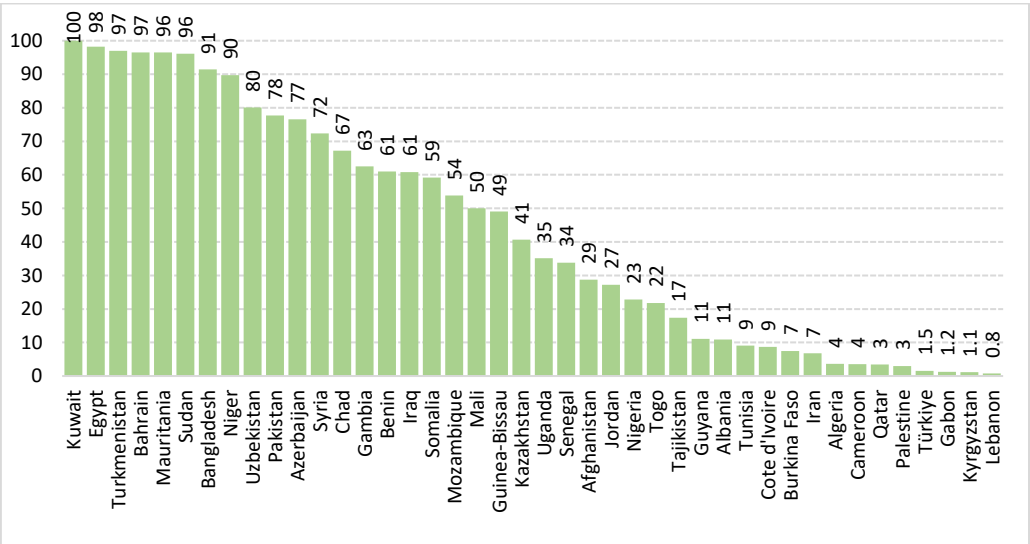
Figure 1.4 Renewable Groundwater and Surface Water Resources per person, OIC Sub-Region, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

A number of major transboundary and regional rivers are shared by OIC countries, including the Nile, Niger, Senegal, Tigris–Euphrates, Amu Darya, Syr Darya, and Indus rivers. These rivers play a critical role in supporting agriculture, urban water supply, and economic development across Africa, the Middle East, and Central and South Asia. Transboundary water resources create dependencies among countries within the same basin.

Figure 1.5 Water Dependency Ratio, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: 15 OIC countries not displayed in the figure have 0 dependency ratio.

In particular, the availability of water in downstream countries often depends on withdrawal practices and dam management in upstream countries. Dependency ratio indicates the extent

to which a country relies on water resources originating outside its borders—transboundary rivers. Six OIC countries, namely; Kuwait (100%), Egypt (98%), Turkmenistan (97%), Bahrain (97%), Mauritania (96%), and Sudan (96%) are almost entirely dependent on external water resources. Additionally, 3 countries—Bangladesh (91%), Niger (90%), and Uzbekistan (80%)—also display very high reliance. At the other end of the spectrum, 15 OIC countries not displayed in the figure depend exclusively on their own internal water resources followed by Lebanon, Gabon, Kyrgyzstan, and Türkiye with negligible dependency ratios (**Figure 1.5**). This highlights significant disparities among OIC members in terms of water security and vulnerability.

Beyond the challenges associated with high dependency ratios and shared transboundary rivers, many OIC countries also face constraints related to non-renewable groundwater resources. Although OIC countries in MENA and Sub-Saharan Africa (SSA) possess fewer renewable water resources, they are home to significant non-renewable groundwater aquifers.

BOX 1: Nubian Sandstone Aquifer System (NSAS): Fossil Water Utilization

The Nubian Sandstone Aquifer System (NSAS) is the world's largest fossil water aquifer system, spanning over two million km². It extends across parts of four OIC countries—northwestern Sudan, northeastern Chad, southeastern Libya, and most of Egypt, including correlative aquifer formations in Israel, Jordan, Syria and the Arabian Peninsula (Sherif & Sturchio, 2021). Various international initiatives and projects related to the NSAS aim to promote socio-economic development, protect biodiversity, conserve land and water resources.

One of the most prominent initiatives is the Great Man-Made River (GMMR) project which launched in 1983 in Libya, and recognised as the world's largest irrigation project. The GMMR extracts substantial volumes of fossil water[1] from the NSAS through an extensive underground pipeline network. These pipelines, some measuring up to four meters in diameter, aimed to produce and transport 6.4 million m³ of groundwater daily to meet the domestic, agricultural, and industrial water demands of northern Libyan urban settlements (Hamad & Saeid, 2025).

. It is the largest underground network of pipes and aqueducts in the world, spanning 2,820 kilometers. The system draws water from over 1,300 wells—most drilled deeper than 500 meters and supplies approximately 6.5 million m³ of fresh water per day to the cities of Tripoli, Benghazi, Sirte, and other areas across Libya (Pleuger, 2021).

The GMMR Project cost an estimated $20-25 billion, with the entire funding provided by the Libyan government and a 1% percent income tax deducted from public wages is used to support project financing (Altaeb, 2022). The water allocation prioritizes agriculture, followed by domestic and industrial use and the usage costs per m³ are estimated at US$0.033 for agricultural, US$0.057 for domestic, and US$0.57 for industrial purposes. Currently, the project supplies approximately 70% of Libya's freshwater needs (Pleuger, 2021), serving regions from the Egyptian border in the east to the Tunisian border in the northwest. As a result, large-scale agricultural development has taken place, transforming arid desert regions—such as Sarir, Kufra, and Jaghbub—into productive farmland. Government-supported farms now cultivate cereals, vegetables, fruits, and fodder crops for livestock (Fetouri, 2023).

Sources: Altaeb, 2022; Fetouri, 2023; Hamad & Saeid, 2025; Sherif & Sturchio, 2021; Margat & van der Gun, 2013; Pleuger, 2021

Globally, the extraction of non-renewable groundwater is heavily concentrated in countries such as Saudi Arabia and Libya, which together account for 77% of the estimated total global extraction (SESRIC, 2018). One of the prominent examples of extraction of water from groundwater aquifers is the Nubian Sandstone Aquifer System (NSAS), which preserves an estimated 150 trillion m³. Its extraction and utilization have had extensive positive impacts on agriculture and food security; however, its future implications for water security remain

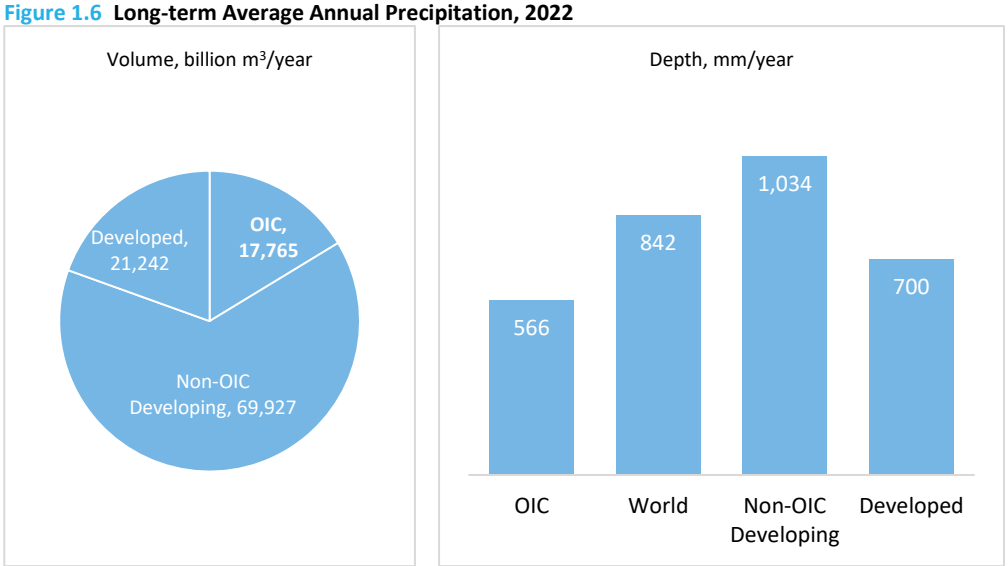
[1] Fossil groundwater' or 'non-renewable groundwater' refers to groundwater bodies formed in the geological past that do not receive significant replenishment under current climatic conditions (Margat & van der Gun, 2013).

questionable (**BOX 1**). Food security in this context is thus considered from a broader water-nexus perspective, in this report. In the arid regions of MENA, groundwater serves as a lifeline for both urban water supply and irrigated agriculture. However, the unplanned depletion of non-renewable groundwater reserves poses a serious challenge, potentially undermining the economic and social well-being of OIC countries in MENA. Striking a balance between preservation and sustainable use is therefore essential to addressing this challenge.

Precipitation Patterns and Water Availability

Building on the challenges of limited renewable water resources, heavy reliance on non-renewable aquifers, and transboundary water dependencies, it is also essential to consider the role of precipitation patterns in shaping water availability across OIC countries. These countries represent a diverse group, spanning multiple geographical regions across four continents. This diversity results in significant variations in climate conditions, natural resource endowments, and developmental levels. While some countries lie in desert and semi-arid regions, others are located in wet tropical environments.

Figure 1.6 Long-term Average Annual Precipitation, 2022



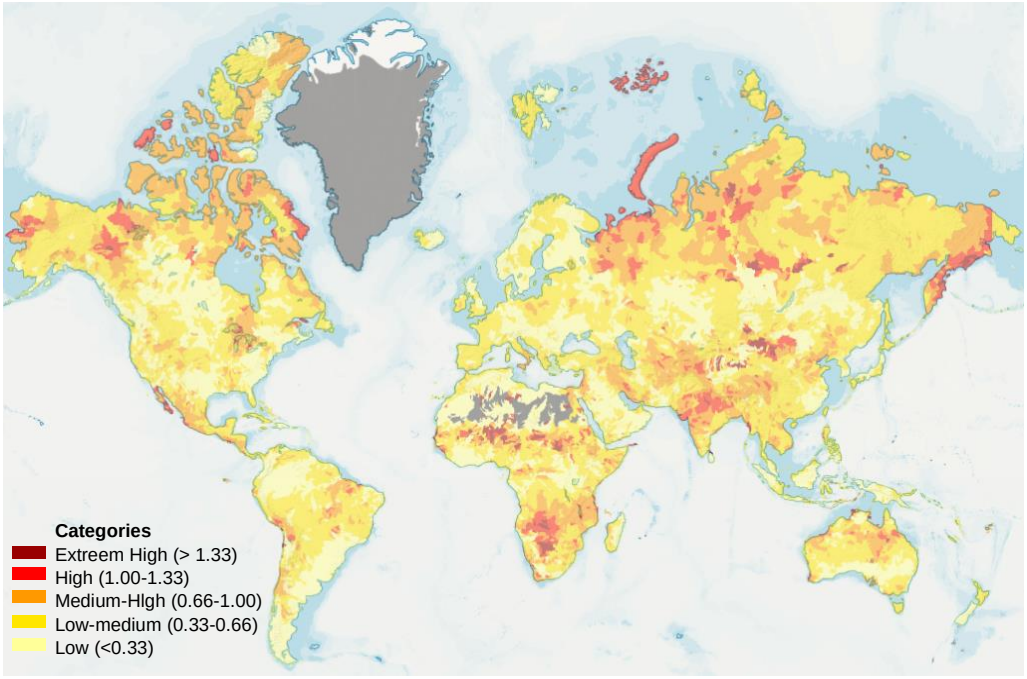
Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: *Long-term average annual precipitation in depth is calculated by dividing volume of precipitation by land area.*

Desert regions experience drastic temperature fluctuations between day and night, with daytime averages reaching around 38°C, while night-time temperatures may drop to 0°C or below. In contrast, tropical regions maintain average temperatures of 18°C or higher throughout the year, accompanied by abundant rainfall and high humidity.

This climatic diversity has significant implications for precipitation levels across OIC countries. Precipitation is a vital component of the hydrological cycle, replenishing both surface water and groundwater to sustain water availability worldwide. In most OIC countries, precipitation primarily occurs as rainfall. However, in higher-altitude or colder regions of countries such as Türkiye, Iran, Albania, and Kazakhstan, snowfall during the winter season also contributes significantly to water replenishment. Given the reliance of agriculture on stable water supplies,

these variations in precipitation patterns directly influence crop yields, irrigation needs, and ultimately food security across OIC countries.

Figure 1.7 Seasonal Water Supply Variability, 2023



Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas.

In 2022, a total of approximately 17,765 km³ of precipitation fell on OIC countries, collectively accounting for 16.3% of the world's annual precipitation volume of 108,933 km³ (**Figure 1.6**). It is important to understand not only the absolute total volume of precipitation, but also how much water falls per unit of land area—a measure technically referred to as precipitation depth. This represents the vertical depth of water that would accumulate on a surface if all precipitation remained without runoff, infiltration, or evaporation. For example, 10 mm/year means that each square meter of land received 10 litters of water in a year. In the OIC, the long-term annual average precipitation is 566 mm/year, well below the global average of 842 mm/year and averages non-OIC developing countries (1,034 mm/year) and developed countries (700 mm/year) (**Figure 1.6**).

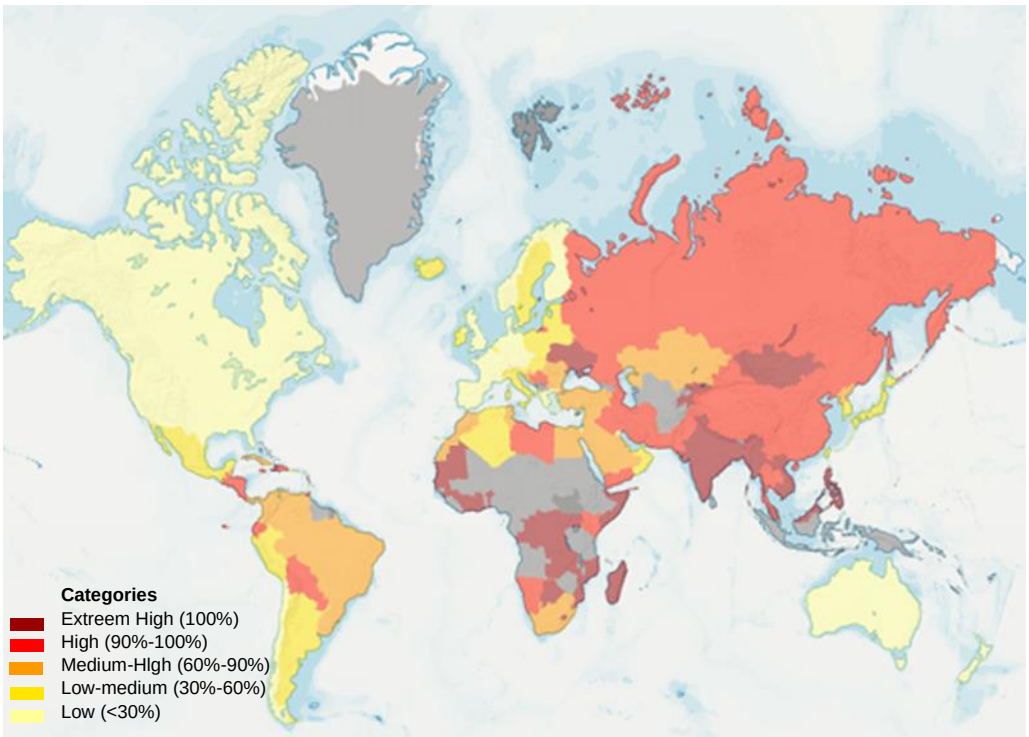
While precipitation depth reflects the average water input to water bodies, it does not capture when this water is received. To fully understand water availability, it is therefore essential to also consider seasonal variability (SV). SV refers to the degree of fluctuation in water supply between different months of the year. A high level of SV can lead to drier dry months, wetter wet months, and an increased likelihood of droughts or intense wet periods (Hofste et al., 2019). Many OIC countries experience "high" to "extremely high" levels of SV, particularly in Sub-Saharan Africa and parts of ECA and South Asia (**Figure 1.7**). This unpredictability makes water availability in these regions less reliable. Consequently, SV has already had significant negative impacts on rural water supply services in several African countries, where widespread

droughts and floods have posed considerable challenges to water security (UNICEF, 2021). Beyond rural water supply, such variability also disrupts agricultural planning, irrigation efficiency, and crop yields—posing direct risks to food security in many OIC countries.

Water Quality Challenges

Building on the challenges posed by low precipitation levels and high seasonal variability, another critical dimension of water security is not just the quantity but also the quality of available water. Achieving water, health, and food security requires both an adequate supply of water and good water quality. However, water quality issues are widespread globally, driven by changes in hydromorphology, the degradation of pristine water bodies, and the rise of pollutants and invasive species (UN, 2018). The direct impact of poor water quality is particularly severe for communities that rely on these sources as their primary supply, as it restricts water availability and increases water-related health risks UNESCO World Water Assessment Programme (WWAP, 2019), leading to broader social and economic consequences.

Figure 1.8 Untreated Connected Wastewater, 2023



Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas.

Developing countries are especially vulnerable, facing high rates of water-related diseases due to insufficient wastewater treatment before discharging into the environment, UNESCO World Water Assessment Programme (WWAP, 2017). Within the OIC region, water pollution has worsened in the majority of rivers since the 1990s. Severe pathogen contamination, together with escalating levels of nutrients and salinity, has been recorded in major rivers across Latin

America, Africa, and Asia, where many OIC countries are located. Pathogens present significant health risks when water is used untreated for drinking or household activities such as cooking, bathing, and cleaning, particularly in rural areas. In addition, increasing salinity reduces the usability of river water for irrigation, industry, and other vital purposes.

Nutrient loading presents another serious challenge for many OIC countries. Untreated wastewater from industry, agriculture, and households contributes heavily to rising nutrient emissions. High nutrient levels not only damage ecosystems and compromise direct water usage but also increase the cost and difficulty of producing clean water. OIC regions are predicted to be hotspots for rising nutrient pollution in surface waters, especially in areas where households lack adequate wastewater treatment systems United Nations Environment Programme (UNEP, 2016)

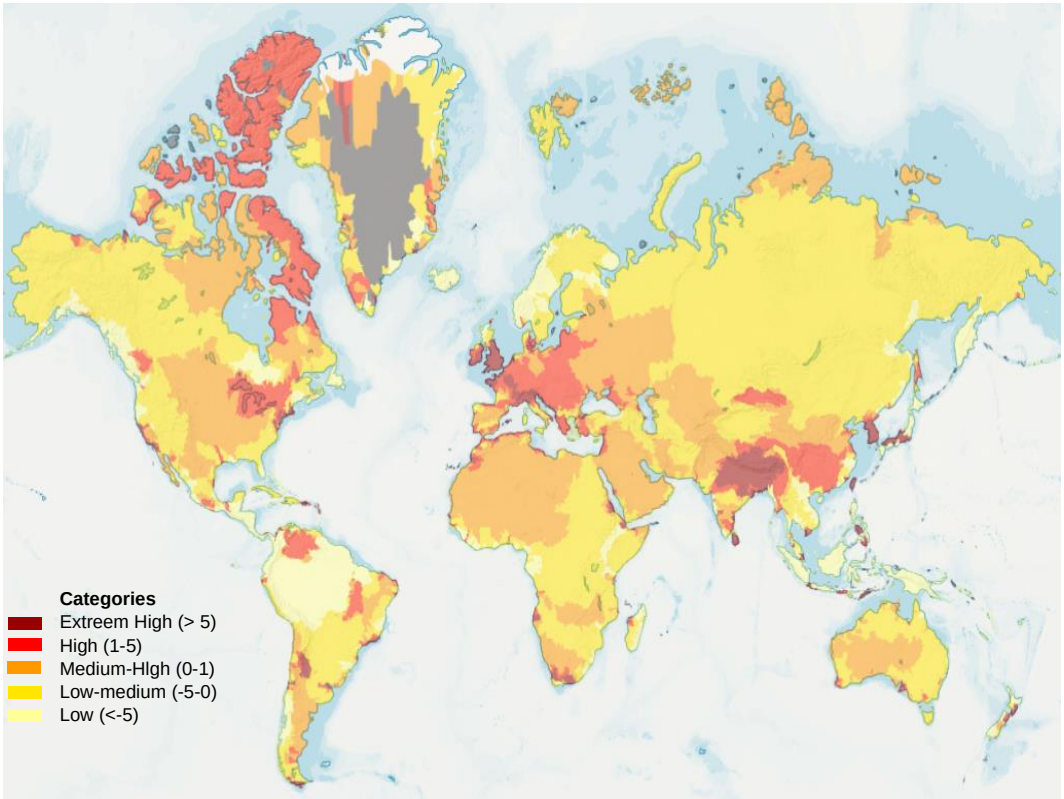
As shown in **Figure 1.8**, the status of wastewater treatment in OIC countries is alarming. The "untreated connected wastewater" indicator measures the percentage of domestic wastewater connected through sewerage systems that does not receive at least primary treatment. Higher values indicate a greater share of untreated wastewater discharge. Some member countries still lack adequate household wastewater connections (light grey), while others with connections discharge substantial amounts of untreated wastewater (red and maroon). This underscores the urgent need for improved wastewater management across the region. Ultimately, water quality challenges do not only threaten public health but also undermine agricultural productivity and food security, as polluted or saline water reduces irrigation efficiency and damages soil fertility, further straining already limited freshwater resources in OIC countries.

Apart from the inadequate treatment of wastewater, which poses risks of exposing water bodies, the general public, and ecosystems to pollutants like pathogens and nutrients (Hofste et al., 2019), another significant concern for water quality is eutrophication. Eutrophication occurs when a water body becomes excessively enriched with minerals and nutrients, leading to an overgrowth of algae. This process can deplete the water body's oxygen, resulting in detrimental effects on the surrounding ecosystem.

Excessive nutrients in water often originate from human activities. Coastal Eutrophication Potential (CEP) serves as a valuable indicator to identify areas with inadequate wastewater treatment. CEP assesses the potential for riverine loadings of nitrogen (N), phosphorus (P), and silica (Si) to stimulate harmful algae blooms in coastal waters (Hofste et al., 2019). The accumulation of N, P, and Si in water bodies triggers algae blooms, contributing to eutrophication.

Figure 1.9 illustrates some coastal areas in OIC countries with high CEP levels, indicating the potential risk of eutrophication. For instance, coastal areas of Morocco, Tunisia, Türkiye, Syria, Bangladesh, and several islands in Indonesia exhibit elevated CEP levels. Addressing eutrophication risks in these regions is crucial to safeguarding water quality and preserving the health of marine ecosystems.

Figure 1.9 Coastal Eutrophication Potential, 2023



Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas.

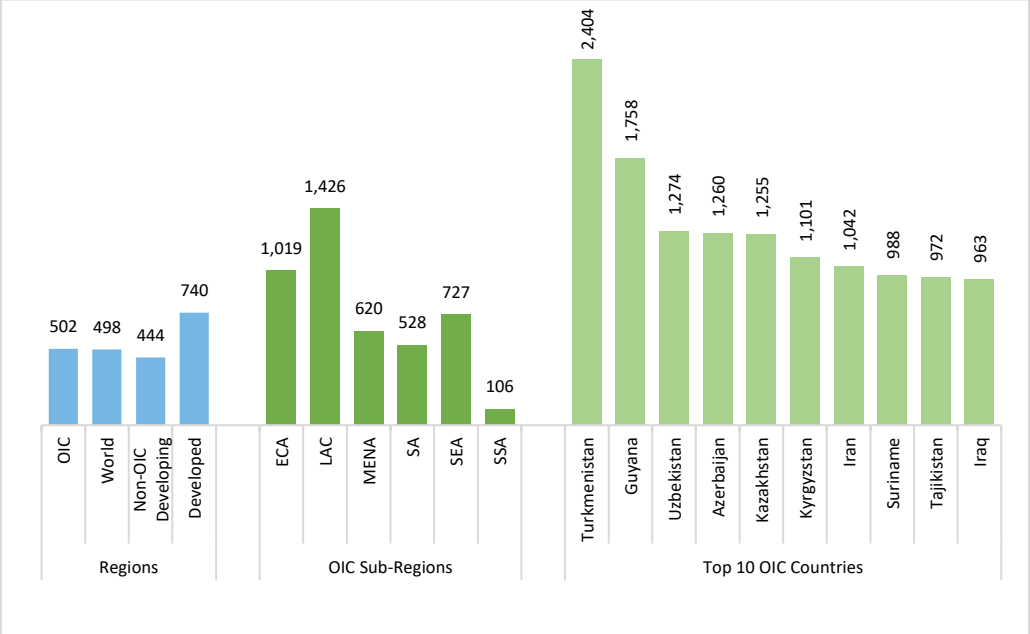
1.2. Understanding Water Demand and Use

Water Demand and Source

The most recent estimates indicate that freshwater withdrawal in OIC countries amounts to approximately 1,013 billion m^3 per year, accounting for 26% of total global freshwater withdrawal. Compared to developed countries, OIC countries exhibit notably lower water withdrawal per capita; however, their level remains above both the global average and the average of non-OIC developing countries.

As of 2022, total annual water withdrawal per person in OIC countries stood at 502 m^3/person/year, compared to 498 m^3/person/year globally, 444 m^3/person/year in non-OIC developing countries, and as high as 740 m^3/person/year in developed countries. Additionally, within the OIC regions, there are significant variations in water withdrawal per capita. In the LAC and ECA regions water withdrawal per person was 1,426 m^3/person/year and 1,019 m^3/person/year respectively, significantly above the developed countries average, while SSA has the lowest water withdrawal, with only about 106 m^3/person/year.

Figure 1.10 Total Freshwater Withdrawal per person, m³/person/year, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

At the individual country level, Turkmenistan (2,404 m³/person/year), Guyana (1,758), and Uzbekistan (1,274) recorded the highest withdrawals per person. Overall, LAC member states, countries in the Europe and Central Asia (ECA) region, as well as Iraq and Iran, exhibited the highest intensity of water withdrawals among the OIC countries relative to their populations, largely due to the heavy reliance of their agricultural sectors (**Figure 1.10**).

Table 1.1 Unconventional Water Sources, 2022

	Desalinated water produced		Direct use of agricultural drainage water		Direct use of treated municipal wastewater	
	10^9 m³/year	% of freshwater withdrawal	10^9 m³/year	% of freshwater withdrawal	10^9 m³/year	% of freshwater withdrawal
OIC	7.3	0.7%	16.6	1.6%	3.5	0.3%
World	22.6	0.6%	132.2	3.4%	17.3	0.4%
Non-OIC Developing	13.2	0.6%	113.6	5.5%	7.5	0.4%
Developed	2.0	0.3%	2.0	0.3%	6.3	0.8%
ECA	0.1	0.1%	2.4	1.2%	0.2	0.1%
MENA	7.1	2.4%	14.2	4.9%	3.3	1.1%
SA	0.015	0.006%				0.0%
SEA	0.023	0.010%				0.0%
SSA	0.005	0.008%		0.0%	0.001	0.0%

Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

It is anticipated that per capita water demand will increase in the future, primarily due to population growth and the corresponding rise in the need for agricultural production to ensure

food security. At the same time, the worsening impacts of climate change may further reduce freshwater availability. In this regard, to meet both current and future water demand, OIC countries should invest in and adopt the development of water withdrawals from non-conventional sources, alongside the sustainable and efficient use of conventional sources.

Conventional water sources, including fresh surface water and groundwater, remain the primary resources and account for the majority of total water withdrawals today. Non-conventional sources are becoming increasingly important in arid and semi-arid regions, with the main ones including desalinated water, treated wastewater, agricultural drainage water, and atmospheric water harvesting.

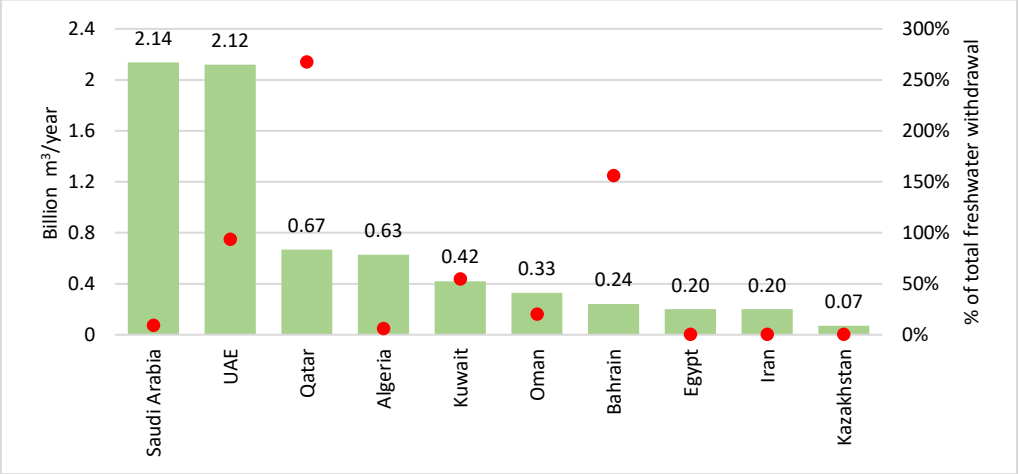
The **Table 1.1** presents a comparative overview of the production and use of water from non-conventional sources—namely desalinated water, agricultural drainage water, and treated municipal wastewater—in OIC, world, non-OIC developing countries, and developed countries as a global country groupings, and regional groups within OIC.

Globally, desalinated water production reaches 22.6 billion m^3 annually (0.6% of total freshwater withdrawals), of which OIC countries account for approximately one-third at 7.3 billion m^3, representing 0.7% of their total freshwater withdrawals. The Middle East and North Africa (MENA) region dominates desalination efforts, producing 7.1 billion m^3, or 2.4% of its total water withdrawals—significantly above global and regional averages (**Table 1.1**).

In terms of direct use of agricultural drainage water, OIC countries utilize 16.6 billion m^3, amounting to 1.6% of their total water withdrawals. Although this is below the global volume of 132.2 billion m^3 (3.4%), it still reflects notable reuse, particularly in MENA, where reuse reaches 4.9%. Similarly, OIC countries directly reuse 3.5 billion m^3 of treated municipal wastewater, comprising 0.3% of their total water withdrawals. While modest compared to developed countries (0.8%), this demonstrates growing potential—especially in MENA, where treated wastewater accounts for 1.1% of water use. Other regions, including Sub-Saharan Africa (SSA) and South Asia (SA), show minimal use of these sources, highlighting opportunities for investment and capacity building in water reuse technologies (**Table 1.1**).

At the individual country level, several OIC members rank among the global leaders in producing water from non-conventional sources. In terms of desalinated water, production is particularly significant in water-scarce regions of MENA. Saudi Arabia (2.14 billion m^3/year), the United Arab Emirates (2.12 billion m^3/year), Qatar (0.67 billion m^3/year), Algeria (0.63 billion m^3/year), and Kuwait (0.42 billion m^3/year) are heavily invested in desalination plants and possess the largest production capacities. Notably, the Maldives, Qatar, and Bahrain reported that desalinated water production exceeds their total annual freshwater withdrawals by 326%, 267%, and 156%, respectively—reflecting the critical role of non-conventional water sources in ensuring water security (**Figure 1.11**).

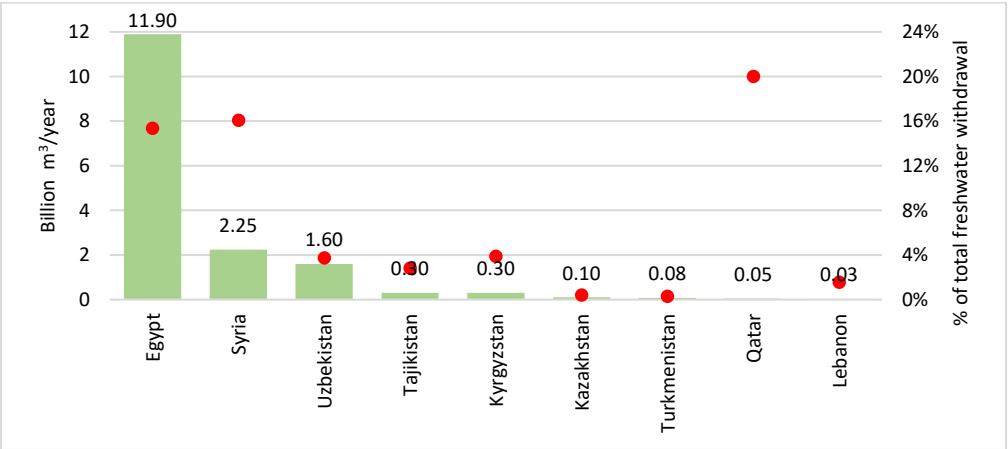
Figure 1.11 Leading OIC Countries: Desalinated water produced, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

Some other OIC countries have also invested in increasing their production capacities of desalinated seawater, although it still contributes only marginally to total withdrawals, which are primarily comprised of conventional sources. This trend reflects regional disparities in the availability of freshwater resources. At this point, it has mainly stimulated countries with critical water scarcity to invest in technology development, adoption, and financial investments in the desalination sector. However, with increasing water scarcity and the rising value of water, this trend is expected to change.

Figure 1.12 Leading OIC Countries: Direct Use of Agricultural Drainage Water, 2022

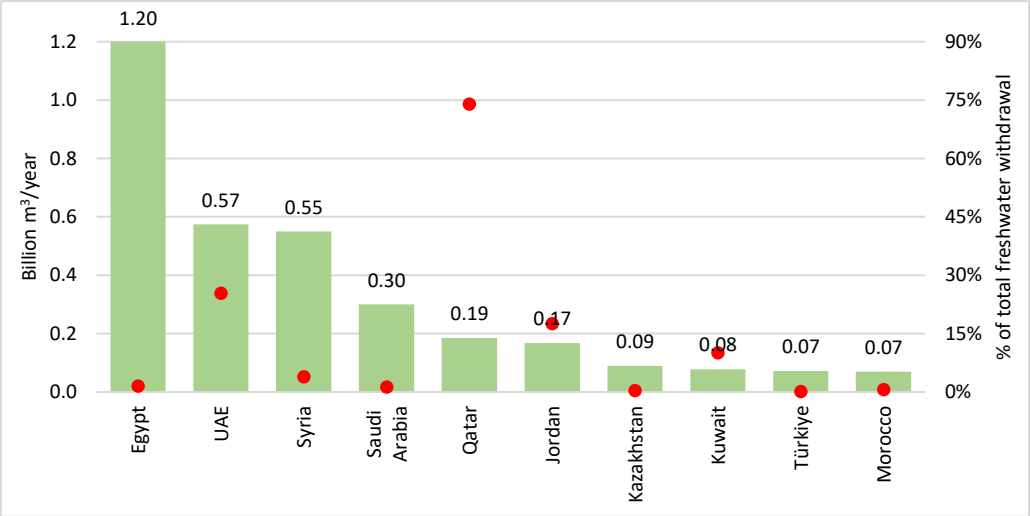


Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

Unfortunately, limited number of OIC countries with extensive irrigation systems reported to practice the reuse of agricultural drainage water. Egypt leads with a reported 11.9 billion m^3/year of agricultural drainage reuse what constitutes 15% of total freshwater withdrawal in the country, followed by Syria at 2.2 billion m^3/year; 16%) and Uzbekistan (1.6 billion m^3/year; 4%). In Tajikistan and Kyrgyzstan reuse relatively small amounts (0.3 billion m^3/year each), yet

this still contributes 3–4% of their total water withdrawals. Qatar also records use of drainage water which amount to only 0.05 billion m^3/year but it makes up 20% of total withdrawal in the country. Other countries report negligible reuse. Overall, reuse of agricultural drainage water remains underutilised in most OIC countries despite its potential to alleviate freshwater stress (**Figure 1.12**).

Figure 1.13 Leading OIC Countries: Direct Use of Treated Municipal Wastewater, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

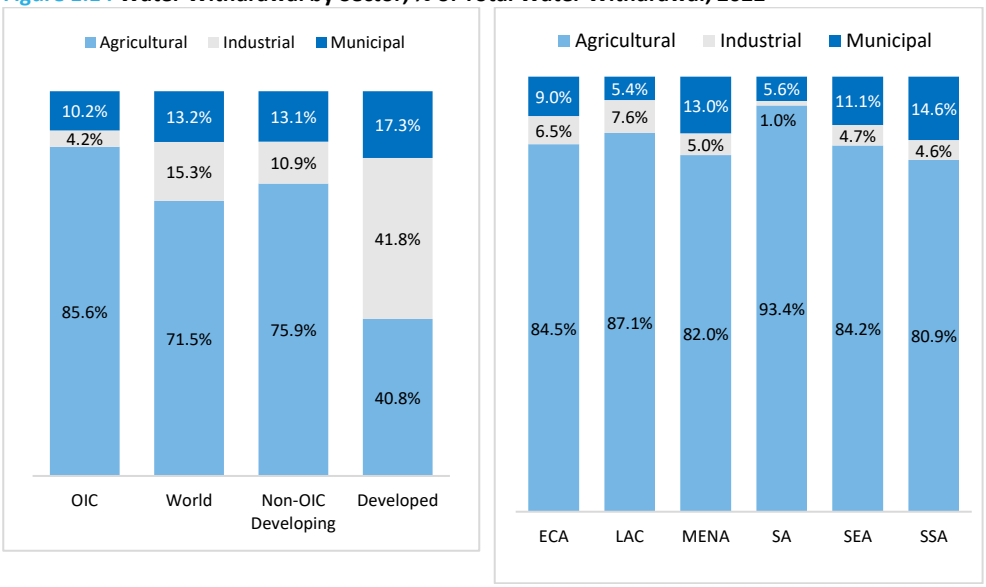
Treated municipal wastewater represents another underexploited alternative water source in most OIC countries, with notable variations. Egypt (1. billion m^3/year; 2%) and the United Arab Emirates (0.57 billion m^3/year; 25%) lead in absolute terms, respectively. Qatar, United Arab Emirates, Jordan and Kuwait report a high reuse rate of 74%, 24%, 18% and 10% respectively. Other countries report more modest volumes of treated municipal wastewater and percentages (**Figure 1.13**).

Water Demand by Sectors

In terms of sectoral water demand, the agricultural sector emerges as the predominant consumer both globally and within the OIC. In 2022, agriculture in the OIC accounted for 85.6% of total water withdrawals, with industrial and municipal withdrawals making up 4.2% and 10.2%, respectively. At the global level, water consumption patterns indicate a lower share for agriculture at approximately 71.5%, while industrial and municipal uses are higher at 15.3% and 13.2%, respectively. In developed countries, water withdrawals by sector are more evenly distributed: agriculture accounts for 40.8%, industry for 41.8%, and municipal withdrawals for 17.3% of total freshwater withdrawals (**Figure 1.14**).

While some variation exists among OIC sub-regions, the pattern remains consistent with the OIC average, with agriculture constituting the largest share—ranging from 80.9% in Sub-Saharan Africa (SSA) to 93.4% in South Asia (SA). The significant share of water demand allocated to agriculture in the OIC underscores the close relationship between water, agriculture, and food security.

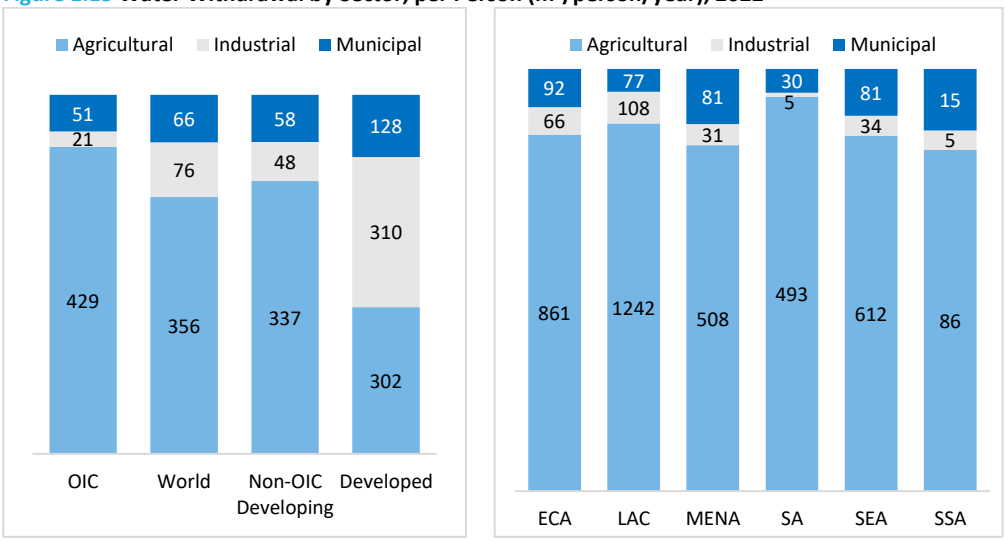
Figure 1.14 Water Withdrawal by Sector, % of Total Water Withdrawal, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

As food demand continues to rise, water demand is set to increase accordingly, posing potential food security risks for the region. This intricate link between water and food security is explored in greater detail in **Chapter 4.**

Figure 1.15 Water Withdrawal by Sector, per Person (m³/person/year), 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

Also, in per capita terms, water withdrawal is overwhelmingly dominated by the agricultural sector at 429 m³/person/year, which is above the levels in developed countries (302), non-OIC developing countries (337), and the global average of 356 m³/person/year for agricultural water withdrawal. In contrast, water usage per capita in the industrial sector is the lowest in the OIC

at 21 m^3/person/year, compared to 310 m^3/person/year in developed countries, 48 in non-OIC developing countries, and the global average of 76. OIC countries thus remain agriculture-intensive, whereas developed countries allocate more water for industry and public services, underlining the need for integrated water resource management and sectoral efficiency improvements in OIC regions (**Figure 1.15**).

The industrial sector, while the least water-consuming, plays a crucial role in the overall water balance. The majority of water demand in this sector stems from energy production, which accounts for around 75% of industrial water withdrawal (Boretti and Rosa, 2019). Ongoing development trends indicate a rise in energy demand, consequently requiring an adequate water supply. Thus, the water sector must address the water–food–energy interaction throughout its value chain—an emerging challenge of the 21st century, particularly in a rapidly growing region like the OIC.

At the same time, OIC countries are experiencing rapid urbanization, making them one of the fastest-urbanizing regions globally. The urban population in the OIC is growing by over 3% annually, and by 2035, it is projected that 343 cities will each have populations exceeding half a million (SESRIC, 2019). Consequently, municipal water demand across OIC countries is expected to surge significantly. This growth is largely driven by the increasing need for reliable water supply and improved sanitation services in expanding urban settlements.

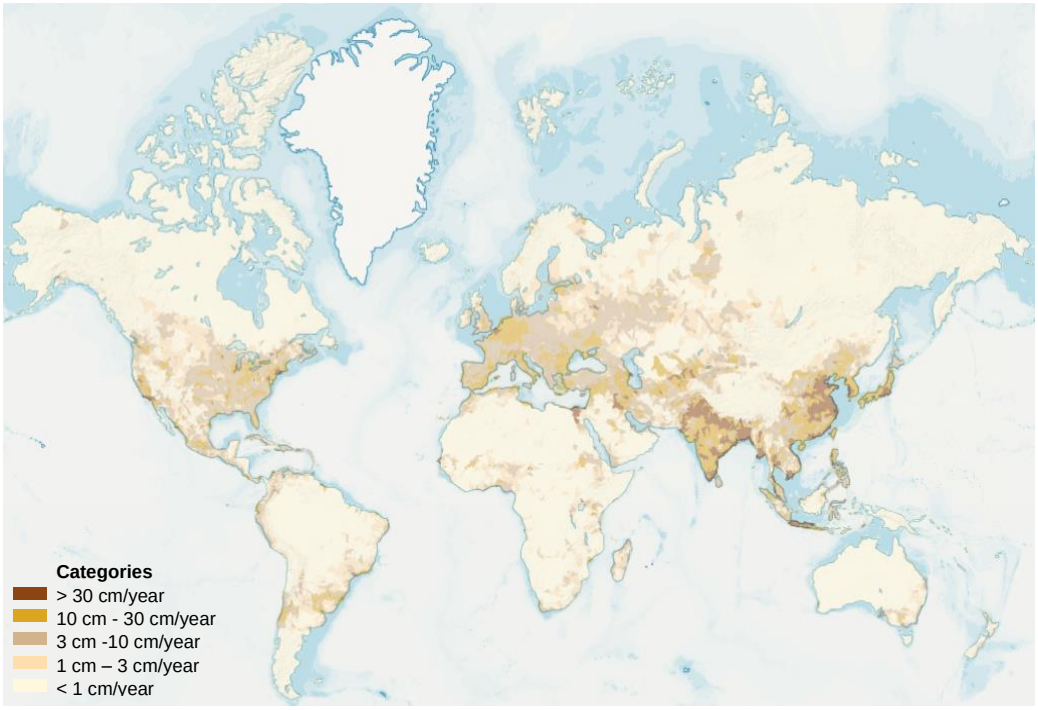
Projected Demand for Water

Water demand has shown a consistent global increase since the 1980s, growing at an approximate rate of 1% per year UNESCO World Water Assessment Programme (WWAP, 2019). This trend is also evident in OIC countries, where a combination of demand drivers, such as population growth, socio-economic development, and shifts in consumption patterns, has significantly contributed to the rise in water demand.

Looking ahead, **Figure 1.16** illustrates the projection of water demand in OIC countries by 2050. While variations exist in the increase of demand both within and between countries, WRI's projections make it clear that water demand is set to increase substantially by 2050, with major regional disparities and serious risks to economies, food systems, and energy.

Water demand is expressed in centimetres per year (cm/year) that refers to how much water would be required to cover the land area with that depth of water annually. In the map, 1 cm/year is equivalent to 100 m^3/hectare/year, means **very low demand**. Scarcely populated OIC countries with relatively abundant water resources such as Guyana and Suriname in the LAC region, Brunei Darussalam in Southeast Asia, and many Sub-Saharan African OIC countries including Mauritania, Libya, Mali, Niger, Chad, Somalia, Djibouti, Burkina Faso, Gambia, Sierra Leone, Togo, Benin, and Comoros are expected to experience a relatively low (< 3 cm/year) increase in water demand by 2050.

Figure 1.16 Projected Change in Water Demand by 2050 (cm/year), BaU Scenario



Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas (August 16, 2023). The "Business-as-Usual" (BaU) scenario reflects a continuation of current global trends, with carbon emissions remaining on a middle-of-the-road pathway—neither substantially reduced nor significantly increased.

A moderate increase in water demand, between 3 and 10 cm per year by 2050, is expected in OIC countries with more localized agricultural development, in upstream countries with easy access to water resources and stably moderate growing domestic needs. This group includes Jordan, Lebanon, Palestine, Syria, Oman, Yemen, Afghanistan, Tajikistan, Kyrgyzstan, Senegal, Cameroon, Guinea, and Cote d'Ivoire.

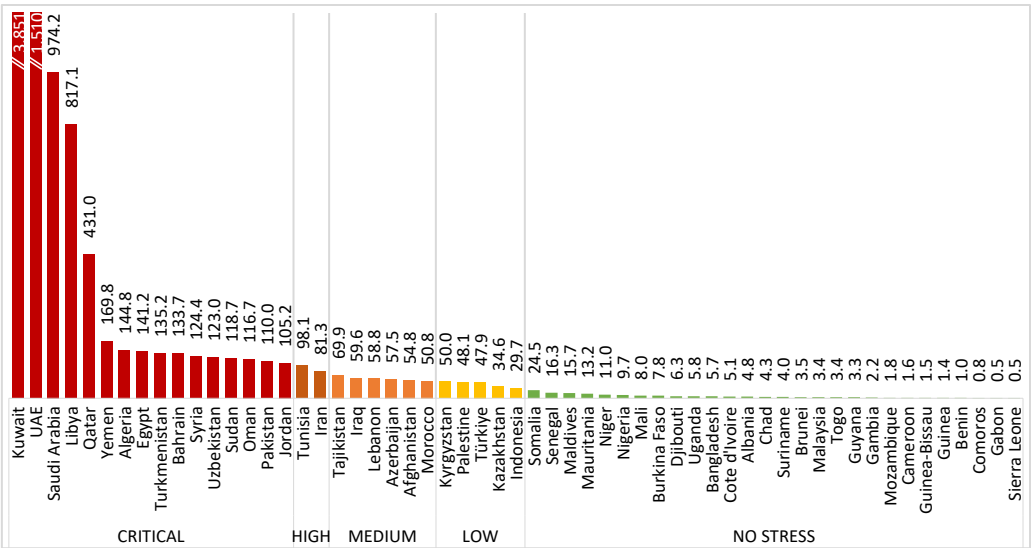
Several OIC countries with expanding urban areas and agricultural activity are projected to have a high increase in water demand, ranging between 10 and 30 cm per year by 2050, including, Türkiye, Iran, Iraq, Morocco, Algeria, Tunisia, Saudi Arabia, United Arab Emirates, Malaysia, Uzbekistan, Kazakhstan, Turkmenistan, and Azerbaijan. In contrast, a very high increase in water demand—exceeding 30 cm per year by 2050—is expected in OIC countries with densely populated urban areas and intensively irrigated agricultural sectors, including Egypt, Bangladesh, Pakistan, Indonesia, and Nigeria.

Overall, water demand in the OIC region is projected to experience significant growth. This surge will primarily be driven by increases in the industrial and domestic sectors. However, agriculture will continue to be the largest consumer of water, though to a lesser extent. As a result, agriculture will retain its pivotal role as the leading water user in the coming years.

1.3. Water Security in a Changing World

Water security is characterized as the ability of a population to ensure sustainable access to sufficient quantities of acceptable quality water, supporting livelihoods, human well-being, and socio-economic development. It also entails protection against water-borne pollution and water-related disasters while preserving ecosystems, all within a context of peace and political stability (UN-Water, 2013, p.1). This comprehensive definition highlights the multiple facets of water security, placing water at the core of broader sustainable development and human welfare.

Figure 1.17 Water Stress in OIC Countries (%), 2022



Source: SESRIC Staff calculation based on FAO AQUASTAT. UN Water & FAO (2021) defined water stress into five categories: <25% = No stress; 25-50% = Low stress; 50-75% = Medium stress; 75-100% = High stress; >100% = Critical stress.

The measurement of water security can be accomplished through the concept of water stress. Water stress is assessed by considering the proportion of water withdrawn by all sectors relative to the available water resources, including the water needed to sustain the natural environment. This indicator offers valuable insights into whether water resources are sufficient to support both the environment and society as a whole, thereby reflecting the water security status of a region. A high level of water stress not only jeopardizes the sustainability of the natural environment but also has adverse effects on socio-economic development and food security, arising from competing water demands. Additionally, this indicator serves as a means to track progress towards SDG Target 6.4[2], which focuses on ensuring sustainable water management and access for all.

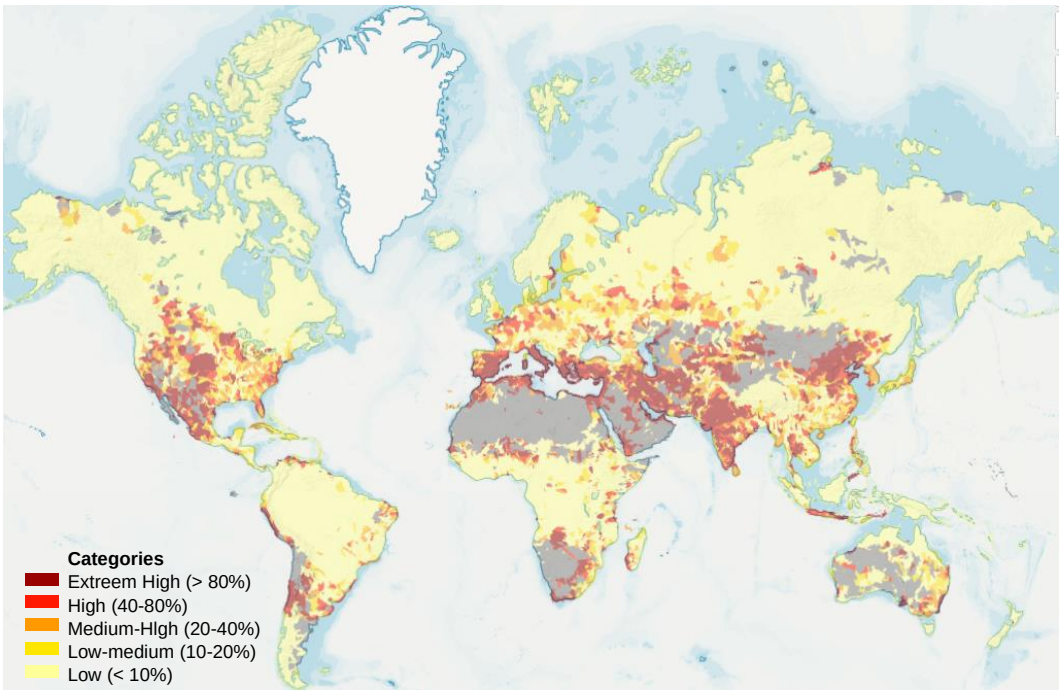
In terms of water stress levels within OIC countries, 28 OIC countries estimated to have no water stress as of 2022. Four countries exhibit 'low' levels, six have 'medium' levels, and two face 'high'

[2] *SDG Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.*

levels of water stress. Additionally, there are 16 OIC countries experiencing 'critical' stress on their freshwater resources (**Figure 1.17**). Notably, many of the countries with critical and high water stress have implemented operational water desalination plants to offset the strain on available freshwater basins. These member countries facing water stress are primarily located in arid and semi-arid regions, characterized by limited and scarce water resources, particularly in the MENA and ECA regions.

The aggregated data presented in **Figure 1.17** fails to capture the variations in water stress levels across different basins within a country. In other words, climate and environment do not recognise country borders but set their own, sometimes shifting, boundaries. The most recent projections by the World Resources Institute allow for viewing both provincial-level data and water stress levels by 2050. Many countries—for instance, Indonesia or Türkiye—are considered medium-high and high water stress countries respectively in the aggregated data by 2050, but in reality, water stress levels vary from low to extremely high across regions and local areas in these and many other countries. Therefore, understanding the water stress situation from a basin, regional, and local perspective is crucial. In this regards, **Figure 1.18,** offers a more detailed spatial resolution of water stress in OIC countries in 2050.

Figure 1.18 Water Stress, Business-as-Usual (BaU) Scenario for 2050



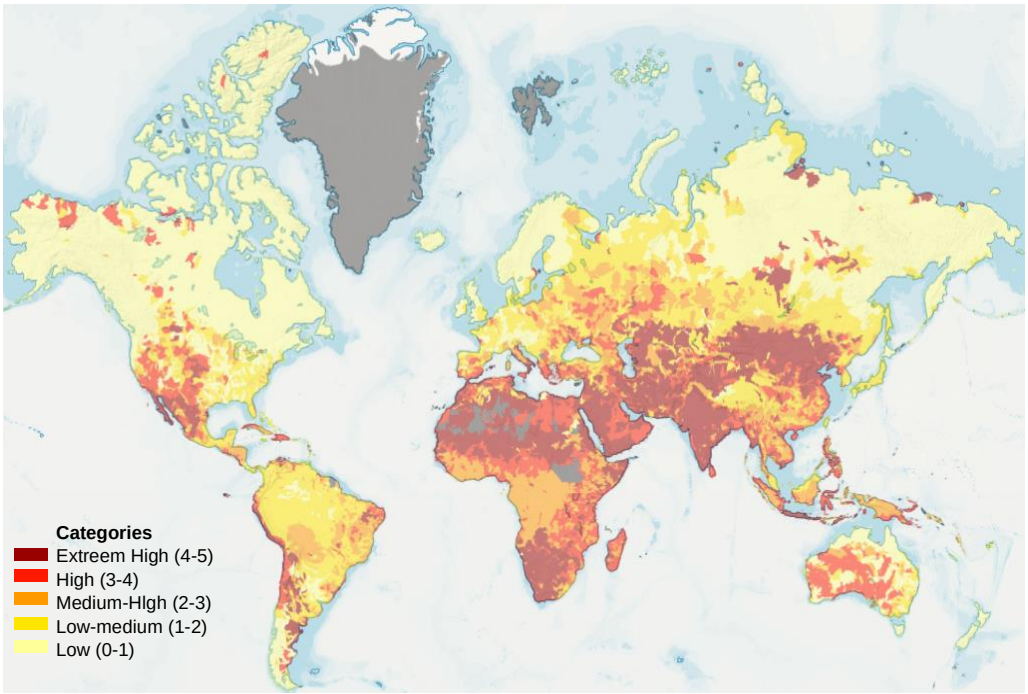
Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas (August 16, 2023). The "Business-as-Usual" scenario reflects a continuation of current global trends, with carbon emissions remaining on a middle-of-the-road pathway—neither substantially reduced nor significantly increased.

Regions with high water stress levels often coincide with centres of economic activity as well as freshwater availability. Notably, many central economic areas in MENA and ECA countries experience at least a 'high' level of water stress. Over time, water stress levels are increasing

due to growing water demand driven by population growth and changing consumption patterns. Additionally, climate change impacts are likely to further alter water availability in the future. Regions already facing water stress will become further distressed, while some regions may begin to experience water stress for the first time.

At the aggregate level, 17 OIC countries, namely; Bahrain, Lebanon, Qatar, United Arab Emirates, Oman, Tunisia, Libya, Jordan, Saudi Arabia, Algeria, Iraq, Iran, Yemen, Egypt, Kuwait, Morocco, and Syria, are forecasted to have extremely high levels of water stress by 2050. They are followed by 10 countries, Turkmenistan, Uzbekistan, Türkiye, Albania, Pakistan, Afghanistan, Kyrgyzstan, Senegal, Niger, and Burkina Faso, which are projected to face high levels of water stress, based on aggregate country-level projections under the Business-as-Usual emissions scenario by 2050 (**Figure 1.18**).

Figure 1.19 Overall Water Risk



Source: World Resources Institute, AQUEDUCT 4.0 Water Risk Atlas (August 16, 2023). The "Business-as-Usual" scenario reflects a continuation of current global trends, with carbon emissions remaining on a middle-of-the-road pathway—neither substantially reduced nor significantly increased.

Understanding water-related risks is a fundamental step in practicing sustainable water management to safeguard water security. High-risk regions often possess characteristics such as low precipitation, high population growth in water-scarce areas, and international competition over water resources. Effective water governance in the region is also crucial in managing overall water risks. To gain a more precise understanding of water-related risks, a quantitative analysis utilizing an index is employed. The World Resources Institute (WRI) developed a composite "overall water risk" score by aggregating 13 water risk indicators, covering aspects such as physical quantity, quality, and regulatory & reputational risks (Hofste et al., 2019).

Figure 1.19 illustrates the overall water risk calculated for OIC countries, highlighting the diversity of water risks both between and within OIC countries. In general, most OIC countries are already exposed to at least medium-high water risk, and immediate attention must be directed towards countries with 'high' to 'extremely high' risks. The continued trend of unsustainable water use and environmental degradation may pose risks to the economy, food production, and societal well-being in the future, particularly affecting vulnerable groups in society and exacerbating inequality.

Chapter 2: PROGRESS IN WATER, SANITATION, AND HYGIENE SERVICES



Access to safe WASH is a fundamental human right and a cornerstone of public health, sustainable development, and socio-economic well-being. WASH services are essential not only for preventing disease and maintaining health but also for supporting livelihoods, enabling education, and building resilient communities. Despite notable progress over the past decades, billions of people around the world—including many in OIC member countries—still lack access to clean drinking water, adequate sanitation, and basic hygiene services (UNICEF & WHO, 2023). These persistent gaps continue to strain health systems, entrench poverty, and limit progress toward food security and broader development goals.

The impacts of inadequate WASH infrastructure are far-reaching. Contaminated water and poor sanitation contribute to the spread of life-threatening diseases such as diarrhoea, cholera, typhoid, and neglected tropical diseases, disproportionately affecting children and vulnerable populations, (CDC, 2024). Beyond the immediate health risks, poor WASH conditions impair agricultural productivity, reduce labour efficiency, increase healthcare costs, and cause educational disruptions—particularly among children—thereby undermining both food security and socio-economic development (WHO, 2015).

2.1. Access to Water, Sanitation and Hygiene (WASH) Services

Recognising interlinkages between access to WASH services, food security and health, the OIC Water Vision 2013–2025, adopted at the 2nd Islamic Conference of Ministers Responsible for Water held in Istanbul in March 2012, underlines the need to ensure universal access to water and sanitation services across member countries. This Vision not only anticipated global priorities but also strongly aligns with Sustainable Development Goal 6, which aims to "ensure availability and sustainable management of water and sanitation for all" by 2030. As such, SDG 6 further reinforces the commitments outlined in the OIC Water Vision, reflecting a shared recognition of the fundamental role of WASH in sustainable development. While OIC countries have made significant progress in expanding water and sanitation services through the OIC Water Vision's framework of "Working together for a water-secure future" and the SDG 6 agenda, basic drinking water, sanitation, and hygiene services remain inaccessible to millions, particularly those living in rural areas and in OIC member countries in Africa.

The nexus between WASH and food security is especially critical in water-scarce regions, where rising demand for water across domestic, agricultural, and industrial sectors places immense pressure on already limited resources. Expanding WASH services requires substantial volumes of water for treatment and distribution, further intensifying resource scarcity (UN-Water, 2020). Conversely, inadequate WASH access contributes to environmental contamination and increases vulnerability to waterborne diseases, which negatively affect agricultural productivity and nutritional outcomes (CDC, 2024).

As Dr. Tedros Adhanom Ghebreyesus, Director-General of the WHO, aptly stated: "Safe water, sanitation, and hygiene at home should not be a privilege of only those who are rich or live in urban centres. These are some of the most basic requirements for human health, and all countries have a responsibility to ensure that everyone can access them." In light of growing water scarcity and its implications for health and food security, strengthening WASH systems remains a top priority for OIC countries. Water is the most important resource for sustaining

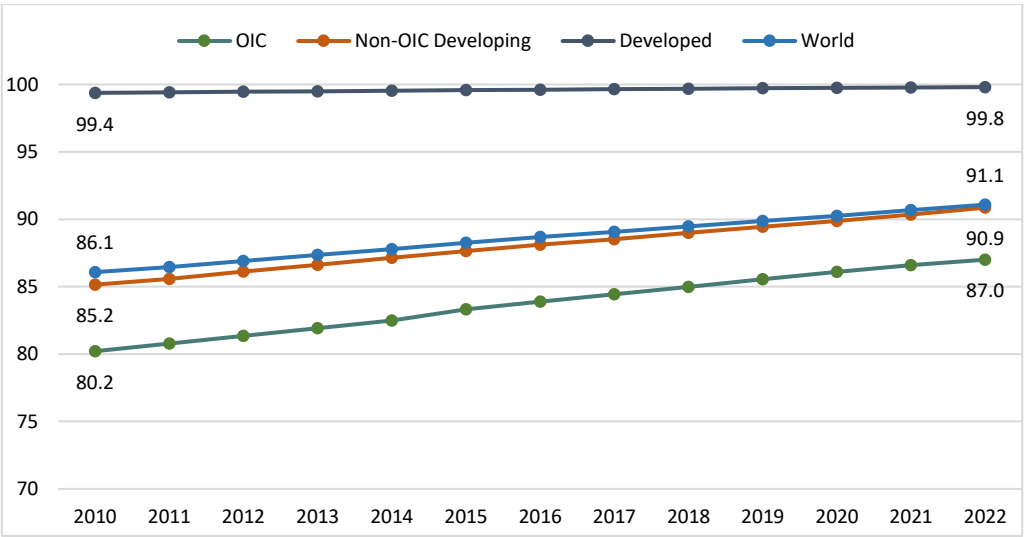
ecosystems, which provide life-supporting services for people, animals, and plants. As such, safe and readily available water is essential for public health, whether for drinking, domestic use, food production, or recreation. Improved water supply, sanitation, and better water resource management can drive economic growth and significantly reduce poverty. On average, a person requires 50 to 100 litres of water daily to meet basic drinking, cooking, and hygiene needs (Fujs and Kashiwase, 2023).

Over the past decade, significant progress has been made in expanding access to basic drinking water, with billions of people gaining access to safely managed services. Accordingly, the number of people without access to at least basic drinking water services declined from 1.2 billion in 2000 to 703 million in 2022 worldwide (UNICEF & WHO, 2023). This progress is tracked using the percentage of people with access to at least basic water services, which include both basic and safely managed drinking water. Basic services refer to drinking water from improved sources such as piped water, boreholes, protected wells or springs, and packaged or delivered water, provided that the round-trip collection time does not exceed 30 minutes (World Bank, World Development Indicators metadata).

Drinking Water

Between 2010 and 2022, the global population with access to at least basic drinking water services increased from 86.1% to 91.1%, a 5-percentage-point increase. In OIC countries, access rose from 80.2% to 87.0%, reflecting a 6.8-percentage-point increase. Since 2013, the share of people with access to at least basic drinking water has grown by 5.1 percentage points. Although OIC countries still lag behind non-OIC developing countries and the global average in coverage, they have experienced a faster growth rate in expanding access to basic drinking water services (**Figure 2.1**).

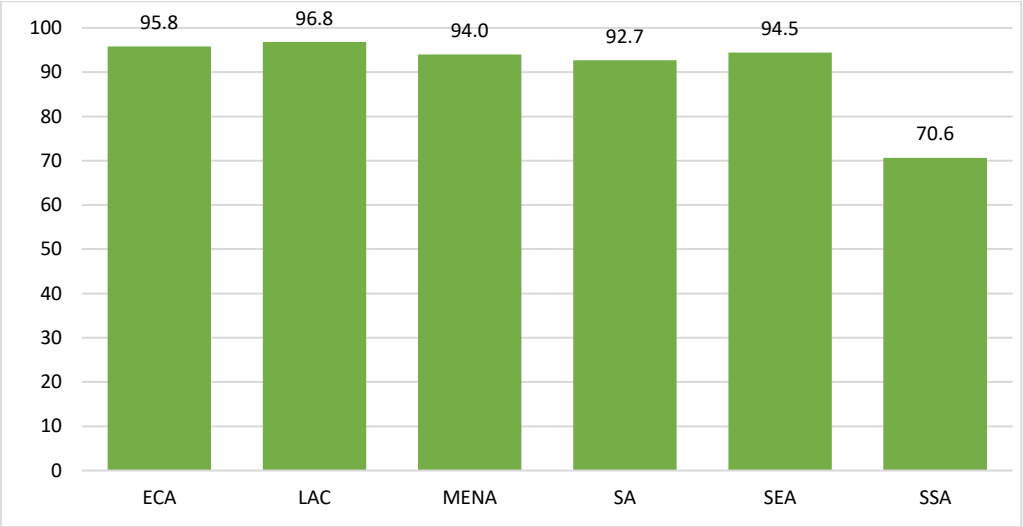
Figure 2.1 People Using at least Basic Drinking Water Services, % of Population



Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database.

While 87% of the population in OIC countries had access to at least basic drinking water services in 2022, coverage varied significantly across OIC geographical regions. The highest access was recorded in Latin America and the Caribbean (LAC) at 96.8%, followed by Europe and Central Asia (ECA) at 95.8%, Southeast Asia (SEA) at 94.5%, the Middle East and North Africa (MENA) at 94.0%, and South Asia (SA) at 92.7%. In contrast, Sub-Saharan Africa (SSA) had the lowest coverage, with only 70.6% of the population able to access at least basic drinking water services (**Figure 2.2**).

Figure 2.2 People Using at least Basic Drinking Water Services, % of Population, by OIC Sub-Regions, 2022



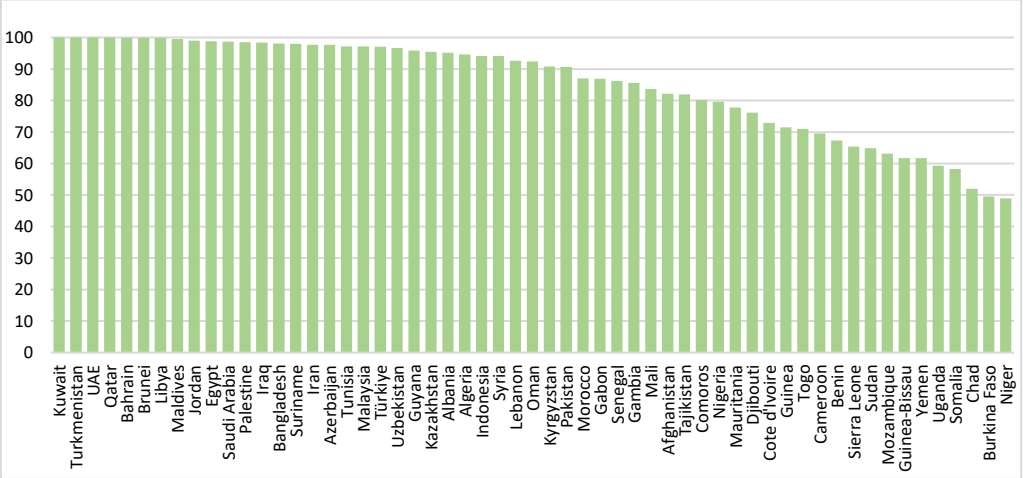
Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

In 2022, access to at least basic drinking water services varied significantly across member countries of the OIC. While some countries reported universal or near-universal coverage, others struggled with critically low access rates.

At the top, four OIC countries—Kuwait, the United Arab Emirates, Turkmenistan, and Qatar—achieved universal coverage, with their entire populations having access to safe drinking water. In stark contrast, Niger recorded the lowest access rate among OIC members, at just 48.9%. Similarly, Burkina Faso reported only marginally better coverage, at 49.5%. These two countries are the only OIC members where more than half of the population lacks access to basic drinking water services (**Figure 2.3**).

The OIC region of Sub-Saharan Africa is home to most of the countries with the lowest access rates. However, progress has been made over the past decade, particularly in 16 OIC countries where access improved by more than 10 percentage points. Notably, many of these improving countries are located in Sub-Saharan Africa. Despite these gains, access rates in this region remain lower compared to other OIC regions, underscoring the need for continued investment and policy focus.

Figure 2.3 People Using at least Basic Drinking Water Services in OIC Countries, % of Population, 2022



Source: World Bank's World Development Indicators Database.

Individually, OIC countries must scale up their efforts to achieve universal coverage by 2030, a key target under the SDGs. While some have already reached this milestone, others—particularly in the OIC Sub-Saharan Africa region—require accelerated action to ensure no one is left behind.

Sanitation

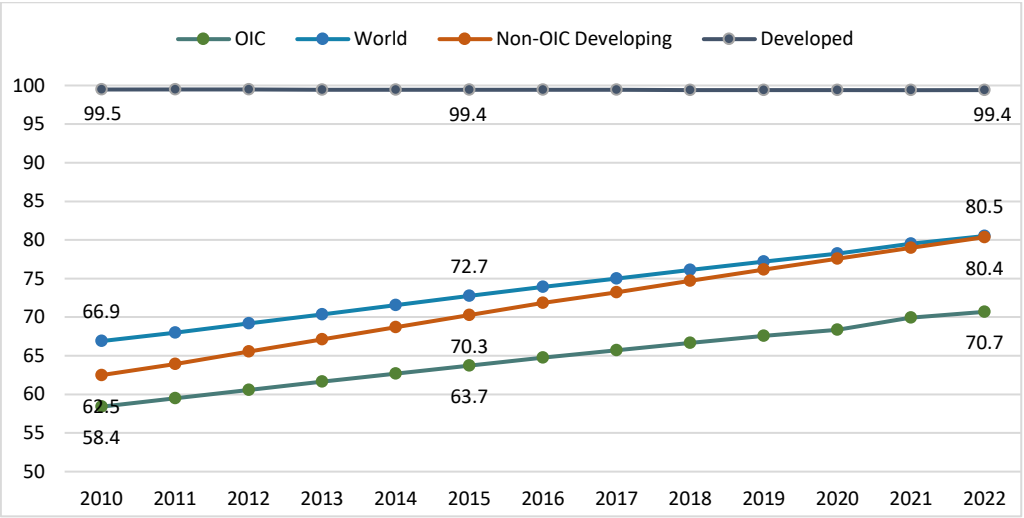
While access to safe drinking water is fundamental, it must be complemented by adequate sanitation to fully safeguard public health and promote sustainable development. Sanitation is more than just hygienic facilities for waste disposal; proper sanitation serves as an essential measure of societal progress, directly combating poverty, disease, and preventable mortality. As a basic necessity, it must be accessible to all people regardless of age, gender, or socioeconomic status. Access to basic sanitation services is measured by the percentage of people using improved facilities, such as flush toilets, septic tanks, or ventilated pit latrines that are not shared with other households (World Bank, World Development Indicators metadata).

However, according to the WHO (2023), inadequate sanitation remains a leading global health threat, particularly for children. Diarrheal diseases—fuelled by poor sanitation—are ranked as the third leading cause of death among children under five worldwide, claiming approximately half a million young lives annually. These staggering losses are preventable, as evidence consistently shows that access to basic and safely managed sanitation services dramatically reduces diarrheal disease transmission.

According to the latest World Bank estimates, only 70.7% of the population in OIC countries had access to basic sanitation services in 2022, leaving nearly 30%—over one-quarter—of the OIC population at risk of sanitation-related diseases like diarrhoea. This coverage lags significantly behind the global average (80.5%), other developing countries (80.4%), and developed countries (99.4%). While significant gaps remain, recent data show encouraging progress in sanitation access across OIC countries. Between 2010 and 2022, the proportion of people with basic sanitation services increased by 12.3 percentage points, with 9.1 percentage points of this

growth occurring during the implementation period of the OIC Water Vision 2013–2025. However, this progress still underperformed compared to the global average increase of 13.6 percentage points during the same period (**Figure 2.4**).

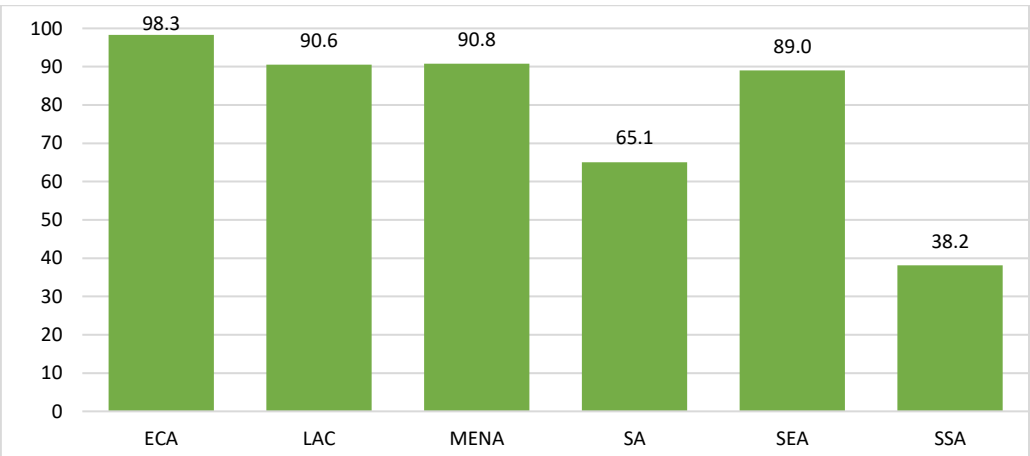
Figure 2.4 People Using at least Basic Sanitation Services, % of Population, 2022



Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database

According to WHO estimates, achieving the SDG targets will require doubling the current rate of progress to reach universal basic sanitation by 2030, while safely managed services demand an even more ambitious five-fold acceleration in implementation (WHO, 2024). Without urgent action—including scaled-up investments, accelerated infrastructure development, and stronger policy commitments—both OIC countries and other developing countries will continue to bear the preventable health consequences and economic costs of inadequate sanitation.

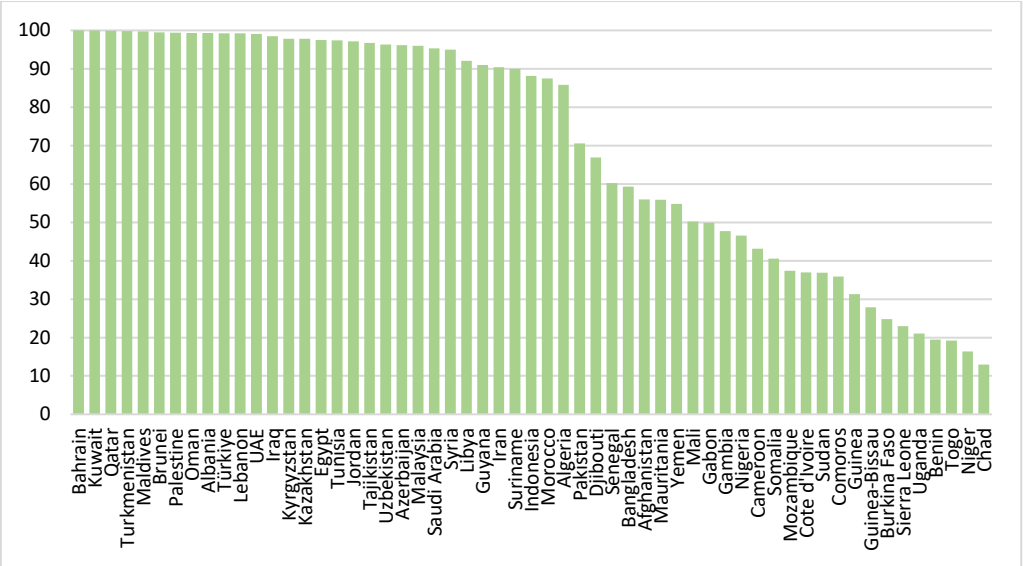
Figure 2.5 People Using at least Basic Sanitation Services, % of Population, by OIC Sub-Regions, 2022



Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

Significant regional disparities exist in sanitation access across OIC geographical groups. In 2022, all OIC regions except Sub-Saharan Africa (SSA) and South Asia (SA) exceeded the global average of 80.5% for basic sanitation access. The Europe and Central Asia (ECA) region led with 98.3% coverage, followed by the Middle East and North Africa (MENA) at 90.8% and Latin America (LAC) at 90.6%. The situation in OIC SSA shows a particularly stark disparity: while the region maintains 70.6% access to basic drinking water services, only 38.2% of the population had basic sanitation coverage (**Figure 2.5**). This rate represents less than half the global average and stands as the lowest among all OIC regions, underscoring a critical infrastructure gap in water and sanitation service provision.

Figure 2.6 People Using at least Basic Sanitation Services, % of Population in OIC Countries, 2022



Source: World Bank's World Development Indicators Database.

At the individual OIC country level, Bahrain and Kuwait achieved universal basic sanitation coverage for all their citizens in 2022. Meanwhile, countries such as Qatar, Turkmenistan, Maldives, Brunei Darussalam, Palestine, Oman, Albania, Türkiye, Lebanon, and the United Arab Emirates reported near-universal coverage, all with rates exceeding 99%. The OIC Europe and Central Asia (ECA) region recorded the highest basic sanitation coverage, with national rates ranging from 96.1% in Azerbaijan to 99.8% in Turkmenistan.

In contrast, only three OIC countries from SSA region—Senegal, Mauritania, and Mali—had basic sanitation coverage for at least half of their populations. In most other countries in this region, coverage remained below 50%, with particularly dire conditions in Chad, Niger, Togo, Benin, Uganda, Sierra Leone, and Burkina Faso, where only about a quarter of the population had access to basic sanitation services (**Figure 2.6**).

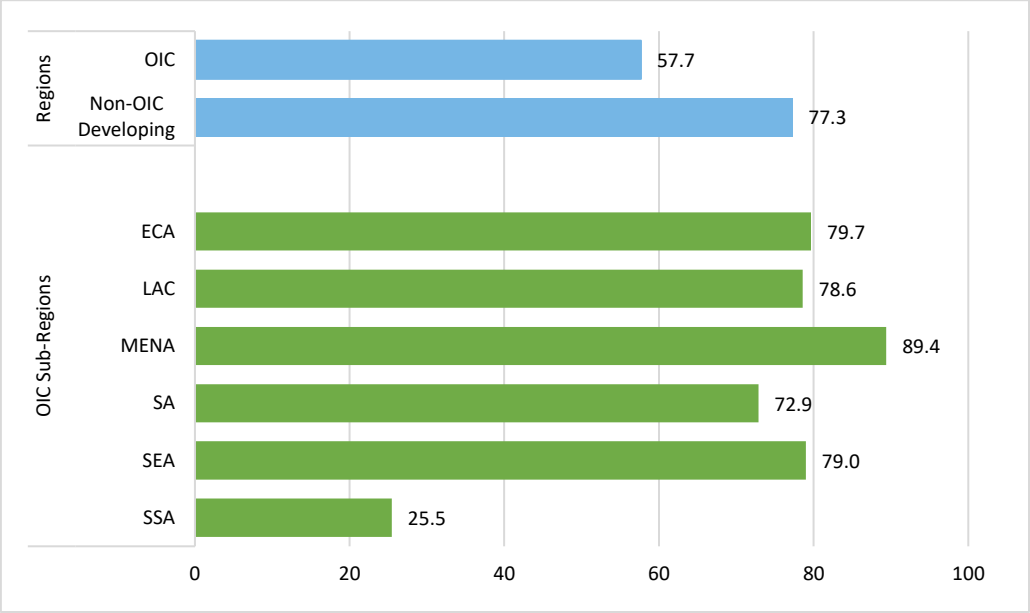
Between 2010 and 2022, basic sanitation coverage improved significantly across OIC countries, with the most notable increases in Indonesia, Mauritania, Pakistan, Mali, and Afghanistan. Despite their low overall coverage, all countries in the OIC SSA region expanded access to sanitation services during this period.

Hygiene

Hygiene is fundamentally linked to public health and sanitation, encompassing key behaviours such as handwashing, menstrual hygiene, and food hygiene—with handwashing using soap and water being the global monitoring priority. Hands play a major role in spreading diseases; therefore, cleaning them regularly with soap and water remains one of the most cost-effective ways to protect health. Yet, billions of people still lack access to handwashing facilities with soap and water.

The indicator basic handwashing facilities at home measures the percentage of the population with access to soap and water at household handwashing stations, including sinks with taps or other water-regulating devices (WHO Metadata). As highlighted earlier, safe drinking water and sanitation are recognized human rights, and access to these services—along with soap and water for handwashing—is fundamental to human health and well-being. Together, they are critical for improving nutrition, enhancing food security and productivity, preventing disease, and enabling effective healthcare. They also ensure the functioning of schools and workplaces and support the full participation of women, girls, and marginalized groups in society (UN-Water, 2021).

Figure 2.7 People with Basic Handwashing Facilities Including Soap and Water, % of Population, 2022

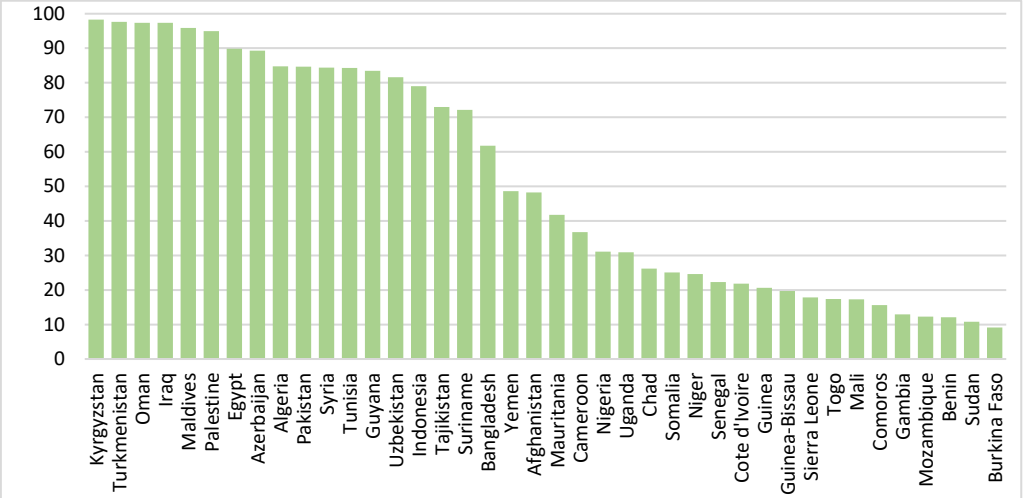


Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database. Note: Analysis is based on data from 40 OIC countries, excluding most of the OIC high-income countries and some of the upper-middle-income countries. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

As of 2022, only 57.7% of the population in OIC countries had access to basic handwashing facilities with soap and water at home. This is significantly below the average for other developing countries, where over three-quarters (77.3%) of the population had such access (Figure 2.7). A regional breakdown of OIC countries reveals notable disparities. The MENA region

leads with 89.4% coverage, followed by ECA (79.7%) and SEA (79.0%). These figures indicate that at least two-thirds of the population in most OIC regions have access to basic hygiene services. The stark exception is SSA, where only about 25.5% of the population has this essential service (**Figure 2.7**).

Figure 2.8 People with Basic Handwashing Facilities Including Soap and Water in OIC Countries, % of Population, 2022



Source: World Bank's World Development Indicators Database.

At the country level, several OIC members—including Kyrgyzstan, Turkmenistan, Oman, Iraq, Maldives, Palestine, Egypt, Azerbaijan, Algeria, Pakistan, Syria, Tunisia, Guyana, Uzbekistan, and Indonesia—have achieved coverage exceeding 75%. In contrast, many OIC SSA countries—particularly Burkina Faso, Sudan, Benin, Mozambique, Gambia, Comoros, Mali, Togo, Sierra Leone, Guinea-Bissau, Guinea, Cote d'Ivoire, Senegal, and Niger—struggled with extremely low access rates of less than 25% (**Figure 2.8**). Inequalities in WASH Coverage: Rural–Urban and Gender Dimensions

2.2. Inequalities in WASH Coverage

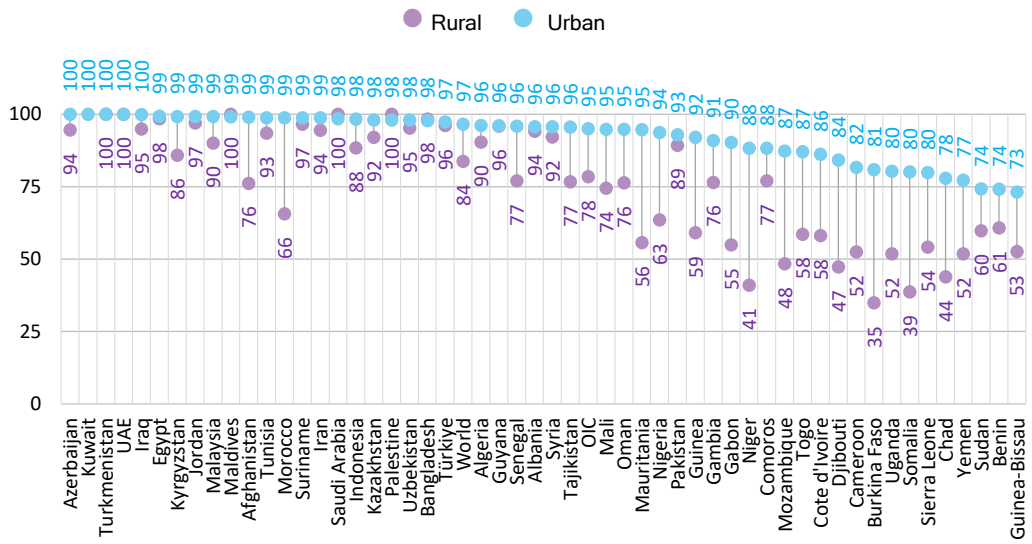
Understanding disparities in WASH coverage between urban and rural areas, and among men and women are essential for prioritising community interventions and resource allocation. According to the World Bank (2017), significant gaps remain in accessing WASH services, often linked to wealth levels, location, and other demographic factors, with rural areas lagging far behind. The rural–urban disparity in particular persists due to reasons such as funding imbalances—where the majority of WASH financing benefits urban residents—and weak national capacity to implement WASH plans, especially in rural areas (WHO & UN-Water, 2014).

In recent years, efforts to address and reduce disparities in access to WASH services have gained momentum, driven by the “leave no one behind” principle advocated by the SDGs. However, structural inequalities in the provision of WASH services persist, leading to discrimination against women and based on factors such as geographical location, socioeconomic status, and context-specific conditions (WHO & UNICEF, 2019).

Rural Urban Disparities

An overview of rural–urban WASH service disparities in OIC countries, based on the latest estimates, shows that the gap is not limited to different OIC geographical groups but also extends to urban–rural divisions within member countries. Globally, 97% of people in urban areas had access to at least basic drinking water services in 2022, compared to 84% in rural communities. In OIC countries, 95% of urban residents enjoyed such services, while only 78% of rural populations did. These disparities resulted in gaps of 13 and 17 percentage points between urban and rural access worldwide and in OIC countries, respectively (**Figure 2.9**).

Figure 2.9: People using at least Basic Drinking Water Services by Area, % of Rural and Urban Populations, in OIC Countries, 2022



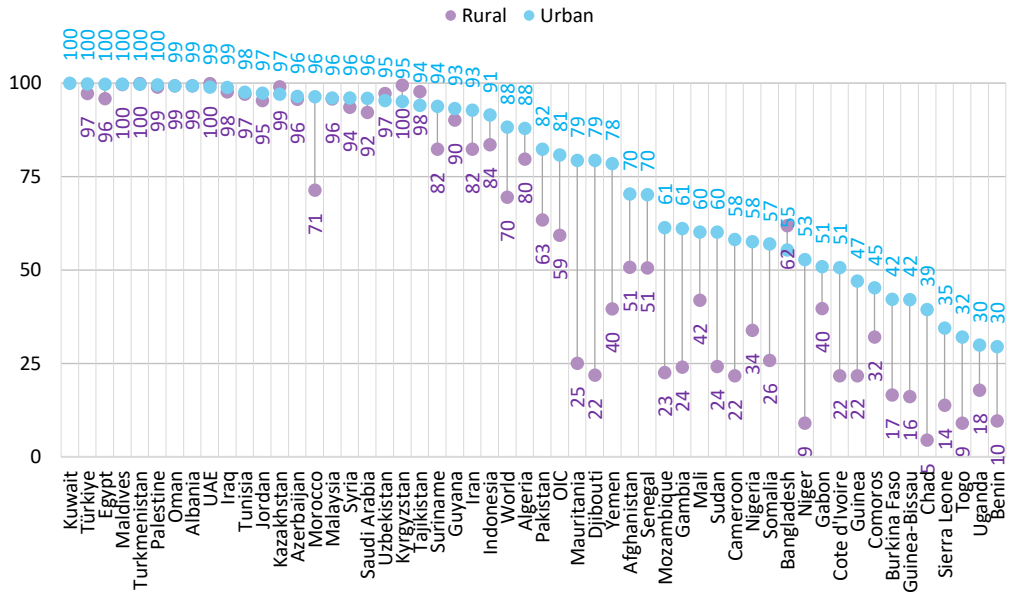
Source: World Bank's World Development Indicators Database. Note: Urban data for Comoros is based on 2019 figures, while rural data for Comoros and Kazakhstan corresponds to 2019 and 2021, respectively.

In 2022, rural–urban disparities in access to basic drinking water services were minimal or fairly balanced in Kuwait, Turkmenistan, United Arab Emirates, Jordan, Suriname, Albania, Türkiye, Egypt, Guyana, Bangladesh, Maldives, Saudi Arabia, and Palestine. In contrast, countries such as Niger, Burkina Faso, Somalia, Mozambique, Mauritania, Djibouti, Gabon, Chad, Morocco, Guinea, and Nigeria experienced disparities exceeding 30 percentage points. While urban populations generally benefit more from this basic necessity, rural communities in these OIC countries—particularly in Sub-Saharan Africa—continue to struggle. However, in Bangladesh, Maldives, Saudi Arabia, and Palestine, rural access to basic drinking water services actually surpassed that of urban areas (**Figure 2.9**).

As of 2022, rural–urban disparities in access to basic sanitation within OIC countries were even more pronounced than those in drinking water services. While 81% of urban residents had access to basic sanitation, only 59% of rural populations did, resulting in an average disparity of 22 percentage points—higher than the 19-point global gap (Figure 2.10). Although more than

half of the population in both rural and urban areas of OIC countries had access to basic sanitation, 10 countries—namely Djibouti, Mauritania, Niger, Yemen, Mozambique, Gambia, Cameroon, Sudan, Chad, and Somalia—still faced extreme disparities exceeding 30 percentage points. In some countries, the situation was particularly dire, especially in Chad, Niger, Togo, Benin, and Sierra Leone, where less than 15% of the rural population had access to basic sanitation, highlighting severe inequities in service provision.

Figure 2.10: People using at least Basic Sanitation Services by Area, % of Rural and Urban Populations, in OIC Countries, 2022



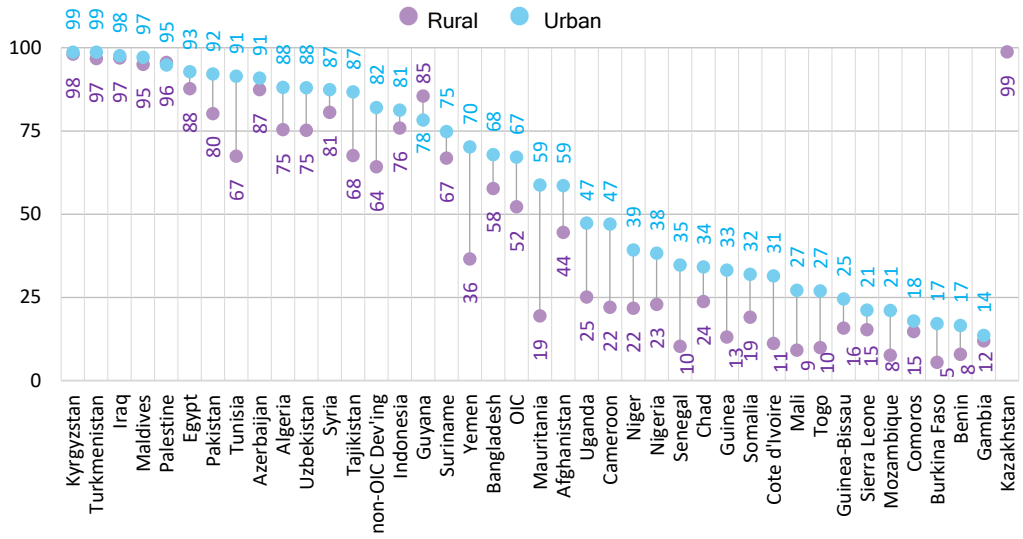
Source: World Bank's World Development Indicators Database. Note: Urban data for Comoros is based on 2019 figures, while rural data for Comoros and Sudan corresponds to 2019 and 2020, respectively.

Conversely, some countries demonstrated near-parity in sanitation access between rural and urban areas. These include Tunisia, Malaysia, the Maldives, Albania, Oman, Turkmenistan, Iraq, Azerbaijan, Palestine, and the United Arab Emirates (**Figure 2.10**).

Access to basic hygiene facilities also remains a significant challenge in developing countries, particularly in rural communities. Latest estimates from 2022 show that 67% of the urban population in OIC countries had basic handwashing facilities, compared to only 52% of rural residents—a disparity of 15 percentage points (**Figure 2.11**). The gap was even more pronounced in countries such as Mauritania, Yemen, Cameroon, Senegal, Tunisia, Uganda, Cote d'Ivoire, and Guinea, where urban coverage exceeded rural access by more than 20 percentage points. In rural areas of Burkina Faso, Mozambique, Benin, and Mali, handwashing services remained especially inadequate compared to urban areas (**Figure 2.11**).

Improving access to hygiene services, especially in rural areas, is essential for promoting public health and achieving SDG Target 6.2, which aims to ensure adequate and equitable sanitation and hygiene for all by 2030 across all OIC countries.

Figure 2.11: People using at least Basic Handwashing Facilities by Area, % of Rural and Urban Populations, in OIC Countries, 2022



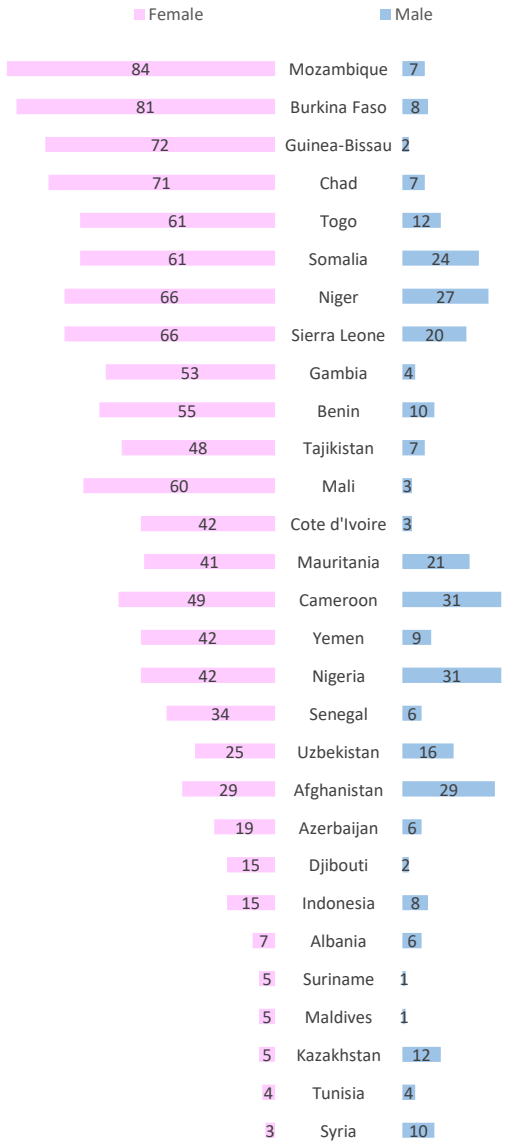
Source: World Bank's World Development Indicators Database. Note: The list is based on latest year available from 2015-2022 from 40 OIC countries, excluding the OIC high-income countries and some upper-middle-income countries

Gender in WASH Coverage

In many societies around the world, the responsibility for managing household WASH falls disproportionately on girls and women, highlighting gender inequality and limiting their opportunities for education, employment, and social mobility. Their duties often include cleaning, washing, waste disposal, personal hygiene, and the preparation and storage of food and water, as well as caring for family members—particularly children, the elderly, and the sick. Recognising this burden, Goal 5 of the 2030 Agenda for Sustainable Development calls for gender equality and the empowerment of all women and girls. The Agenda also emphasises that advancing gender equality is essential for progress across all SDGs, including those related to WASH. While the importance of WASH in achieving gender equality is widely acknowledged, SDG Target 6.2 explicitly calls for special attention to the needs of women and girls in WASH at national and global levels (WHO & UNICEF, 2023). Despite the SDGs' emphasis on equitable access to water, women remain primarily responsible for fetching water in most households without on-premises access. This burden has wider implications for gender roles, economic participation, and educational attainment, particularly for girls (Borja-Vega & Grabinsky, 2019).

Data from 29 OIC countries corroborates this situation, showing that in rural areas, the burden of collecting water primarily falls on women and girls. This is especially evident in 11 OIC SSA countries—namely Mozambique, Burkina Faso, Guinea-Bissau, Chad, Niger, Sierra Leone, Somalia, Togo, Mali, Benin, and Gambia—where in at least one out of every two households without piped water, women and girls are tasked with water collection (**Figure 2.12**). Consequently, they have limited time available for income-generating work or pursuing education.

Figure 2.12 Primary Responsibility for Water Collection in Rural Areas, by Gender,%, in OIC Countries, 2017



Source: Based on data from UNICEF's Thematic Report on Safely Managed Drinking Water (2017). Note: Includes only countries where at least 10% of households access water off-premises. Female data includes girls under 15 and women aged 15 and above; male data includes boys under 15 and men aged 15 and above. Data does not add up to 100% as not all households collect water and data for some households is unavailable.

Furthermore, the physical strain of carrying water can result in adverse health consequences, such as chronic pain and disability. The consequences of inadequate WASH access extend beyond water collection to sanitation and hygiene, with serious implications for women's safety, dignity, and health. For women and girls, sanitation is also about personal safety; being forced to relieve themselves outdoors or in shared, non-gender-segregated facilities increases the risk of harassment, abuse, and sexual violence (Masgon & Gensch, n.d.). Furthermore, women and girls have specific hygiene needs during menstruation and pregnancy. These require clean, lockable, gender-sensitive toilets with access to sanitary materials and appropriate disposal systems (UNICEF & WHO, 2024). The implications of women's WASH responsibilities are not limited to the household but also impact agricultural productivity and household food preparation, areas where women are often central actors. In many rural settings, small-scale farming, kitchen gardens, and livestock care typically fall within the domain of women and rely heavily on access to water. Such participation has made women account for a significant share of agricultural employment, particularly in low- and middle-income countries (FAO, 2011 & 2023). However, their productivity is often constrained by the disproportionate burden of unpaid and under-recognised work—especially WASH-related tasks such as water collection and hygiene management—and the exclusion of women from participating in water and sanitation management.

Yet, there is clear evidence that when women are included in WASH and agricultural water governance, outcomes improve significantly. In support of this, FAO has emphasised the importance of involving women in decision-making and ensuring gender-sensitive data collection and projects, especially through tools like the Socioeconomic and Gender Analysis Program (SEAGA), FAO's Global Information System on Water and Agriculture (AQUASTAT), and field-level gender diagnostics. Such measures help steer water programs toward more equitable and effective interventions (FAO, n.d.).

Box 2: Water and Sanitation Gender Strategy 2018-2022-Uganda

Uganda's Water and Sanitation Gender Strategy (2018–2022) is a sectoral policy document developed at the national level. The Vision of the Strategy is: "An environment where men, women, and vulnerable groups are empowered to access and manage water resources in an integrated, equitable, and sustainable manner." The overall goal of the WSGS is to empower men, women, boys, girls, and vulnerable groups by ensuring equity in access to and control of resources in the water and sanitation sub-sector, thereby contributing to poverty reduction.

Recognizing that women and girls bear the greatest burden of water collection and sanitation management yet remain underrepresented in decision-making, the strategy seeks to integrate gender perspectives into policies, enhance stakeholder capacity, and improve participation in resource management. It builds on lessons from the earlier 2003–2008 and 2010–2015 strategies, while addressing persistent challenges such as unequal power dynamics and the lack of inclusive planning.

The strategy provides a framework for mainstreaming gender in policy formulation, project implementation, and monitoring at both national and local levels. It emphasizes collaboration with the private sector, requiring contractors to incorporate gender expertise in development projects. By fostering equitable resource distribution and addressing the practical and strategic needs of marginalized groups, the strategy contributes to poverty reduction and sustainable development.

Through this Strategy, the Government of Uganda reaffirms its commitment to sustainable water and environmental management, ensuring that gender-responsive approaches guide future initiatives for the benefit of present and future generations.

Source: Ministry of Water and Environment of the Republic of Uganda

Similarly, the UN Committee on the Elimination of Discrimination against Women (CEDAW), in its 2016 General Recommendation No. 34 on the Rights of Rural Women, stressed that "the rights of rural women and girls to water and sanitation are not only essential rights in themselves but also key to the realization of a wide range of other rights, including rights to health, food, education, and participation." CEDAW, through this recommendation, calls on States to establish inclusive, gender-responsive development, agricultural, and water policies with adequate budgets to ensure that the specific needs and rights of rural women are met (CEDAW, 2017).

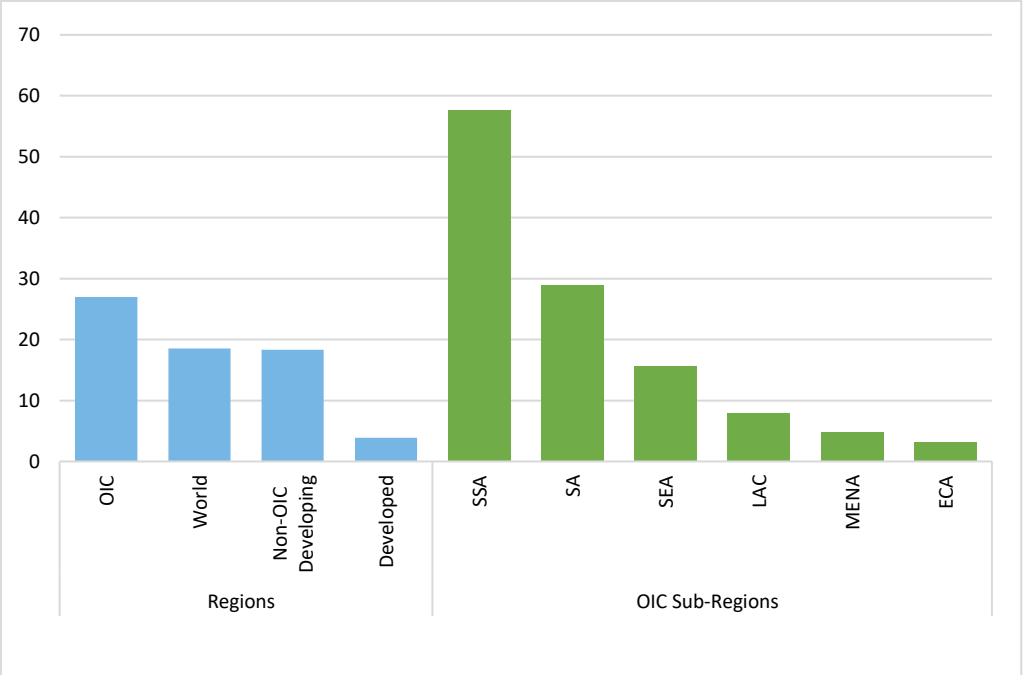
Despite these recognitions, many policies and initiatives remain insufficiently gender-responsive, leaving rural women without access to enabling institutional and legal frameworks. Less than 50 countries have laws or policies that explicitly support women's participation in water and sanitation management, perpetuating systemic exclusion worldwide (UN-Water, 2021). For instance, among OIC countries, Uganda has developed a dedicated Water and Sanitation Sub-Sector Gender Strategy to address these gaps (**Box 2**). Overall,

gender-responsive WASH programming leads to better access to water, improved sanitation, reduced disease incidence, and decreased gender-based violence. In OIC countries, this calls for the inclusion of women's perspectives in the planning, design, management, and monitoring of WASH infrastructure (UNICEF, 2017).

2.3. Consequences of Inadequate WASH Conditions

Water is essential for life, yet its scarcity and contamination remain major contributors to preventable deaths and diseases worldwide. Unsafe drinking water, inadequate sanitation, and poor hygiene practices continue to pose serious public health threats, particularly in low-income and rural communities (WHO, 2019). Contaminated water acts as a vehicle for illnesses such as diarrhoea, cholera, dysentery, typhoid, and polio, among others. Each year, water, sanitation, and hygiene-related diseases claim hundreds of thousands of lives, with diarrhoea alone responsible for a substantial proportion of these deaths, particularly among children under five (UNESCO, 2021).

Figure 2.13: Mortality Rate Attributed to Unsafe Water, Unsafe Sanitation and Lack of Hygiene, per 100,000 Population, 2019



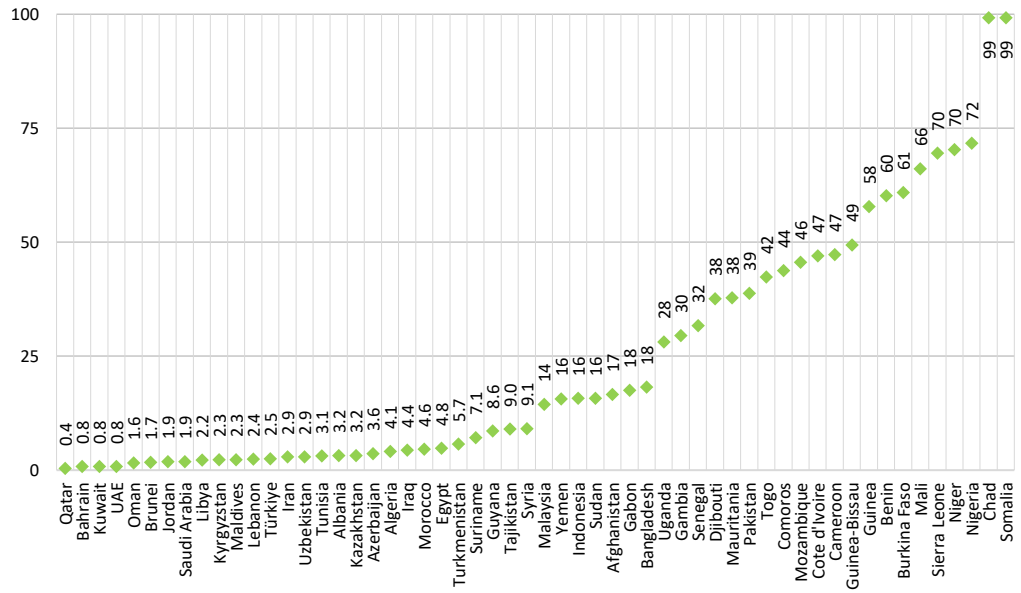
Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database. Note: Basic hygiene facilities refer to handwashing facilities that include both soap and water. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

In 2019, the global mortality rate attributed to unsafe water, sanitation, and hygiene was 18.5 deaths per 100,000 people, aligning with rates in non-OIC developing countries. However, OIC countries recorded significantly higher mortality, at 27 deaths per 100,000 people (Figure 2.13). The majority of WASH-attributable deaths in OIC countries occurred in SSA and SA regions, with

rates of 57.7 and 29 deaths per 100,000 people, respectively. In contrast, the lowest mortality rates within the OIC were observed in the ECA and MENA regions, with 3.2 and 4.9 deaths per 100,000 people, respectively, figures which closely aligned with the 3.9 per 100,000 rate seen in developed countries (**Figure 2.13**).

At the individual country level, 21 OIC countries had mortality rates exceeding the overall OIC average in 2019. All of these countries are located in the OIC SSA region, which also reports the lowest access to WASH services. Among them, Somalia, Chad, Nigeria, Niger, Sierra Leone, Mali, Burkina Faso, Benin, and Guinea recorded particularly high mortality rates, surpassing 50 deaths per 100,000 people. Conversely, significant progress in achieving universal or near-universal WASH services has yielded positive outcomes in several OIC countries, particularly in the MENA region. Countries such as Qatar, Bahrain, Kuwait, United Arab Emirates, Oman, Jordan, and Saudi Arabia reported notably low mortality rates associated with unsafe WASH services in 2019 (**Figure 2.14**).

Figure 2.14: Mortality Rate Attributed to Unsafe Water, Unsafe Sanitation and Lack of Hygiene, per 100,000 Population, in OIC Countries, 2019



Source: SESRIC staff calculations based on data from World Bank's World Development Indicators Database. Note: Basic hygiene facilities refer to handwashing facilities that include both soap and water.

The implications of unsafe water and sanitation extend far beyond public health, placing a heavy burden on healthcare systems and national economies. Safe and reliable water access is critical for food production and agricultural sustainability. Water scarcity and contamination threaten crop yields, livestock health, and food safety, thereby undermining food security, especially in already vulnerable regions such as OIC SSA and SA. Investing in WASH infrastructure supports resilient agricultural systems, ensuring that food production can meet the nutritional needs of growing populations while safeguarding public health and economic stability.

Box 3 highlights Jordan's experience in implementing WASH through the integration of Islamic principles on hygiene and water stewardship into national policies, serving as a model for other OIC countries.

Box 3: WASH Provision Guidelines from an Islamic Perspective, Experience from Jordan

WASH services play a significant role in maintaining hygiene among Muslims worldwide, particularly in the context of worship and daily life. To ensure sustainable WASH services in Muslim communities, it is essential to sensitize and educate them on this issue. Al-Zoubi et al. (2020) explained this concept while highlighting the pivotal role of Waithat (female preachers), Imams, and other Islamic religious leaders in providing necessary education and guidance within the community of believers. Their research emphasized how faith-based guidance can positively influence public health behaviours.

As part of this initiative, various government institutions and organizations—including the Ministry of Water and Irrigation, the Ministry of Awqaf, Islamic Affairs and Holy Places of Jordan, the General Iftaa Department, and the Sanitation for Millions Programme implemented by the German Agency for International Cooperation—collaborated to present a comprehensive understanding of WASH from an Islamic perspective. The guidelines primarily focus on the teachings of Islam regarding hygiene and provide insights into how these teachings can be practically applied in daily life. They also include behaviour models and best practices related to hygiene, all supported by evidence from Sharia and relevant fatwas issued by the General Iftaa Department. This ensures that the information provided aligns with Islamic principles and legal opinions.

Moreover, the guide covers various aspects of personal and public hygiene, addressing both individual responsibilities and the community's role in promoting hygienic practices. Special emphasis is placed on the importance of rationing water consumption and providing effective methods to achieve this. In addition, the guide incorporates practical and interactive activities aimed at enhancing awareness and encouraging positive hygiene behaviours among Muslims.

Source: Al-Zoubi et al. (2020)

PART II:

WATER, AGRICULTURE, ENVIRONMENT AND SUSTAINABLE FOOD SECURITY SYSTEMS

Chapter 3: WATER, AGRICULTURE, AND FOOD SECURITY



*Food security is achieved when all individuals have consistent physical and economic access to sufficient safe and nutritious food that meets their dietary needs and preferences, enabling an active and healthy lifestyle (**FAO, 1996; High Level Panel of Experts (HLPE), 2020**). Fulfilling this basic human right depends on a multitude of complex and interconnected factors that influence the availability, accessibility, stability, and utilization of food.*

Various elements such as adequate water and energy resources, soil fertility, irrigation capabilities, and the quality of agricultural inputs like seeds and fertilizers directly affect the quantity and quality of food produced. Moreover, socio-economic factors, including an individual's purchasing power, household income, and access to markets, play a role in determining their ability to access food. Economic downturns, conflicts, and natural disasters can disrupt food production and distribution, impacting food stability. Moreover, consumption patterns, nutritional preferences, and access to basic water, sanitation, and hygiene services impact the utilization of nutrition.

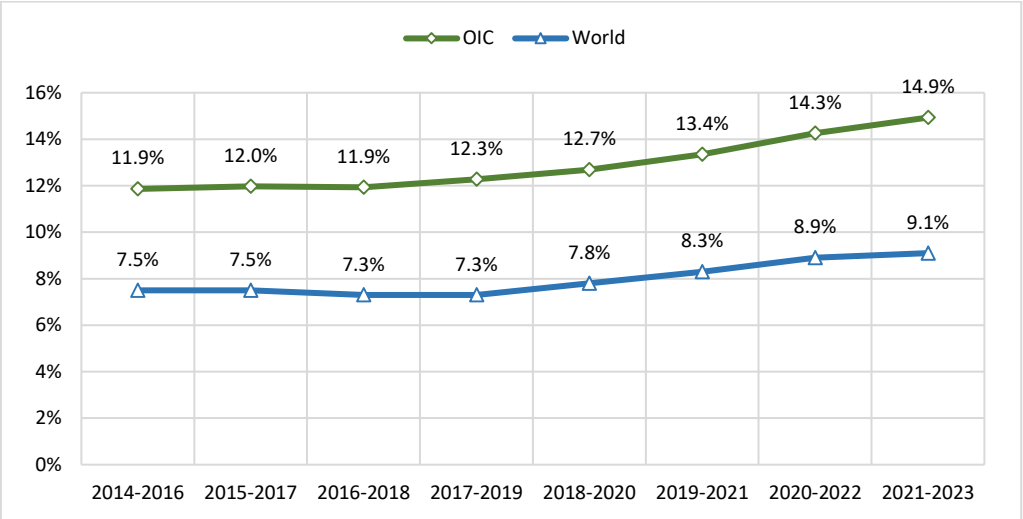
3.1. Water Security for Food Security: Integrated Perspectives

Over the past two decades, OIC countries have made a progress in enhancing overall food security. Although the share of agriculture in the total GDP of OIC countries gradually declined from 10.8% in 2010 to 10% in 2023, this trend is attributed to economic structural transformation not the decline in agricultural production and trade, despite the continued presence of factors such as agricultural market instability, environmental stresses, and the depletion and degradation of land and water resources. Notably, there has been substantial growth in per capita food production and gross food production, contributing to increased accessibility.

However, hunger and malnourishment persist in low- and middle-income OIC countries. OIC countries were home to 192 million undernourished people in the 2014-2016 period average, corresponding to 34.4% of the world's total undernourished people. This number has increased to 263 million people by 2021-2023 period, bringing the OIC countries' share in the world up to 36.4%. The prevalence of undernourishment—a key indicator of food security—increased more sharply in the OIC region than the global average from the 2014-2016 period to the 2021-2023 period. Globally, the prevalence rate of undernourishment increased from 7.5% to 9.1%, while in the OIC region, it rose from 11.9% to 14.9% (**Figure 3.1**).

This upward trend has been driven by a combination of economic, geopolitical, social, and environmental factors, including armed conflicts, trade disruptions, debt crises, the COVID-19 pandemic, and associated austerity measures, which contributed to sustained inflation and elevated living costs. In particular, the surge in prices of basic nutritious food has disproportionately affected poor populations, reducing their food intake and exacerbating undernourishment. From a country-level perspective, OIC countries have made impressive progress towards achieving food security. Particularly, the prevalence of undernourishment was below 2.5% in eight countries (Algeria, Azerbaijan, Guyana, Kazakhstan, Kuwait, Malaysia, Türkiye, and Uzbekistan) as of 2023. In contrast, between 34% and 51% of the population in Somalia, Yemen, Uganda, Chad, and Syria were affected by undernourishment (**Figure 3.2**).

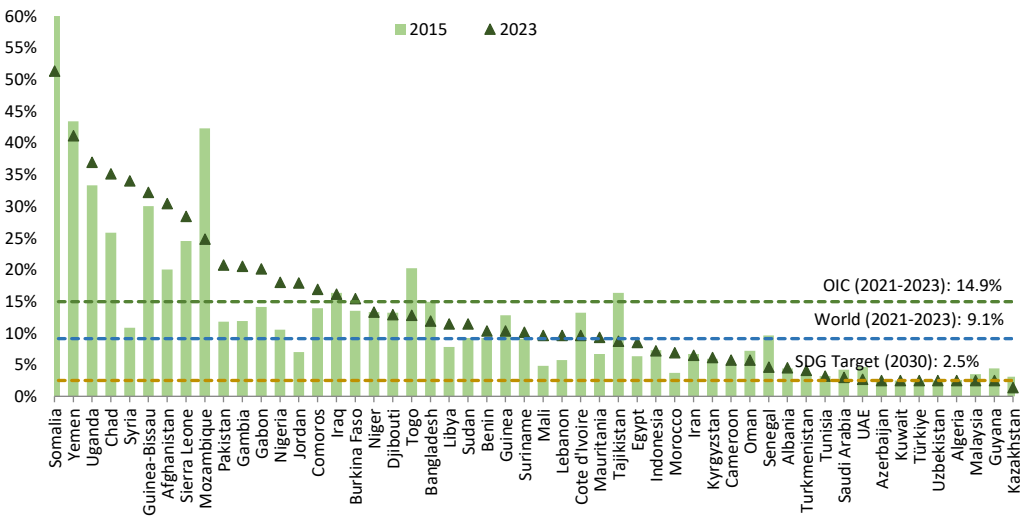
Figure 3.1 Prevalence of Undernourishment (3-year average)



Source: SESRIC staff calculations based on data from the FAOSTAT Online Database last updated on 03/02/2025.

It is self-evident that undernourishment is a function of poverty, and higher rates of undernourishment are typically observed in areas with persistent and widespread poverty. In many cases, the rise in undernourishment stems from the fact that growth in food production per hectare of arable land has not kept pace with population increases, exacerbating food insecurity.

Figure 3.2 Prevalence of Undernourishment (3-year average) in OIC Countries, 2015 vs 2023

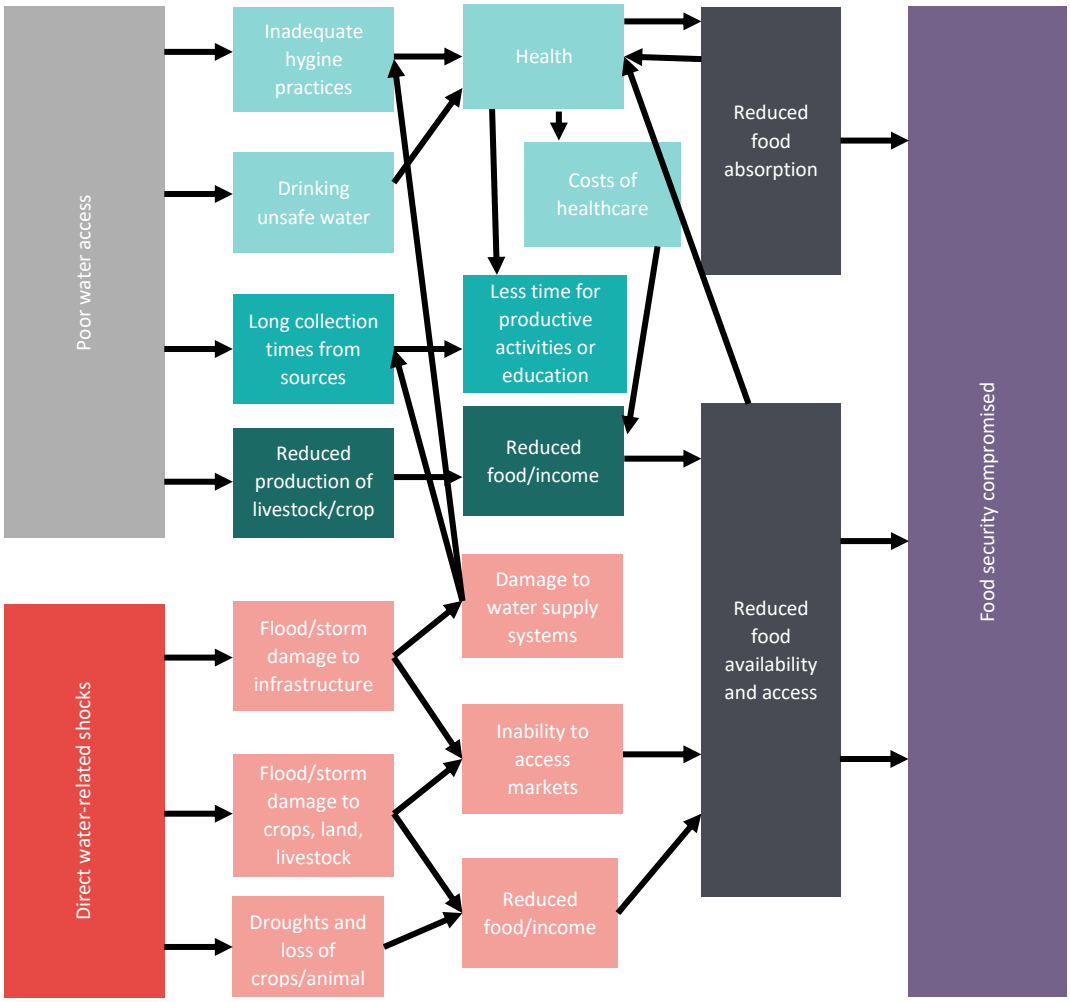


Source: SESRIC staff calculations based on data from the FAOSTAT Online Database last updated on 03/02/2025.

The growing food trade deficit is a particular source of concern for countries in crisis that require external assistance for food. These countries spend over half of their export earnings on commercial food imports. According to FAO classifications, 23 OIC countries were classified among 45 countries globally in 'Crisis Requiring External Assistance' (FAO, March 2025), most of

them in Sub-Saharan Africa and the arid regions of West Asia and North-eastern Africa. In general, the majority of these countries are characterised by low-income level, conflicts, political instability, and a high prevalence of undernourishment. They are unable to produce sufficient food to meet their domestic demands and lack the resources to import it as well.

Figure 3.3 Micro-Level Impacts of Poor Water Access and Direct Water-related Shocks on Food Security



Source: Overseas Development Institute (2017).

Besides, compared to the other country groups, people living in OIC countries have the lowest recorded access to WASH services, as discussed in **Chapter 2** of this report, which poses serious implications for food security system. Food security is intricately linked to the utilization of water resources, as illustrated in **Figure 3.3**, where inadequate access to water and water-related shocks directly and indirectly impact food security, especially in impoverished and low-income households. Basic access to WASH services is crucial for ensuring the safety of food consumed and stored by households. Contamination of food due to the unavailability of clean water, irregular hand-washing practices, and lack of water for food preparation and utensil

cleaning can lead to the spread of infectious microorganisms, affecting nutrient absorption and contributing to food insecurity.

Chapter 2 of this report also highlights that women and girls often shoulder the primary responsibility for water collection and management in households. The time they spend on these tasks negatively affects their income-generating opportunities, limiting their ability to purchase and consume nutritious food, consequently impacting household feeding practices and food security.

The quantity, quality, and management of water resources in a country are inherently linked to food security. The agriculture sector, being one of the largest consumers of water globally, is profoundly influenced by any instabilities in water availability and quality. Despite increasing interventions in water resource management for agriculture, achieving food security in OIC countries faces challenges due to several reasons:

1. The rapid population growth in the OIC region — with the population projected to rise to 2.8 billion by 2050 — places significant pressure on the food and water sector. Global food demand was estimated to increase 60% by 2050, according to FAO estimates, making it particularly challenging for arid and semi-arid countries already facing water scarcity.
2. Scarcity of inputs necessary for food production may lead to competition over insufficient resources, influencing food production, distribution, and accessibility. This may drive farmers to adopt unsustainable practices that harm ecosystems in the long run.
3. Natural and artificial disasters, such as droughts, floods, conflicts, and economic recessions, coupled with inadequate interventions to adapt to or mitigate climate change, will have direct and severe impacts on food security in the short and long term.
4. Economic growth in the OIC region may increase individual wealth and purchasing power, leading to changes in food consumption patterns. Food insecurity may not solely manifest as hunger but may also result in inadequate access to sustainable and nutritious food, leading to malnutrition.

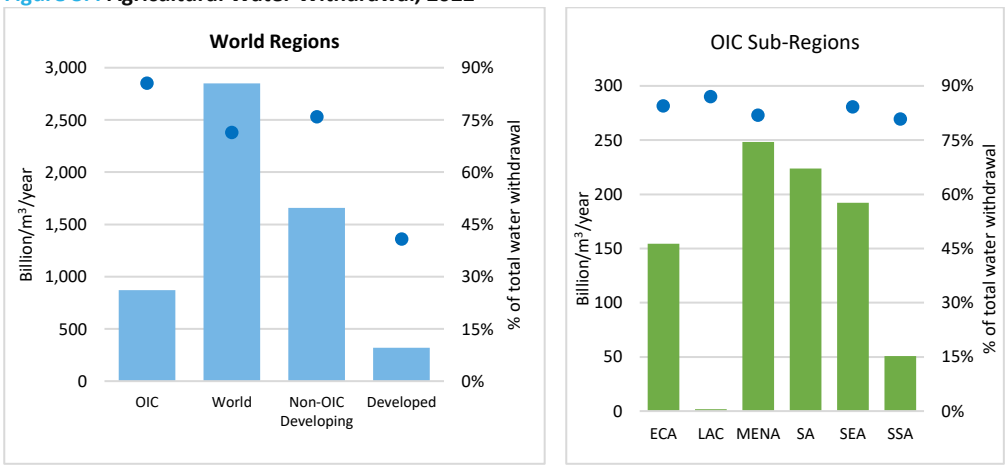
Meeting water demand in the agriculture sector remains a significant challenge for OIC countries, which collectively hold nearly one-third of the world's total agricultural land area (approximately 1.4 billion hectares. Water security in the OIC region is alarming, with high water stress and dependency ratios on external water resources for water supply (**Chapter 1**).

3.2. Agricultural Water Demand and Utilization

The pressure to increase food production can result in a corresponding rise in water withdrawal, which is already at its highest in the agriculture sector. Globally, agricultural water withdrawal accounts for 71.5% of the total water withdrawn, while the remaining 28.5% is attributed to the industrial (15.3%) and municipal sectors (13.2%).

In the OIC region, 85.6% of the total water withdrawal, approximately 872 billion m^3/year, is utilized for agricultural purposes, as depicted in **Figure 3.4**. In comparison, developed countries withdraw 320 billion m^3 of water annually for agriculture, constituting 40.8% of their total water withdrawal, and non-OIC developing countries withdraw 1,659 billion m^3/year, representing 75.9% of their total water withdrawals.

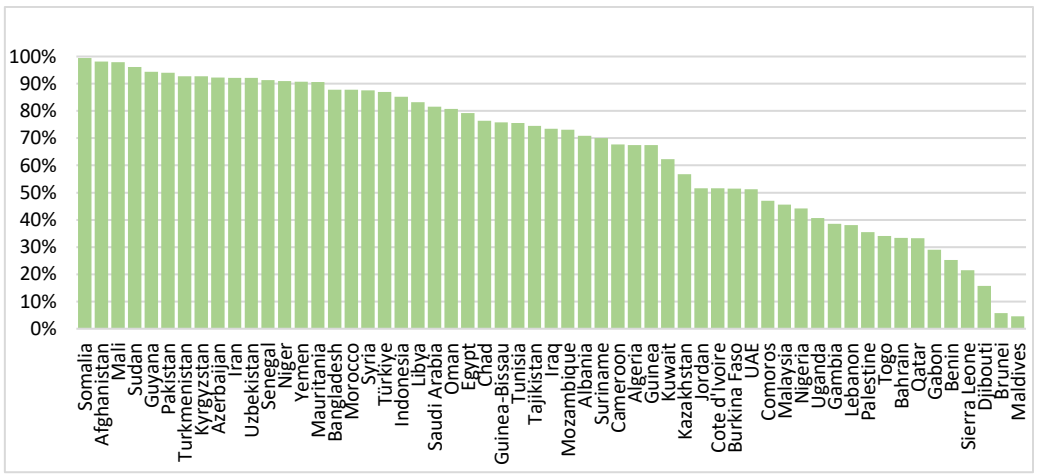
Figure 3.4 Agricultural Water Withdrawal, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa. See ANNEX I for country classifications.

Analysis of the total agricultural water withdrawal in the OIC sub-regions reveals that MENA region recorded the highest withdrawal (248 billion m^3/year), followed by SA (224 billion m^3/year), SEA (192 billion m^3/year) and ECA (155 billion m^3/year). Additionally, **Figure 3.4,** illustrates that in each of the OIC regions, agricultural water withdrawal constituted more than 80% of their total water withdrawal, with the highest percentage in SA (93.4%) and the lowest in SSA (80.9%).

Figure 3.5 Agricultural Water Withdrawal in OIC Countries (% of total water withdrawal), 2022



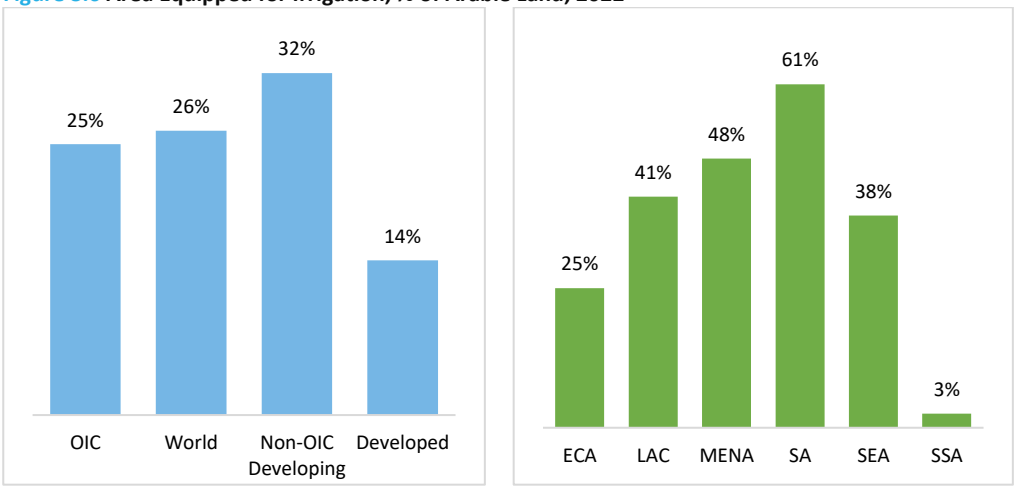
Source: FAO AQUASTAT Dissemination System.

On an individual country level, agricultural water withdrawal in OIC countries exhibited significant variation, as depicted in **Figure 3.5**. The highest withdrawals were observed in Somalia (99%), Afghanistan (98%), Mali (98%), Sudan (96%), and Guyana (94%), whereas the lowest withdrawals were recorded in Maldives (0%), Brunei Darussalam (6%), Djibouti (16%), Sierra Leone (22%), and Benin (25%).

It is crucial to recognize that water resource distribution within the OIC region is highly diverse. While some countries have ample water resources, others face severe scarcity. Moreover, in countries with abundant water resources, challenges arise in terms of accessibility to these resources, proximity to agricultural or arable land, efficient regulation for consumption, and affordability for exploration and development. This highlights that water scarcity is not solely a result of physical water scarcity, but also stems from infrastructural and institutional limitations.

Interventions such as artificial irrigation can effectively mitigate water scarcity and its impact on the agriculture sector. Irrigation plays a vital role in increasing food production while ensuring sustainability. However, the reliance on rain-fed and irrigated agricultural lands varies across countries. Some countries can primarily rely on rain-fed irrigation for food production, while others require irrigation and have developed sophisticated infrastructure for this purpose (SESRIC, 2023). Nonetheless, OIC countries, especially certain regions in MENA, SA and ECA, are vulnerable to the impacts of climate change, which may exacerbate variability of water availability seasonally and annually, as discussed in **Chapter 4.** Regions with low precipitation and rainfall density require irrigation infrastructure to maintain resilient agricultural yields to sustain food security.

Figure 3.6 Area Equipped for Irrigation, % of Arable Land, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa.

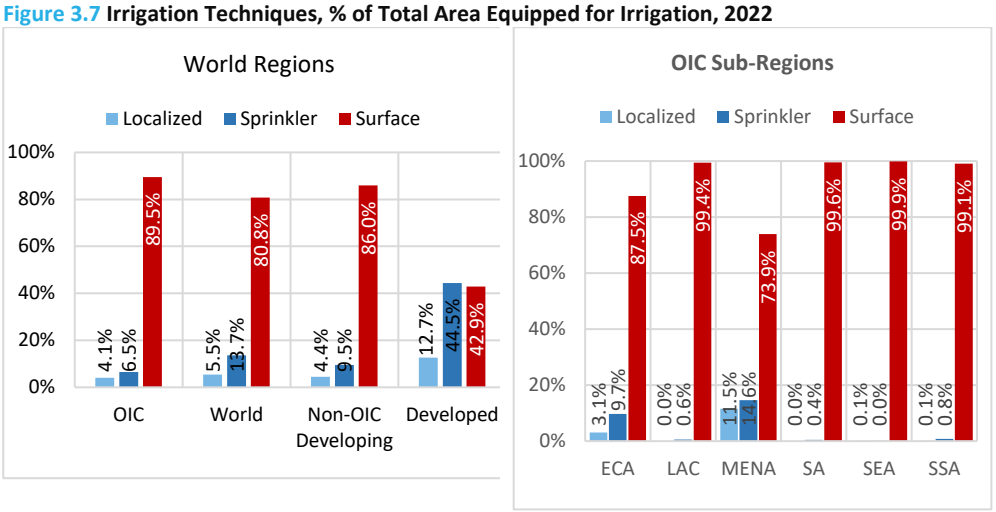
The term “area equipped for irrigation” refers to the land area equipped to provide water to the crops, other than direct rainfall. Area equipped for irrigation in OIC region covers approximately 80 million hectares (21% of the world). **Figure 3.6** illustrates that quarter of the total arable land area in OIC countries is equipped for irrigation, which is slightly lower than the global average (26%) and visibly below the non-OIC developing countries group average (32%). Developed countries use more resiliently their arable land area and water resources without having the need to over-irrigate arid regions, while also being more blessed with higher precipitation, rainfall, and climatic conditions in contrast to OIC and developing countries.

Various irrigation techniques are employed across OIC countries. The most commonly used technique is 'surface irrigation,' which consumes the largest volume of water. While this technique is widely used globally, it is considered wasteful as a significant amount of water diverted for surface irrigation is lost through deep percolation or surface runoff. In 2022, 89.5%

of the total area equipped for irrigation in OIC countries utilized surface irrigation, compared to 86% in non-OIC developing countries, 42.9% in developed countries, and 80.8% worldwide (**Figure 3.7**). At the country level, 22 out of 49 OIC countries with available data on irrigation techniques used surface irrigation to more than 98% of the area equipped for irrigation (**Figure3.8**).

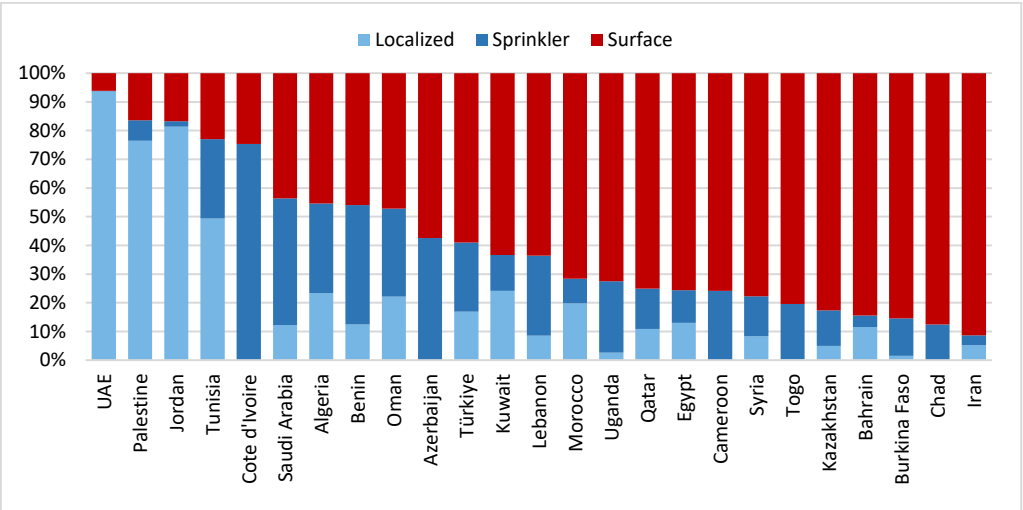
In developed countries, sprinkler and localized irrigation were used on 44.5% and 12.7% of the area equipped for irrigation, which saves more water compared to surface irrigation. However, the adoption of sprinkler and localized irrigation methods were significantly lower in both OIC countries (6.5% and 4.1%) and non-OIC developing countries (9.5% and 4.4%) (**Figure 3.7**).

Figure 3.7 Irrigation Techniques, % of Total Area Equipped for Irrigation, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System. Note: ECA=Europe and Central Asia; LAC=Latin America; MENA=Middle East and North Africa; SA= South Asia, SEA=Southeast Asia; SSA=Sub-Saharan Africa.

Figure 3.8 Irrigation Techniques in Selected OIC Countries, 2022



Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

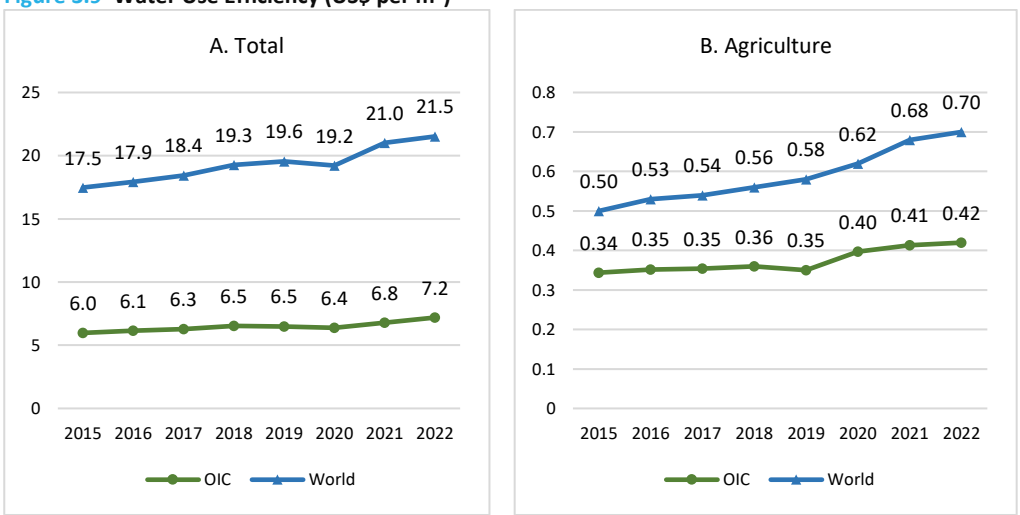
There are notable variations among OIC countries—some have adopted the use of sprinkler and localised irrigation in significant portions of their irrigated areas. **Figure 3.8** shows the OIC countries where the use of sprinkler and localized irrigation techniques jointly ranged from 9% to 94% of the countries' total area equipped for irrigation. Particularly, the United Arab Emirates, Palestine, Jordan, Tunisia, Cote d'Ivoire, Saudi Arabia, Algeria, Benin, Oman, and Azerbaijan had the highest utilization of such irrigation techniques. On the other hand, in 29 OIC countries, the share of irrigated land using sprinkler or localized irrigation techniques was negligible—as of 2022, these methods accounted for zero or less than 1% of the total area equipped for irrigation.

3.3. Enhancing Agricultural Productivity and Efficiency for Food Security

Effectively addressing the challenges related to food security and water use efficiency in the OIC can be achieved through improving the productivity. It requires, cohesive management of agricultural inputs including land and water resources, alongside investments in sustainable technologies. Moreover, enhancing the resilience of member countries against future shock, some of which are unavoidable, necessitates timely interventions and mitigation strategies.

The way in which water is utilized has critical implications for economic productivity, environmental sustainability, and long-term water security—making Water Use Efficiency (WUE) a key metric for sustainable development. WUE measures the economic output—value added in US dollars—generated per cubic metre of water withdrawn and is assessed across three main sectors: agriculture, industry, and services. Agriculture, often the dominant water user in OIC countries, presents the greatest potential for efficiency gains, particularly through improved irrigation techniques and crop selection. The industrial and service sectors, though generally more water-efficient, can also benefit from innovation and stricter water management practices. Increasing WUE not only supports sustainable resource use but also enhances resilience to climate change and helps ensure sufficient water availability for future generations.

Figure 3.9 Water Use Efficiency (US$ per m³)

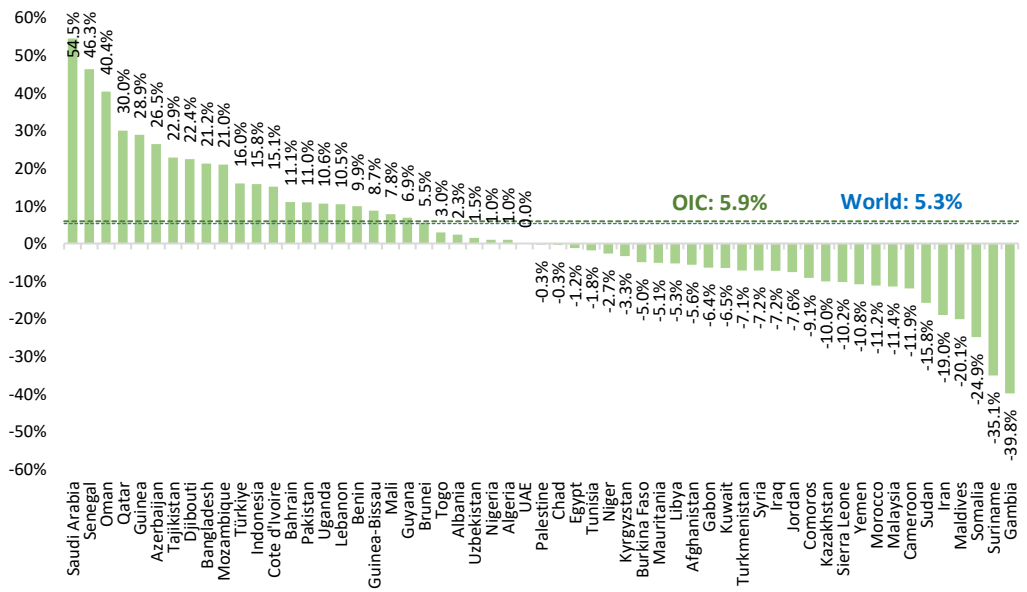


Source: SESRIC staff calculations based on FAO AQUASTAT Dissemination System.

Between 2015 and 2022, the average WUE across OIC countries increased modestly from US$6.0 to US$7.2 per cubic metre, marking a gain of US$1.2. However, this improvement remains significantly below the global average, which rose from US$17.5 to US$21.5 over the same period—an increase of US$4.0 (**Figure 3.9 A**). In 2022, the highest WUE among OIC countries was observed in Qatar (US$192), Kuwait (US$105), and Gabon (US$103), indicating strong efficiency. In contrast, the lowest WUE values were recorded in Afghanistan, Syria, and Kyrgyzstan—each with less than US$1.0, reflecting limited economic output per unit of water used. Most OIC countries recorded improvements during this period, with the most notable increases in Benin (+US$16.2), Cote d'Ivoire (+15.3), the United Arab Emirates (+14.4), Malaysia (+13.6), and Gabon (+11.5). However, sharp declines were observed in Qatar (-US$14.6), Kuwait (-8.7), and Lebanon (-8.4).

As the agriculture sector accounts for approximately 85.6% of total water withdrawal in OIC countries (**Figure 3.4 and 3.5**), making improvements in agricultural WUE particularly critical. Between 2015 and 2022, the average agricultural WUE in OIC countries increased from US$0.34 to US$0.42 per cubic metre, a gain of only US$0.08. This remains below the global average, which rose from US$0.50 to US$0.70—a gain of US$0.20 (**Figure 3.9 B**). In 2022, the highest agricultural WUE was observed in Djibouti (US$14.4), Brunei Darussalam (US$5.5), Palestine (US$4.2), and Sierra Leone (US$4.0)—well above the world average. Conversely, Niger, Guyana, Togo, Guinea, Mali, and Uganda recorded WUE levels of US$0.05 or less, reflecting extremely low economic returns from water use in agriculture. Notable gains were made in Djibouti (+US$4.9), Sierra Leone (+0.8), Malaysia (+0.4), and the United Arab Emirates (+0.4), likely due to improved irrigation systems and diversification into higher-value crops. Declines were observed in Palestine (-US$1.0), Suriname (-0.4), Lebanon (-0.3), and Kuwait (-0.3).

Figure 3.10 Change in Gross per capita Production Index Compared to Base Year (2014-2016 = 100), 2023



Source SESRIC staff calculations based on data from the FAOSTAT Online Database last updated on 03/02/2025.

While, WUE and total agricultural production has been steadily increasing in the majority of OIC countries, the gross per capita food production index reveals that many member states still lack sufficient production capacity to meet the domestic demand of their growing populations. As a result, several of them continue to rely heavily on food imports. In 2023, 29 out of the 57 OIC countries recorded a negative percentage change in their gross per capita agricultural production index compared to the 2014-2016 base period. Among them, 12 countries, including Gambia, Suriname, Somalia, Maldives, Iran, Sudan, Cameroon, Malaysia, Morocco, Yemen, Sierra Leone, and Kazakhstan, experienced the most significant declines, with double-digit percentage decreases. On a positive note, 28 OIC countries demonstrated progress in per capita agricultural production, with 17 of them achieving double-digit growth. Saudi Arabia, Senegal, and Oman recorded the highest increases; 54.5%, 46.3% and 40.4%, respectively (**Figure 3.10**).

Table 3.1 OIC Countries Ranked Among Top 20 Producers of Selected Agricultural Commodities Globally, 2023

Commodity	Country (World Rank)
Dates	Egypt (1), Saudi Arabia (2), Algeria (3), Iran (4), Iraq (5), Pakistan (6), Sudan (7), Oman (8), Tunisia (9), United Arab Emirates (10), Libya (11), Türkiye (13), Kuwait (14), Morocco (15), Yemen (17), Qatar (19), Jordan (20)
Millet	Niger (2), Mali (4), Nigeria (5), Senegal (6), Burkina Faso (8), Sudan (9), Chad (10), Pakistan (14), Guinea (17), Uzbekistan (20)
Sorghum	Nigeria (2), Sudan (7), Burkina Faso (10), Niger (11), Mali (13), Cameroon (14), Chad (16), Egypt (18), Senegal (20)
Cocoa Beans	Cote d'Ivoire (1), Indonesia (3), Cameroon (6), Nigeria (7), Uganda (12), Guinea (17), Sierra Leone (20)
Oil palm fruit	Indonesia (1), Malaysia (2), Nigeria (4), Cameroon (9), Cote d'Ivoire (10), Guinea (18), Benin (19)
Cassava	Nigeria (1), Indonesia (6), Mozambique (10), Cote d'Ivoire (11), Cameroon (12), Benin (19)
Rice	Bangladesh (3), Indonesia (4), Pakistan (9), Nigeria (14), Egypt (16)
Tea leaves	Türkiye (5), Indonesia (7), Bangladesh (8), Uganda (9), Iran (18)
Wheat	Pakistan (8), Türkiye (9), Iran (12), Kazakhstan (16), Egypt (17)
Coffee	Indonesia (3), Uganda (7), Guinea (12), Cote d'Ivoire (17)
Barley	Türkiye (5), Iran (12), Morocco (14), Kazakhstan (14)
Dry Beans	Uganda (7), Mozambique (13), Cameroon (15), Kazakhstan (17)
Maize	Indonesia (8), Nigeria (13), Pakistan (15), Türkiye (16)
Sugar cane	Pakistan (5), Indonesia (7), Egypt (15), Iran (20)
Soya beans	Nigeria (12), Benin (17), Indonesia (20),
Oats	Türkiye (15)

Source: SESRIC staff calculations based on data from the FAOSTAT Online Database las updated on 03/02/2025.

Notwithstanding generally low levels of agricultural development and limited per capita availability of agricultural products, 24 OIC countries rank among the world's top 20 producers of major agricultural commodities (**Table 3.1**). These include a range of crops, from cereals such as wheat, barley, rice and maize to tropical/temperate-zone commodities like palm oil, cocoa, coffee, rubber, and sugar. However, countries whose agricultural exports are concentrated in a limited number of such commodities face heightened vulnerability to international price fluctuations. Furthermore, the limited availability of processing facilities often results in the exports of primary commodities with little or no value added, posing additional challenges to the global competitiveness of their agricultural sectors.

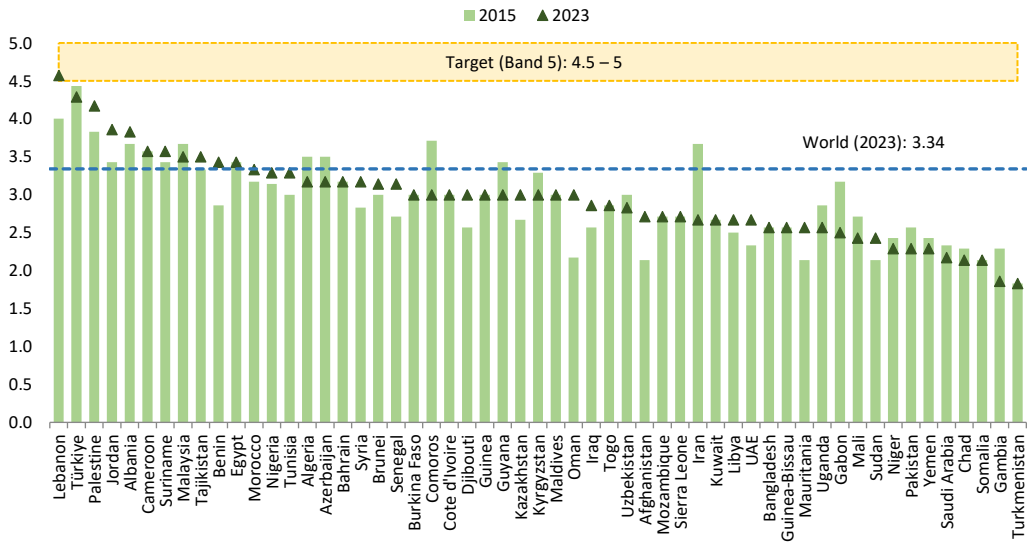
Productive and Sustainable Agriculture

Concerning the global Sustainable Development Agenda 2030, the performance of the agriculture sector, like other sectors, must be assessed against three dimensions of sustainability: economic, social, and environmental. The OIC-2025: PoA, in terms of sustainable agriculture and productivity, calls for developing food production systems through diversification, water conservation, and efficient land use. Another goal is to optimise the use of land and natural resources for sustainable agriculture. Targeting agricultural production helps to maintain ecosystems, strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and progressively improve land and soil quality. The recently developed index by FAO "progress toward productive and sustainable agriculture" is a proxy indicator for measuring countries' performance in sustainable agricultural productivity, as there was previously no measurable indicator for these goals. For meaningful interpretation, the index score is divided into five bands, as shown below.

Score	Trend towards productive and sustainable agriculture
1 –< 1.5	**Band 1:** Very far from achieving productive and sustainable agriculture
1.5 –< 2.5	**Band 2:** Far from achieving productive and sustainable agriculture
2.5 –< 3.5	**Band 3:** At a moderate distance to achieving productive and sustainable agriculture
3.5 –< 4.5	**Band 4:** Close to achieving productive and sustainable agriculture
4.5 – 5	**Band 5:** Productive and sustainable agriculture already achieved

Source: UNSD Global SDG Indicators Metadata

Figure 3.11 Progress toward Productive and Sustainable Agriculture, Current Status Score



Source: SESRIC staff compilation based on data from the UNSD Global SDG Indicators Database last updated on December 13, 2024.

As of 2023, among OIC countries, Lebanon led with a score of 4.57, the only OIC country in Band 5, signifying its achievement of productive and sustainable agriculture. It was followed by eight Member States in Band 4 – Türkiye (4.29), Palestine (4.17), Jordan (3.86), Albania (3.83), Cameroon (3.57), Suriname (3.57), Malaysia (3.5), and Tajikistan (3.5) – classified as close to achieving productive and sustainable agriculture. Most (36) OIC countries were categorised in Band 3 based on their index scores, signifying a moderate gap to reach productive and sustainable agriculture. The remaining 10 OIC countries with available data were categorised in Band 2, suggesting that these countries were far from productive and sustainable agriculture. No OIC country fell in Band 1 (**Figure 3.11**).

Chapter 4: CLIMATE CHANGE IMPACTS ON THE WATER SECTOR



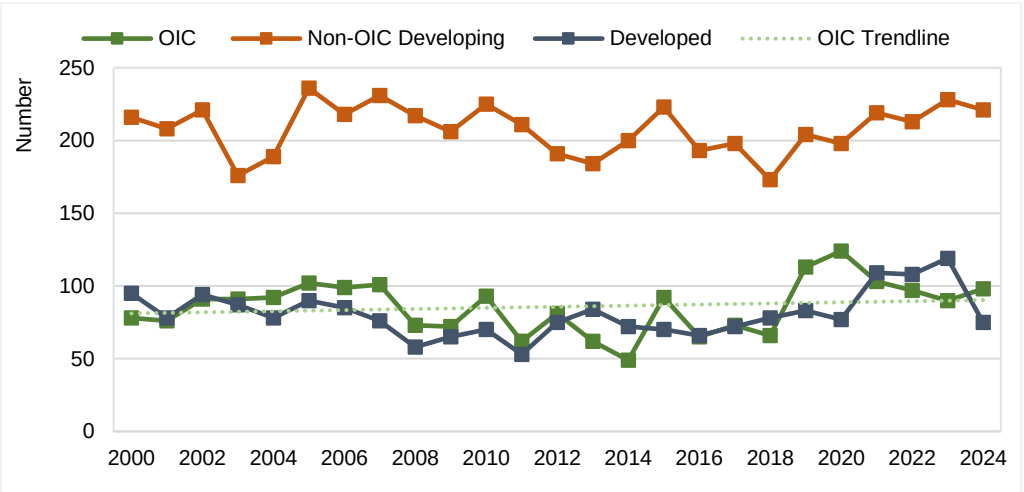
Climate change as a central component of the triple planetary crisis—climate change, biodiversity loss, and pollution and waste—is placing increasing strain on water resources. Its effects, coupled with excessive water withdrawals, have profound implications for both the quantity and quality of freshwater resources. It manifests through intensified floods and prolonged droughts, while rising sea levels drive saltwater intrusion into coastal aquifers. In addition, heavier rainfall and flooding increase runoff, carrying pollutants, sediments, and nutrients that degrade surface water quality and undermine watershed health. These impacts further exacerbate food insecurity in water scarce regions through disrupting irrigation and increasing vulnerability of farming activities.

While the precise attribution of individual extreme weather events to climate change remains methodologically complex, there is strong scientific consensus linking climate change to an increase in the frequency and severity of extreme weather events and water resources quality and availability. The Intergovernmental Panel on Climate Change (IPCC), in its Sixth Assessment Report, states that: "It is an established fact that human-induced greenhouse gas emissions have led to an increased frequency and/or intensity of some weather and climate extremes since pre-industrial times, in particular for temperature extremes" (IPCC, 2021, p. 8).

4.1. Climate Change, Natural Hazards and Water Resources

Climate change is evident in the rising frequency and intensity of climate-related hazards, such as prolonged heatwaves, increasingly erratic rainfall patterns, stronger thunderstorms, and more severe storm surges. In recent decades, the frequency and intensity of extreme weather events have increased substantially across the globe, with OIC member countries experiencing some of the most severe impacts. The aggregated annual data reveal a growing frequency of these events, underscoring their strong correlation with extreme climate hazards. These climatological (drought, wildfire), hydrological (flood), and meteorological (storm) extremes have disrupted infrastructure, displaced populations, and placed additional stress on freshwater and already vulnerable food security situation.

Figure 4.1 Trends in Climate-Induced Natural Disasters, 2000-2024

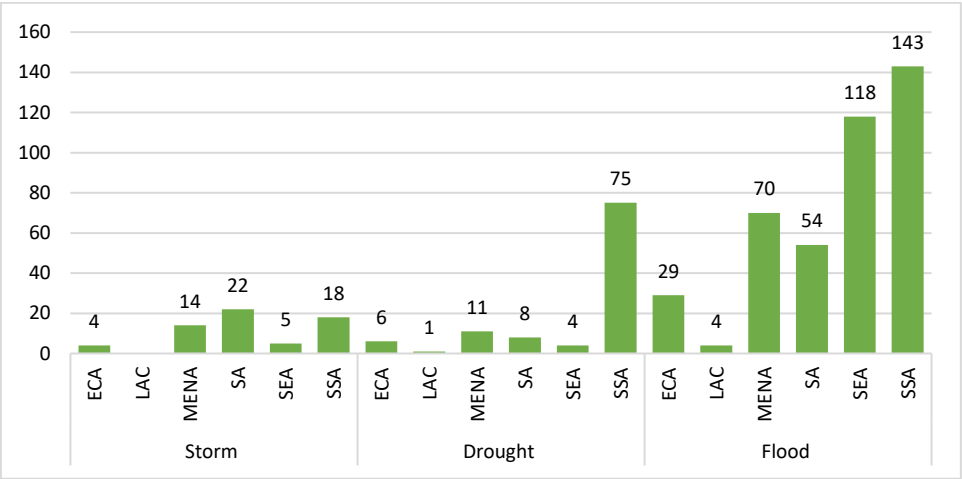


Source: SESRIC staff calculation based on EM-DAT Database.

Risks to water availability and water-related hazards are projected to rise in the medium to long term, with higher global warming levels exacerbating these effects (IPCC, 2021) along with global population rises. As shown in **Figure 4.1**, between 2000 and 2024, the occurrence of disasters has intensified. Overall, floods and droughts remain the most frequently occurring climate-related hazards in the OIC region. OIC region witnessed a growing prevalence of extreme heat events and temperature anomalies. These rising temperatures, combined with increasingly erratic rainfall patterns, have contributed to both agricultural and meteorological droughts, posing significant risks to food security, water availability, and rural livelihoods across the region. Simultaneously, excessive and frequent rainfall events have led to widespread and severe flooding in all OIC sub-regions

Within the OIC, the Sub-Saharan Africa sub-region was the most prone to both of these hazards, with 143 floods and 75 droughts recorded between 2000 and 2024, while the Southeast Asia was the second most vulnerable region to floods, with 118 flood occurrences recorded during the period in consideration. In the Middle East and North Africa, despite its arid climatic conditions, floods have been more prevalent than other hazard types, making floods and droughts the dominant climate-related risks. Meanwhile, South Asia, the region with the highest number of storms, recorded 22 storms and 8 droughts (**Figure 4.2**).

Figure 4.2 Total Number of Climate-Related Hazard by Type in OIC Sub-Regions, 2000-2024



Source: SESRIC staff calculation based on EM-DAT Database.

Climate projections indicate that global temperatures are likely to increase by more than 2°C under current greenhouse gas emission trends, a threshold associated with disproportionately severe climate impacts. While all climate zones were expected to experience warming, OIC member countries situated in arid and semi-arid zones—particularly in Sub-Saharan Africa, the Middle East, and South Asia—faced the highest temperature increases. These regions have seen a marked rise in the frequency and duration of heatwaves over the past two decades compared to the late 20th century. In contrast, countries within the Europe and Central Asia region of the OIC reported a notable decline in cold spells, further underscoring the uneven distribution of climate impacts. The global temperature rise exceeding 2°C can make extreme precipitation events up to 1.7 times more frequent and about 14% more intense than under current

conditions, according to Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2021). Such a scenario can have profound implications for disaster risk management and resilience planning in OIC member states. In 2023, the IPCC published a comprehensive synthesis report providing an overview of the current state of knowledge on climate change, its impacts, risks, and the landscape of mitigation and adaptation (**BOX 4**).

BOX 4: Summary Findings from IPCC's AR6 Synthesis Report: Climate Change 2023

The "AR6 Synthesis Report: Climate Change 2023" integrates the findings of six reports released by the IPCC between 2018 and 2023, drawing upon the work of hundreds of scientists worldwide. The report summarizes the state of knowledge on climate change, its impacts and risks, and the landscape of mitigation and adaptation.

Findings

- The scale of the climate challenge is unprecedented, with the burden falling disproportionately on the developing world.
- Human-induced greenhouse gas (GHG) emissions are the leading cause of global warming, which has reached 1.1°C above pre-industrial levels over the past decade.
- In 2019, around 34% of the global GHG emissions of 59 billion tons of CO_2-equivalent came from the energy sector, 24% from industry, 22% from agriculture, forestry, and other land use, 15% from transport, and 6% from the construction and building sector.
- Almost half of the world's population lives in regions highly vulnerable to global warming, particularly in West, Central, and East Africa; South Asia; Central and South America; Small Island Developing States; and the Arctic.
- Even with the current 1.1°C warming, impacts are already more severe than anticipated. Almost half of the world's population faces water scarcity for at least one month each year, while rising temperatures increase the incidence of vector-borne diseases. At the same time, agricultural productivity in middle and low latitudes has declined significantly, with crop productivity growth in Africa shrinking by a third since 1961. Since 2008, extreme floods and storms have displaced more than 20 million people annually.
- If unchecked, GHG emissions will drive warming to 1.5°C between 2030 and 2035. Without strengthened adaptation and mitigation policies, global warming is projected to range between 2.2°C and 3.5°C by 2100.
- Global climate finance was estimated at US$590 billion in 2020, yet to limit warming below 1.5°C, it needs to increase by 3 to 6 times by 2030.
- Financing for adaptation must also rise dramatically to avert, minimize, and address losses and damages. Developing countries, for instance, will need US$127 billion annually by 2030 and US$295 billion annually by 2050 to take necessary adaptive measures.

Recommendations

- To keep warming to 1.5°C above pre-industrial levels, the world requires rapid and sustained GHG reductions across all sectors. Compared to 2019 levels, CO_2 emissions must fall by at least 48% by 2030, 65% by 2035, and reach net zero by mid-century. To this end:
- Urgent, system-wide transformations are needed to secure a net-zero, climate-resilient future. The world must rapidly phase out fossil fuels, the primary driver of the climate crisis.
- Support climate-resilient green development by integrating adaptation and mitigation, advancing sustainable development for all. This requires increased international cooperation, improved access to financial resources—especially for vulnerable regions, sectors, and groups—and inclusive governance with coordinated policies.
- Climate finance for both mitigation and adaptation must increase dramatically this decade, as current public and private finance flows for fossil fuels remain higher than those for climate action.
- Governments must set clear climate goals and coordinate across multiple policy domains, with inclusive governance processes to enable effective climate action.
- Regulatory and economic instruments should be scaled up and widely applied to support deep emissions reductions and climate resilience.

Source: IPCC (2023)

One critical dimension of climate change related risks is sea-level rise (SLR), which directly amplifies water-related hazards and food security challenges in many member states. Climate change is a key driver of SLR, primarily through two mechanisms: the melting of land-based ice sheets and glaciers, and the thermal expansion of seawater as it warms. When ice from land surfaces—such as the Greenland and Antarctic ice sheets—melts, it adds to the total volume of water in the oceans. At the same time, rising global temperatures cause seawater to expand—a phenomenon known as thermal expansion—further contributing to sea-level rise (IPCC, 2021). Model-based projections of global mean sea-level rise (relative to the 1986–2005 baseline) suggest significant increases by the end of the 21st century. According to the IPCC's Sixth Assessment Report, global sea levels are projected to rise between 0.27 and 1.01 meters (0.9 to 3.3 feet) by 2100, depending on greenhouse gas emission scenarios and ice sheet dynamics (IPCC, 2021).

SLR poses a serious threat to coastal regions, especially through saltwater intrusion and coastal flooding. This not only undermines freshwater availability but also places additional stress on food systems and human settlements. One of the less visible yet profound consequences of rising sea levels is the intrusion of saltwater into freshwater aquifers, particularly in low-lying coastal areas. This phenomenon occurs when higher sea levels increase pressure on coastal groundwater systems, allowing saline water to migrate inland and contaminate freshwater supplies (Werner et al., 2013; Taylor et al., 2013). Reduced groundwater recharge due to altered precipitation patterns further compounds this issue, limiting the natural ability of aquifers to flush out saline water.

Even modest increases in sea levels can have significant consequences for coastal settlements. SLR leads to more frequent and severe coastal flooding, accelerated coastal erosion, and higher storm surge impacts. These hazards directly affect livelihoods and essential services, from water provision to food distribution. Urban infrastructure, including water supply systems, wastewater treatment facilities, and drainage networks, is at risk. Moreover, damage to transport networks and port infrastructure can disrupt food supply chains, leading to temporary or prolonged food insecurity in affected regions (Porter et al., 2014).

The impacts are particularly acute in densely populated coastal zones, where a large proportion of the global population resides. Without adaptive measures, these communities face increasing risks from permanent inundation, loss of arable land, salinization of soil and water resources, and displacement, all of which have direct bearing on food security (Ahsan and Özbek, 2022). For example, the loss of arable land and saline intrusion reduce food production by making agricultural land less fertile and unproductive, while displacement undermines food security through reduced access, affordability, and availability. This illustrates the close linkage between climate change, water security, and food security in OIC member states, underscoring the urgent need for integrated adaptation strategies.

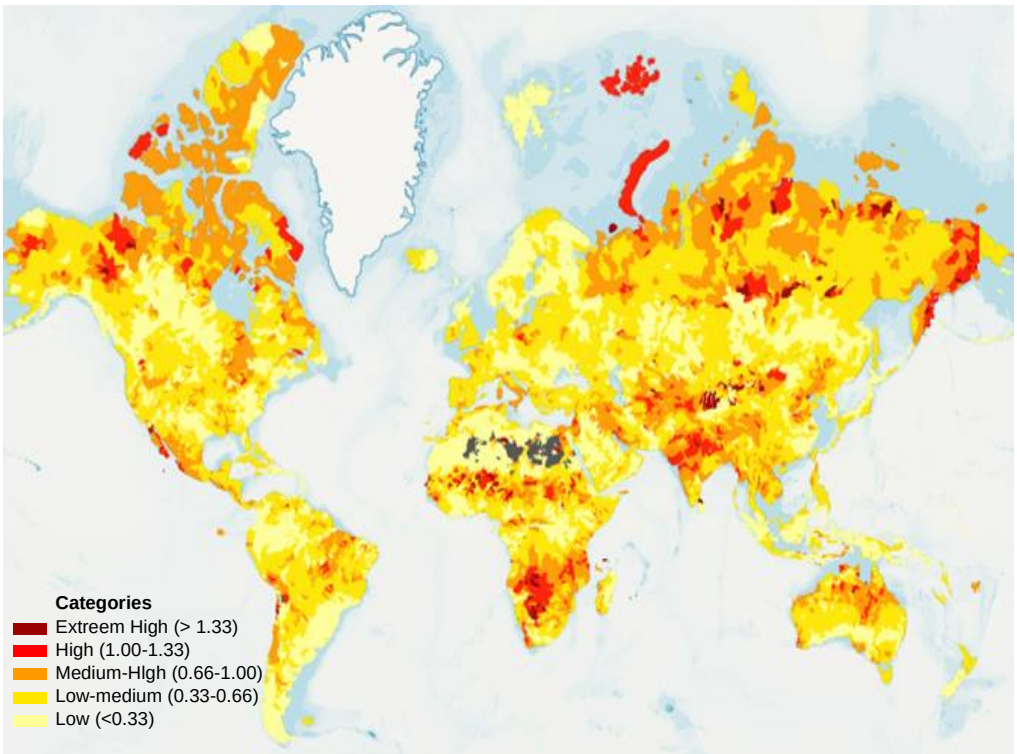
4.2. Water Resources in the Face of Climate Change

Climate change impacts are being felt through reduced availability, disrupted hydrological cycles, and intensified water-related hazards. It is important to highlight that along with shifting climatic conditions also increasing water demand contributes to water stress. In other words,

water abstraction—the process of extracting water from natural sources—remains one of the main pressures on water systems, and these pressures are expected to intensify as climate change progresses. The interface between ecological flow requirements and water abstraction remains weak. This disconnect is particularly concerning given the water dependency of ecosystems and their services. Prolonged and intensified water scarcity poses significant threats to ecosystem services. At the same time, ecosystem degradation undermines water-related services such as filtration, storage, and regulation, creating a vicious cycle that further strains water systems under climate stress.

River flow rates are anticipated to decline across many regions due to shifting precipitation patterns and rising temperatures. Reduction in rainfall can drastically lower water availability, threatening agricultural productivity and food security, particularly in economies dependent on rain-fed agriculture. Seasonal variations in water availability and peaks in scarcity are especially severe in regions with semi-arid and arid climates such as Algeria, Egypt, Libya, Morocco, and Tunisia, where peak summer demand coincides with minimal precipitation. For example, significant reductions in the surface area of critical basins like Lake Chad in SSA have already been recorded (Mahmood et al., 2019). In Sub-Saharan African member states, projected increases in temperatures will intensify droughts, while some countries within the SA region, experiencing shifts in seasonal monsoonal trends, are expected to face more severe seasonal droughts. The MENA region, already characterized by high water scarcity, is projected to face worsening drought conditions due to surging temperatures and declining rainfall.

Figure 4.3: Projected Change in Seasonal Water Supply Variability by 2050



Source: Adopted form WRI (2025).

As discussed in **Chapter 1**, certain regions within the OIC already experience significant variability in water supply. Future supply is projected to become more erratic and uncertain due to climate-induced water variability. As shown in **Figure 4.3**, OIC member countries are projected to experience seasonal water variability. The SSA, ECA, and LAC regions are expected to record substantial increases in seasonal variability by 2050 compared to the baseline level. Burkina Faso, Chad, Mali, Niger, and Turkmenistan are projected to undergo "high" seasonal variability. Countries projected to have high-to-medium seasonal variability include Albania, Bangladesh, Comoros, Guinea-Bissau, Iraq, Jordan, Lebanon, Mozambique, Palestine, Sudan, and Tajikistan. Low seasonal variability is projected for countries in different geographical locations such as Algeria, Oman, and Qatar in the MENA region; Cameroon and Guinea in SSA; and Indonesia and Malaysia in SEA. Notably, these areas with high supply variability overlap with those already facing considerable water stress, indicating that climate change will further intensify the strain on these regions.

Additionally, rising global temperatures are elevating water temperatures, which negatively affects water quality by lowering dissolved oxygen levels and reducing the self-purification capacity of water bodies. Warmer water also promotes the proliferation of harmful algal blooms, further degrading water quality. This situation increases the risk of contamination, both through runoff during floods and through the concentration of pollutants during droughts. Moreover, climate-induced disturbances threaten ecosystems reliant on water systems, particularly wetlands and forests. As a result, the potential loss of biodiversity and other essential water-related ecosystem services, including, carbon sequestration, water purification, and natural flood regulation is intensifying.

Another important point to highlight is that, the world has experienced terrestrial water storage (TWS) (the total volume of water stored on the land surface and in the subsurface) losses averaging about 1 cm per year since 2002 (WMO, 2021). This trend continued in 2024, with anomalies decreasing by 796 km^3, from -6,609 km^3 in 2023 to -7,404 km^3 in 2024 (Li, 2025). Direct human activities, such as unsustainable water abstraction, combined with the impacts of global warming—particularly ice sheet and glacier loss—are putting additional pressure on freshwater resources. Given that only about 0.5% of Earth's water is usable and available as freshwater, the impact of continued TWS loss due to climate change could severely constrain freshwater availability. Consequently, agricultural productivity is at risk, as the quantity and quality of freshwater required for irrigation decline.

4.3. Vulnerabilities and Readiness in the Face of Climate Change

The impacts of climate change on the water sector in OIC countries differ across regions, countries, and local areas. It is crucial to understand the climate vulnerabilities and readiness of water sector in order to effectively plan and implement measures at various levels. An analysis of The Notre Dame Global Adaptation Initiative (ND-GAIN) Composite Index for 2025 water sector vulnerability to climate change in OIC member countries had an average vulnerability level of 0.46, slightly above the global average of 0.43. Similarly, in terms of readiness for climate change, OIC countries scored an average of 0.37 lower than the global average of 0.40 (See Box 5). This indicates that the water sector vulnerability of the member countries is highly vulnerable to climate change. In other words, the water sector in OIC countries faces high vulnerability with insufficient adaptation capacities.

A regional breakdown shows varying degree of vulnerability and readiness of the water sector within OIC countries. From a vulnerability perspective, the ECA with a vulnerability level of 0.34 had the lowest vulnerability in the region lower than the global average of 0.43. SSA and SA recorded the highest average overall water sector vulnerability each with a score of 0.54 while LAC and MENA regions' vulnerability stood at per with the global average. The regions with the highest overall water sector readiness were ECA and SEA with average readiness scores of 0.46, followed by SA with 0.32. LAC and SSA comprised of the regions with the least readiness posture with an average score of 0.28 and 0.29 respectively.

BOX 5: The Notre Dame Global Adaptation Initiative (ND-GAIN) Composite Index

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

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

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

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

Source: Adapted from Chen et al. (2015)

Table 4.1 provides a detailed comparison of OIC sub-regions with the global average for each component of the vulnerability and readiness indices. In terms of exposure, on average, the water sectors of ECA and MENA regions have lower exposure to climate change than the global average while SEA and ECA regions are less sensitive to water sector vulnerability. Adaptive capacities are strongest in the ECA, MENA, and SEA regions. The average scores for SSA and SA are above the global average in all the components under the vulnerability index, indicating that the region is highly exposed with limited adaptive capacity. ECA countries in general, are less exposed, less sensitive and better equipped to mitigate potential damages from the adverse consequences of climate events. Thus, national efforts to reduce vulnerability in the water sector to climate impacts should target specific dimensions where each region is most lacking.

Regarding the readiness level, the OIC as a group demonstrates a lower level of preparedness to adapt to climate change than the global average, as manifested in its lower scores in the "governance", "economic" and "social" components of the readiness index. Lower readiness also indicates a reduced capacity to optimize investments in adaptation measures. Among the

OIC sub-regions, LAC, SSA, and SA are the countries trailing the global average in the 'governance' component while SEA, ECA and MENA countries regions have a stronger governance score than the global average. A Similar trend to the governance component exist under the economic component. The social readiness in sub region of the member countries is strongest in the ECA region, above the global average and weakest in SSA with the rest of the regions also faring from the global average.

Table 4.1 Water Sector Vulnerability and Readiness Scores, 2025

Region	Vulnerability		
	Exposure	Sensitivity	Adaptive Capacity
OIC	0.43	0.37	0.59
ECA	0.36	0.24	0.42
LAC	0.41	0.34	0.55
MENA	0.37	0.40	0.51
SA	0.55	0.45	0.62
SEA	0.46	0.26	0.51
SSA	0.48	0.40	0.74
World	0.44	0.33	0.52
Region	Readiness		
	Governance	Economic	Social
OIC	0.40	0.40	0.31
ECA	0.50	0.50	0.39
LAC	0.27	0.27	0.29
MENA	0.48	0.48	0.33
SA	0.30	0.30	0.35
SEA	0.53	0.53	0.31
SSA	0.30	0.30	0.26
World	0.41	0.43	0.37

Source: SESRIC staff calculations based on ND-Gain Index 2025.Note: Vulnerability score: lower score means less vulnerable (better); Readiness score: higher score means more readiness (better). ECA= Europe and Central Asia; LAC= Latin America; SA= South Asia; SEA= Southeast Asia; MENA=Middle East and North Africa; SSA= Sub-Saharan Africa.

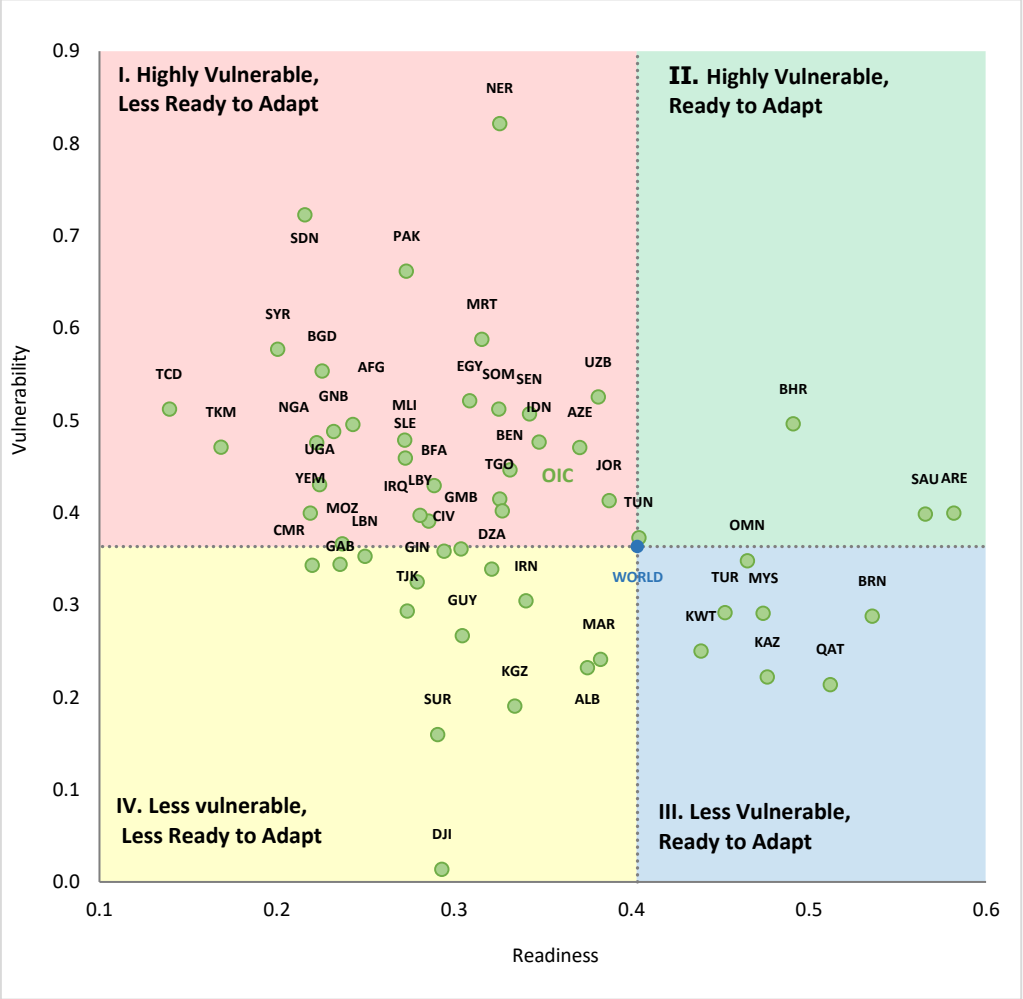
Figure 4.4 presents a scatter plot matrix to provide a quick comparison of the water sector's vulnerability and readiness to climate change at the OIC country level. This figure offers a clear overview of individual countries and the OIC regions. The plot is divided into four quadrants, delineated by the world average level of water sector vulnerability and readiness. The countries in quadrant **I** are characterized by high vulnerability with low readiness to adapt while those in quadrant **II** features countries with high vulnerability, however these countries are prepared to adapt. Quadrant **III** comprises of countries that are less vulnerable but at the same time ready to adapt to the impacts of climate. Finally, countries within quadrant **IV** are more vulnerable with the least readiness posture.

At the individual country level, 32 OIC member countries have higher vulnerability to climate change compared to the world average, and 43 OIC countries exhibit readiness levels below the world average. Several points can be derived from the scatter plot:

1. Countries with the highest vulnerability in their water sectors are Niger, Sudan, Pakistan and Mauritania while countries with the least readiness to adapt to climate change are Chad, Turkmenistan, and Syria.
2. Several SSA countries fall within the top left box quadrant, representing countries that are highly vulnerable and least ready to adapt.

3. United Arab Emirates, Saudi Arabia and Bahrain are the only countries with high vulnerability but have high readiness to adapt.
4. ECA countries are scattered across the red, yellow, and blue quadrants, and LAC countries have low vulnerability and low readiness.
5. There are seven countries in the safest zone - the bottom right quadrant, indicating they are less vulnerable and highly adaptable. These countries include Türkiye, Qatar, Malaysia, Oman, Kazakhstan, Kuwait and Brunei Darussalam.

Figure 4.4 Water Sector Vulnerability and Readiness to Climate Change Impacts by OIC Sub-Regions, 2025



Source: SESRIC staff generated figure based on ND-Gain Index 2025.Note: ECA= Europe and Central Asia; LAC= Latin America; SA= South Asia; SEA= South East Asia; MENA=Middle East and North Africa; SSA= Sub-Saharan Africa.

Countries in the quadrant I require special attention since they face the highest risks of climate change impacts with the lowest adaptive capacity. Those in the quadrant IV, despite low vulnerability, need to enhance their economic, social, and governance readiness to better adapt to climate change. In the quadrant II, despite high vulnerability, the presence of sufficient

resources enhances their capacity to adapt, reducing future risks. Finally, the quadrant III represents the lowest risks of climate change impacts on the water sector, as these countries are less vulnerable and possess adequate capacity to adapt.

4.4. Adapting to Climate Change in the Water Sector

Climate change presents a multidimensional challenge to water management. It affects water quantity through precipitation and evaporation changes, and water quality through increased runoff and pollutant concentration. It also heightens the risk of both droughts and floods, contributing to broader ecosystem degradation. As water plays a critical role in climate regulation cycles, effective water governance will be vital in climate adaptation and resilience strategies. The compounded pressures of climate change, rising demand, and ecological degradation pose severe challenges to global water security. Addressing these challenges will require integrated water resource management, improved coordination between ecological and human water needs, and robust policies that can operate effectively under uncertainty.

Adaptation to climate change in the water sector is not optional but rather an urgent necessity. By integrating robust planning, innovative technologies, and ecosystem-based approaches, water systems can be made more resilient to current and future climate risks. A proactive, inclusive, and well-financed adaptation strategy will be key to safeguarding water resources and supporting sustainable development under a changing climate. The variability of water resources over time and space can act as a constraint on socio-economic development. As discussed earlier, the impacts of climate change will exacerbate water-stressed regions, potentially affecting economic, environmental, and political dimensions.

An immediate area that demands attention is the formulation of an adaptation strategy to cope with hydrological changes. Water-related risks play a pivotal role and should be integrated into the decision-making processes for climate change adaptation in the water sector. Currently, the UNFCC advocates for the Iterative Adaptation Cycle, which revolves around four steps: impact, risk and vulnerability assessment; planning for adaptation; implementing adaptation measures; and monitoring and evaluation and learning. The iterative adaptive cycle has been embedded in the United Arab Emirates Framework for Global Climate Resilience see **BOX 6**.

Due to agricultural sector's heavy dependence on water, a significant portion of water-related adaptations is initiatives are being explored in the sector. According to Caretta et al. (2022), adaptation measures in the agriculture sector revolve around five main approaches:

1. **Water and soil conservation measures (such as reduced tillage, contour ridges, and mulching)**. Water conservation measures such as the use of modern irrigation techniques are frequently employed as adaptation responses to reduce water-related climate impacts.

2. **Changes in cropping patterns**. Farmers also commonly implement changes in cropping patterns, adjust the timing of sowing and harvesting, diversify crops towards cash crops, and adopt improved cultivars that can withstand hazards like floods and droughts.

3. **Conservation agriculture**. Conservation agriculture has proven to be effective in increasing soil carbon, yields, and technical efficiency. This approach includes practices that allow for shading and soil moisture retention, leading to the added benefit of reducing pest attacks.

4. **Climate-smart agriculture (which includes improved cultivars and agronomic practices)**. For traditional food grains in smallholder agriculture, the adoption of improved practices, such as modern varieties or integrated nutrient management, plays a crucial role in making production more resilient to climate stress.

5. **The use of non-conventional water sources**. Using non-conventional water sources, such as desalinated and treated wastewater, is emerging as an important strategy to increase water availability for agriculture. Many water-intensive industries are experiencing water stress, making water reuse an appealing adaptation option.

While adaptation policies will reflect the prevailing climatic, resources and technological conditions of individual member countries, adaptation decisions, plans, and efforts could centre on a range of structural, institutional, technological, and ecosystem-based measures to reduce vulnerabilities and strengthen resilience. Integrated Water Resource Management (IWRM) Promotes coordinated development and management of water, land, and related resources. It also facilitates stakeholder collaboration and supports adaptive decision-making under uncertainty. Water use efficiency in irrigated agricultural land must be maximized to reduce wastage. In terms of daily water consumption, Saudi Arabia, which is among the highest water stressed countries, launches yearly water conservation campaigns including the Qatrah Program as an adaptation strategy for its water sector in order to rationalize water usage.

Furthermore, diversifying water supply by using reclaimed water, desalination, and rainwater harvesting will also reduce freshwater attribution especially in countries with low ground water availability. Enhancing natural water retention and filtration by protecting and restoring watershed areas could increase recharge rates in waterbodies such as lakes and rivers and streams. To protect water infrastructure, climate-resilient water infrastructure systems needs upgrading or newly designed to withstand extreme weather events.

From an institutional perspective, climate risk assessments should be incorporated into national water policies and planning frameworks. In the face of growing water stress and climate variability, Trans-boundary Water Governance mechanisms should be considered an integral part of national water sector adaptation strategies. This is particularly significant for member countries that share critical water resources with neighbouring countries. Adaptation measures must be integrated into a comprehensive framework for sustainable water management, which considers not only the societal benefits but also environmental sustainability. For more in-depth discussions on this framework, refer to Chapter 7. Through the implementation of such policies, stakeholders can proactively address the challenges posed by climate change on water resources and strive for sustainable and resilient water systems.

BOX 6: The United Arab Emirates Framework for Global Climate Resilience

The United Arab Emirates Framework for Global Climate Resilience was adopted during COP28 as a framework for the Global Goal on Adaptation to decrease climate change-related vulnerabilities and build adaptive capacities. Cantered on affixing nature, peoples, lives and livelihoods at the forefront of climate change, has seven broad thematic targets crucial for achieving global human wellbeing and sustainable development. In addition to this, it has four-dimensional targets that covers national adaption processes.

Seven Thematic Targets:

- Water: to significantly reduce climate-induced water scarcity and enhance climate resilience to water-related climate hazards towards a climate resilient water supply, towards access to safe and portable drinking water for all;
- Food and agriculture: Attaining climate-resilient food and agricultural production and supply and distribution of food, as well as increasing sustainable and regenerative production and equitable access to adequate food and nutrition for all;
- Health: Attaining resilience against climate change related health impacts, promoting climate-resilient health services, and significantly reducing climate-related morbidity and mortality, particularly in the most vulnerable communities;
- Ecosystems: Reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems;
- Infrastructure and settlements: Increasing the resilience of infrastructure and human settlements to climate change impacts to ensure basic and continuous essential services for all, and minimizing climate-related impacts on infrastructure and human settlements;
- Poverty eradication and livelihoods: Substantially reducing the adverse effects of climate change on poverty eradication and livelihoods, in particular by promoting the use of adaptive social protection measures for all;
- Cultural heritage: Protecting cultural heritage from the impacts of climate-related risks by developing adaptive strategies for preserving cultural practices and heritage sites and by designing climate-resilient infrastructure, guided by traditional knowledge, Indigenous Peoples' knowledge and local knowledge systems.

Four Dimensional Targets under the "Iterative Adaptation Cycle":

- **Impact Vulnerability and Risk Assessment**
  by 2030 all Parties have designed, established and operationalized a system for monitoring, evaluation and learning for their national adaptation efforts and have built the required institutional capacity to fully implement the system
- **Planning**
  By 2030 all Parties have conducted up-to-date assessments of climate hazards, climate change impacts and exposure to risks and vulnerabilities and have used the outcomes of these assessments to inform their formulation of national adaptation plans, policy instruments, and planning processes and/or strategies, and by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services
- **Implementation**
  By 2030 all Parties have in place country-driven, gender-responsive, participatory and fully transparent national adaptation plans, policy instruments, and planning processes and/or strategies, covering, as appropriate, ecosystems, sectors, people and vulnerable communities, and have mainstreamed adaptation in all relevant strategies and plans;
- **Monitoring and evaluation**
  By 2030 all Parties have designed, established and operationalized and system for monitoring, evaluation and learning for their national adaptation efforts and have built the necessary institutional capacity to fully implement the system.

Source: Bueno et at. (2024).

Chapter 5: MANAGEMENT OF WATER FOR SUSTAINABLE FUTURE



Economic, technological advancement, and industrialisation are coupled with extensive use of natural resources. These developments, however, were attained at a price (Chapter 4). Environmental catastrophes like loss of biodiversity, declining environmental quality, and altered climatic conditions, have been caused by such resource Based economic enterprises and developments (UNEP, 2019). This has principally been because the ecological worth of river basins had been neglected most of the time, what has caused major environmental impacts like destruction of ecosystems, loss of species, and reduction in the quantity and quality of rivers and overall water resources (UNESCO, 2021).

However, the traditional approach that largely focused on engineering-based solutions in water management is now considered obsolete, as it has not been successful in addressing the challenges related to water. Recognizing the limitations inherent in the traditional approaches, greater emphasis has been made in incorporating the values of sustainable development in the management of the water resources. This includes promoting inter-sectoral integration, engaging a broader range of stakeholders, considering the human dimensions of water management, and acknowledging the economic, ecological, and cultural values of water resources (UNESCO, 2023).

Additionally, the water management system must be adaptable to address future uncertainties, including the impacts of climate change. Importantly, the sustainable management of water resources is critical to ensuring food security, particularly in regions where agricultural production is heavily dependent on water availability and climate variability.

5.1. Water Resources Management Approaches

The sustainable approach to water management highlights the importance of multi-sector integration, broader stakeholder involvement, and the recognition of economic, social, and ecological values of water resources (Schoeman et al., 2014). It ensuring equitable access to water resources, as recommended by the relevant SDGs and the OIC Water Vision and requires participatory and transparent management practices.

Moreover, it is crucial to integrate policies across various related sectors, such as energy and agriculture, to establish a robust regulatory and institutional framework. In this process, careful consideration of the impacts and trade-offs resulting from different policies is necessary before making decisions on the most suitable path to pursue.

In the OIC, water governance is closely linked to preserving peace and security in the region. Many treaties regulating water resources in various OIC countries are either ineffective or non-functional, posing risks to peace and stability (SESRIC, 2018). Therefore, there is a pressing need to find agreeable approaches for OIC countries to address water governance both within their own territories and in relation to shared water resources.

Globally, three approaches have gained attention in solving water-related challenges: Integrated Water Resources Management (IWRM), Ecosystem-based Approaches (EBA), and Adaptive Management (AM). These approaches aim to ensure sustainable and inclusive water management, taking into account the interconnectedness of water with agriculture, society, economy, and environmental in general and food security in particular.

Integrated Water Resources Management

Integrated Water Resources Management (IWRM) is likely the most familiar expression among the literature on water resources management. Constraints of traditional extractive-based approach to the methods of water planning led the world to seek a holistic approach to a solution considering ecological as well as societal values in the decision-making on water. The main aim of IWRM is to bridge the gap between sustainable development and cross-sectoral planning. (United Nations Environment Programme, 2021).

Figure 5.1 General Framework of IWRM



Source: GWP (2020)

It gained global recognition during the 1977 Water Conference and popularized thereafter by the Global Water Partnership (GWP) during the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, in June 1992. The Conference highlighted the Dublin Statement agreed upon earlier in January during the International Conference on Water and the Environment (ICWE) held in Dublin, Ireland, and it outlaid action recommendations founded on four guiding principles – the so-named Dublin Principles. In brief, IWRM aim to advance the harmonised development and management of the water, land, and related resources to achieve the maximization of economic and social welfare with a guarantee to ensure the sustainability of essential ecosystems (GWP, 2011; GWP, 2000).

The framework of IWRM, depicted in **Figure 5.1**, consists of three pillars:

- **Enabling environment**: This involves developing appropriate policies, strategies, and legislation for sustainable water resources development and management.
- **Institutional framework**: It focuses on putting the policies, strategies, and legislation into practical implementation.
- **Management instruments**: This pillar provides the necessary tools for institutions to fulfil their duties effectively.

The framework recognizes the interdependence of sectors by source of water use. For instance, Intensification of water withdrawals in agricultural water leads to water pollution and

availability for other sectors, hindering its usability for other purposes such as drinking, industry, and others. Increasing discharges from municipal and industrial sources can also contain contaminants that threaten the health of river ecosystems. On the other hand, dedicating water solely for ecological purposes might limit its availability for other essential sectors, including agricultural food production thus negatively impacting food security. In practice, IWRM involves basin-scale management of water resources, establishing water rights, implementing water pricing for allocation, and embracing participatory decision-making processes (Giordano & Shah, 2017).

Since 1992, an estimated 80% of nations have undertaken reform processes aimed at enhancing the enabling environment for the management of water resources by applying IWRM measures (UNEP, 2012). Throughout the last several decades of application, nations that incorporated the integration approach have observed the development of infrastructure, the diversification of funding sources, and strengthened institutional arrangements, marking the accomplishment of more sound water management practices as well as socio-economic gains (UNEP, 2024). Specifically, the latter include increased efficiency of water usage, specifically within the agricultural sector, as well as access to water as well as increased water quality through the enhancement of wastewater treatment, along with favourable social as well as environmental impacts.

In the OIC, several countries have also adopted IWRM practices. For example, Kazakhstan, Kyrgyzstan, Azerbaijan, Tajikistan, and Turkmenistan have embraced IWRM since the early 2000s, implementing basin management approaches, reforming institutional setups, and making regulatory changes (OECD & United Nations, 2014). Additionally, many other OIC countries are currently at various stages of IWRM implementation. Despite the acceptance of the IWRM concept by the international community, studies have highlighted certain limitations associated with its practical application (UNEP, 2024). Some experts argue that IWRM is a somewhat vague concept, which hinders its effective implementation. Key areas of disagreement include what aspects need to be integrated, how integration should be achieved, who should provide leadership in the process, and how the necessary funding will be allocated (Schoeman et al., 2014).

Ecosystem-Based Approach

Various ecosystem-based approaches (EBA) have been framed as a result of the integration of ideas on the management of natural resources, consisting of sustainable development, biodiversity, natural capital, as well as ecosystem services. The ideas were assimilated into international agreement policies, specifically the Convention on Biological Diversity (CBD) with the Ecosystem Approach, the UN Millennium Ecosystem Assessment, as well as programs such as the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) (Schoeman et al., 2014).

EBA has led to several other ecological-based ideas, among them being Nature-based Solutions (NbS). The idea functions as an umbrella, gathering several ecosystem-based methods, defined as measures that conserve, manage in a sustainable manner, or restore natural or modified ecosystems to address societal problems efficiently, delivering multiple human well-being and

Figure 5.2 Nature-based Solutions Framework



Source: Adapted from Cohen-Shacham et al. (2016)

biodiversity benefits (Cohen-Shacham et al., 2016). For water resources management, NbS contributes directly to SDG Target 6.6 by helping to restore and protect water-related ecosystems.

For the case of adopting NbS for the water bodies for the agri-sector, it has several benefits. It achieves the stable high-quality water supply, hence the sector achieves high productivity while achieving the reduction of downstream pollution.

For the case of water and sanitation, building wetlands for the treatment of wastewater has been shown to be cost-effective while allowing for the reuse of the treated effluent water for non-potable purposes as well as for energy generation.

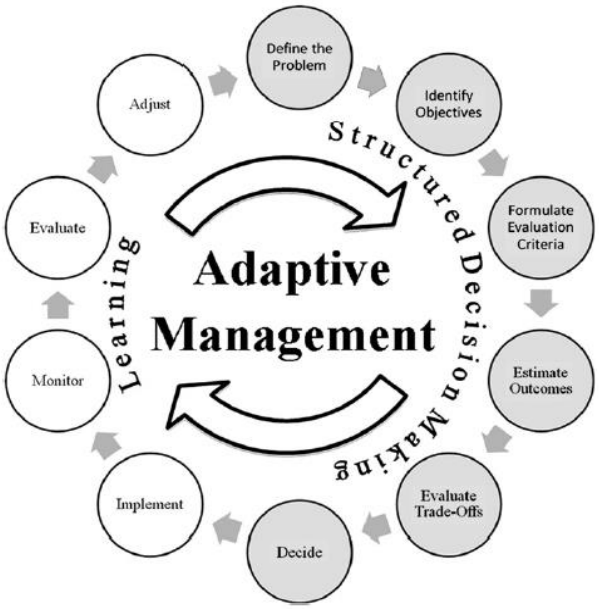
NbS has been applied to some of the water projects in the OIC countries. Egypt, for example, has established wetlands to treat wastewater, producing secondary-standard effluents to be used for irrigation. The project saved not only water but also had lower construction and operating costs compared to conventional systems, with both environmental and financial gains (United Nations World Water Assessment Programme/UN-Water, 2018). In Jordan, the NbS approach has been employed to restore the unsustainable land management practices in the Zarqa River basin. The project aims to allow the land to naturally regenerate itself and has resulted in economic growth through the cultivation of indigenous plants and the conservation of natural resources in the region (Cohen-Shacham et al., 2016).

While the EBA concept seems appealing and offers fewer risks, it also comes with limitations. Like IWRM, EBA suffers from concept ambiguity, and the existence of multiple branches of similar concepts may lead to confusion among stakeholders (Schoeman et al., 2014). This can pose challenges during the implementation of the concept. Additionally, there are debates surrounding the valuation of ecosystem services, which is a component of EBA. Implementing the concept is further challenged by the status quo of traditional water development practices, including civil engineering approaches and market-based economic instruments, as well as the expertise of service providers and the perceptions of policymakers and the public (United Nations World Water Assessment Programme/UN-Water, 2018).

Adaptive Management

Adaptive management (AM) is a systematic procedure for enhancing the management of resources by learning from the results of other ongoing or completed management activities (Williams et al., 2009, p.1; Holden et al., 2022). Considering uncertainties and case-specific circumstances, AM allows the methods and techniques used in its implementation to vary, making it the most suitable approach for managing natural resources.

Figure 5.3 Adaptive Management Project Cycle



Source: Adapted from Allen et al. (2011)

AM process typically involves several steps, as shown in **Figure 5.3**. The problem to be addressed has to be clearly defined, initially, and the objectives are established after consultation with the stakeholders. This leads to the specification of multiple options to address the problems. Next, evaluation criteria for the system are determined, along with the interpretation of how the system responds to different interventions. This often involves the development of quantitative conceptual models. Subsequently, actions are implemented based on the selected options. Regular monitoring of the system is essential to observe its behaviour over time. Based on the monitoring results, adjustments are made to the interventions. The cycle then returns to the first step, and the process continues until a desirable outcome is achieved.

AM is often described as a "learning by doing" approach, wherein formal iterative processes evolve based on the impacts observed from the interventions. However, while many projects claim to follow adaptive management principles, only a small number fully adhere to the complete AM cycle (Williams et al., 2009). Nevertheless, AM is being practiced in some OIC countries. For example, Central Asian countries apply AM principles to water allocation systems, particularly along the Amu Darya River Basin—shared by Afghanistan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan—promoting fairness in allocation and enabling adaptation to climate change. The basin management also includes legal instruments and joint organizations that align with IWRM principles. Despite some limitations, this approach has ensured water allocation in Central Asian countries over the last decades (USAID, 2016). Climate adaptive water resource management in Aral Sea Basin underscores efforts to modernise irrigation and management structures in the Amu Darya River to improve adoptive response to climate variability which signals recognition of adaptation gaps that earlier systems had not sufficiently addressed ADB **(2022)**. While AM shows great promise in addressing uncertainties of the future,

there are significant challenges in its implementation. As with IWRM and EBA, AM faces issues related to definition ambiguity, complexity, institutional barriers, cost, and underlying risks. These challenges are further compounded by cultural obstacles, where institutions tend to prioritize actions over reflection, prioritize box-ticking over learning, and foster competition instead of cooperation (Allen et al., 2011).

Water Demand Management

To achieve sustainable water resources management, it is essential to focus on demand-side management of water. Water demand management, aimed at sustainable development, involves enhancing water-use efficiency through prudent utilization and implementing measures to reduce water consumption.

The advantages of implementing water demand management in OIC countries are numerous. Firstly, managing demand alleviates pressure on scarce water resources. Secondly, encouraging or adopting measures for efficient water use proves to be more productive than investing in additional sources of supply. Thirdly, estimating present and future sectoral water use becomes possible, which is crucial for water planning and allocation. Lastly, demand management contributes to the sustainability of the water resource by reducing water losses.

Agriculture is one of the most important sectors in OIC countries. The future demand for food will require an increase in agriculture yields by improving its resource use efficiency, and therefore water plays a central role. The most general approach to improve water use efficiency in the agriculture sector is by practising conservation and reuse of water. Water conservation is recognized as a basis to implement 'sustainable ecological intensification' of food production (Freie Universitat, n.d.). Conservation works by enhancing ecosystem services in agricultural landscapes through improved soil and vegetation management. The idea is to keep water basin pristine enough from any disturbance, therefore, maintaining the quantity and quality of water for the end-use sector. In terms of reuse of water, technologies to collect and treat drainage agriculture water can be used such that the treated water can be applied again to the crops. This will minimize the use of water from surface or groundwater.

According to Evans & Sadler (2008), in addition to general water conservation and reuse practices, three possible options can be exercised to save water at the farm level. These options are:

1. **Increasing crop productivity per unit of water**. This option considers alternatives that include planting drought-tolerant crops or reducing inputs such as fertilizers or water to decrease vegetative vigour.
2. **Improving management capacity of growers**. This can be realized by increasing grower ability to optimize irrigation amounts in time and space utilizing site-specific irrigation techniques, enhanced water delivery systems, decision support tools, and other advanced methodologies.
3. **Spatially optimizing water applications and use**. This can be applied through various scientific irrigation scheduling scenarios including deficit irrigation, geographically relocating specific crops to areas of maximum adaptation and productivity, and fully or partially retiring lands from irrigation so water can be moved to more productive areas or uses.

Urban Water Supply & Use

Addressing water use in urban areas is crucial due to the continuous growth in urban populations and the subsequent increase in water demand. It is estimated that by 2050, 233 million urban dwellers in various cities globally may experience a surface-water deficit due to exceeding water demands (Flörke et al., 2018).

Cities are complex dynamic systems, comprising a mix of infrastructure and administrative systems. Achieving urban water use efficiency involves not only efficient water consumption but also considering water supply source efficiencies and demand management. The concept of "water-sensitive cities" emerges as a vision for the cities of the future, integrating environmental sustainability, supply security, flood control, public health, amenity, liveability, and economic sustainability (Brown et al., 2009).

The source of water supply in cities must align with its intended purpose. Different water sources may be suitable for specific uses, such as landscape irrigation versus drinking water. Utilizing unconventional water sources can be beneficial, including rainwater harvesting, stormwater capture, recycled wastewater, and desalinated water. Combining grey infrastructure (conventional infrastructure) with green infrastructure (nature-based solutions) can improve water supply availability in urban areas.

Demand management is a critical aspect of building a sustainable and resilient water system for cities. Encouraging behavioural changes in water consumption and raising awareness and literacy about water play a crucial role in improving water use efficiency. Embracing water-efficient appliances, accompanied by proper labelling, and utilizing smart metering and big data analysis can further enhance urban water demand management and build social capacity for effective water usage practices.

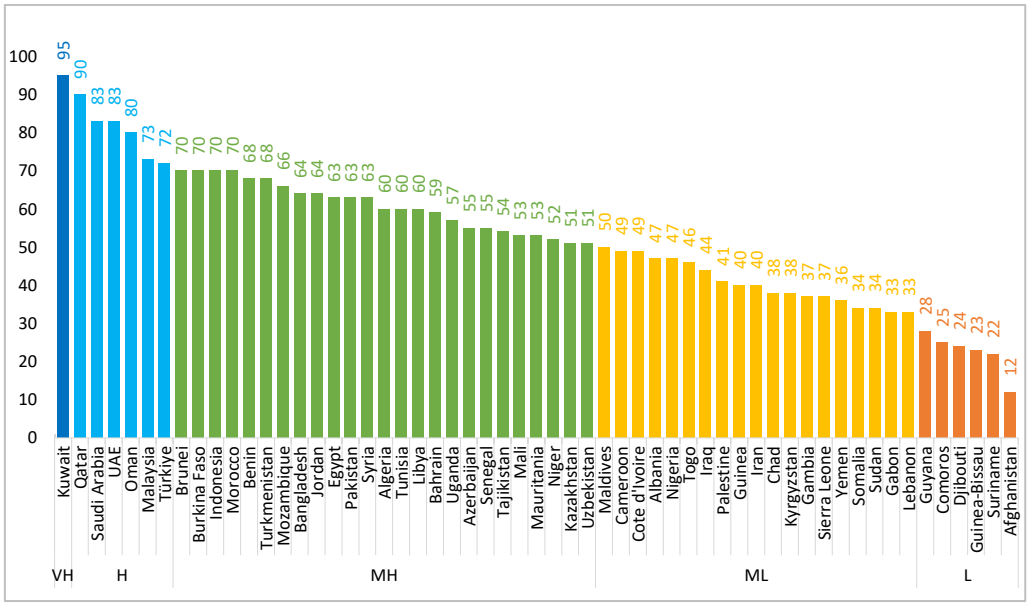
5.2. Water Governance and Cooperation

Addressing the diverse challenges in the water sector requires strategic interventions that effectively combine technical expertise, well-defined governance structures, and efficient management practices. The contemporary approach to water resource management emphasizes the importance of meeting the water needs of current and future generations by integrating sustainable development principles into the water sector. This integration involves multi-sector collaboration, broad engagement of stakeholders, and heightened awareness of the economic, social, and ecological values associated with water resources (Schoeman et al., 2014). Additionally, the management system should be adaptable to address potential future shocks and uncertainties, including those arising from climate change.

In response to the shortcomings of traditional water planning, the international community has sought a water management solution that incorporates ecological and societal considerations into decision-making processes. Integrated Water Resources Management (IWRM) stands out as a comprehensive framework that aims to bridge the gap between sustainable development and cross-sectoral planning (United Nations World Water Assessment Programme/UN-Water, 2018). IWRM recognizes the interconnected relationships between water, food security and other sectors, making it essential to involve diverse stakeholders in shaping water policies. In

practice, IWRM involves basin-scale management of water resources, the establishment of water rights, water pricing mechanisms for allocation, and inclusive participatory decision-making.

Figure 5.4 Degree of Integrated Water Resources Management (IWRM) Implementation (%), 2023



Degree of implementation	Score range (%)	General interpretation for overall IWRM score
Very high (VH)	91-100	Vast majority of IWRM elements are fully implemented, with objectives
High (H)	71-90	IWRM objectives of plans and programmes are generally met, and geographic coverage and stakeholder engagement is generally good.
Medium-high (MH)	51-70	Capacity to implement elements of IWRM is generally adequate, and elements are generally being implemented under long-term programmes.
Medium-low (ML)	31-50	Elements of IWRM are generally institutionalized, and implementation is underway.
Low (L)	11-30	Implementation of elements of IWRM has generally begun, but with limited uptake across the country, and potentially low engagement of stakeholder groups.
Very low (VL)	**0 -10**	Development of elements of IWRM has generally not begun, or has stalled.

Source: SESRIC staff compilation based on data from the UNSD Global SDG Indicators Database last updated on, December 13, 2024.

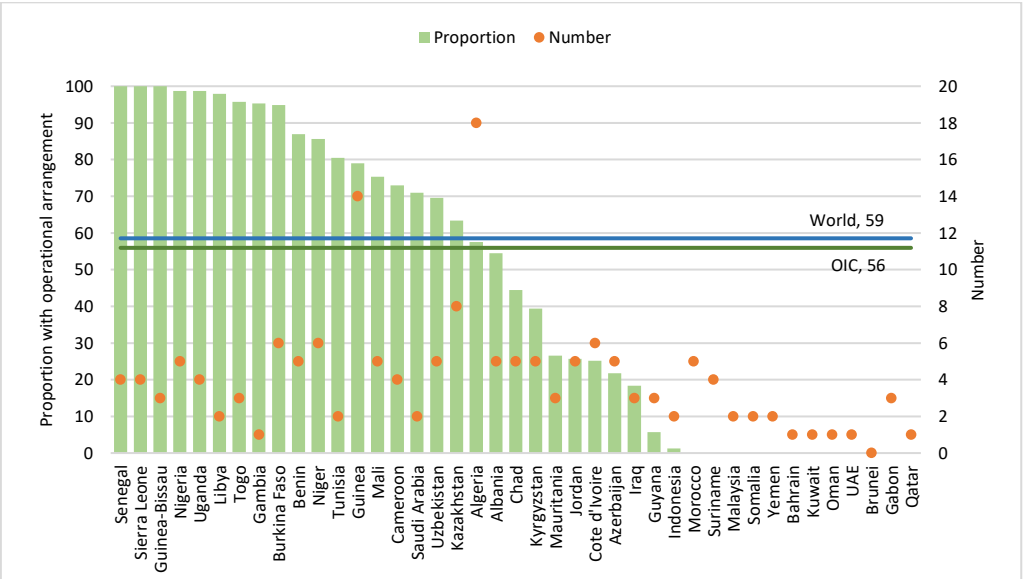
The implementation of IWRM can serve as an indicator of good governance in managing the water sector. Since 1992, all OIC countries have initiated reform processes to enhance the enabling environment for water resource management based on the principles of IWRM. Over the years, countries that have embraced integrated approaches have experienced infrastructure development, diversified financing sources, and improved institutional frameworks, resulting in

more effective water management practices and generating socio-economic benefits (United Nations Environment Programme (2024)). Notably, such benefits have been observed through enhanced efficiency in water use, particularly in the agriculture sector, along with improved access to water and enhanced water quality through advanced wastewater treatment practices.

OIC countries are actively implementing Integrated Water Resources Management (IWRM) to enhance their water resource management practices. For example, countries like Kazakhstan, Kyrgyzstan, Azerbaijan, Tajikistan, and Turkmenistan have initiated IWRM implementation efforts, focusing on transitioning to a basin management approach, restructuring institutions, and introducing regulatory reforms since the 2000s, according to the joint report by the United Nations and Organisation for Economic Co-operation and Development (2014).

Figure 5.4 illustrates the status of IWRM implementation, classifying countries into six categories based on their progress; very low, low, medium-low, medium-high, high, very high. The majority of OIC countries fall into the "Medium high" (25 countries) or "Medium low" (19 countries) categories, indicating that they have already institutionalised many aspects of IWRM. No OIC country was categorized as having a very low level of implementation. Six OIC countries—Afghanistan, Suriname, Guinea-Bissau, Djibouti, Comoros, and Guyana—were classified as "Low," suggesting that they have started developing elements of IWRM but with limited uptake across the country and potentially low engagement of stakeholder groups. In contrast, Kuwait, with a 95% degree of implementation, was categorized as "Very high," second only to Monaco globally. Only nine countries in the world were placed in this category. Following Kuwait, six OIC countries—Qatar (90%), Saudi Arabia (83%), United Arab Emirates (83%), Oman (80%), Malaysia (73%), and Türkiye (72%)—were placed in the "High" category.

Figure 5.5 Proportion of Transboundary Basins (river and lake basins and aquifers) with an Operational Arrangement for Water Cooperation, 2023



Source: SESRIC staff compilation based on data from the UNSD Global SDG Indicators Database last updated on, December 13, 2024.

Collective action involving multi-stakeholder monitoring and reporting processes is crucial to establish national targets and accelerate sustainable and equitable water resource development and management practices. Another critical aspect to address in global water management efforts is the presence of 153 countries sharing 286 transboundary rivers, lakes, and aquifers. These shared water basins encompass approximately 62 million km^2 of land (42% of global land area), support over 2.8 billion people, and producing 22 000 km^3 of river discharge accounting for 54% of global river discharge UNEP-DHI and UNEP (2016). The management of these transboundary water resources is vital, but it often faces challenges due to inadequate cooperation. Despite around 450 transboundary water treaties adopted since 1820, many shared basins lack sufficient arrangements to support effective management (UN and UNESCO, 2018). It is essential for global efforts to prioritize cooperation in addressing water issues in these shared basins to achieve sustainable water resource management worldwide.

Globally, around 59% of transboundary basins—including river and lake basins and aquifers—had operational arrangements in place as of 2023. This proportion was 56% in the OIC region as a group, based on the data available for 41 OIC countries out of 57. As of 2023, several OIC countries demonstrated strong water cooperation by having operational arrangements for nearly for all of their transboundary basins. Top performers with 100% coverage include Senegal, Sierra Leone, and Guinea-Bissau, each managing 3 to 4 basins effectively. Close behind, Nigeria, Uganda, Libya, Togo, Gambia, and Burkina Faso. Overall, proportions were above the global average in 18 OIC countries. In contrast, 12 OIC countries had no operational water cooperation arrangements indicating significant gaps in formal water cooperation for their transboundary basins. Besides, some OIC countries have set a positive example by demonstrating commendable practices in water-sharing cooperation during critical and even potentially conflicting situations, as highlighted in **BOX 7**.

Furthermore, strong financial support is essential to achieve progress in SDG 6, which focuses on water and sanitation. Scaling up funding for water sector projects is crucial to address water issues effectively. This requires an increase in funding from both internal and external sources. Sustainable investments in the water sector should be supported by appropriate business models and alternative financial sources, such as blended finance, loans, and revolving funds.

Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan (constant 2023 US$ millions) to OIC and non-OIC developing countries has steadily increased in recent decades. OIC countries (51 countries) were recorded to receive approximately 46%, and non-OIC developing countries (95 countries) about 47%, of WASH-related government spending, with around 7% allocated to unspecified recipients. Development assistance plays an important role in improving the WASH sector in the OIC as well as in other developing economies, as availability and access to WASH services remain limited in many developing countries. A lack of adequate infrastructure, investment, or policy frameworks may result in deficient coverage of WASH services, leading to worsening health conditions and food security.

Development assistance for water and sanitation increased markedly between 2010 and 2023 (**Figure 5.6**). In OIC countries, ODA to the sector, as part of official government spending plans, rose by US$ 821 million—from US$ 3,171 million in 2010 to US$ 3,992 million in 2023 (in constant 2023 US dollars). In comparison, in non-OIC developing countries, ODA for water supply and sanitation increase was relatively less by US$ 431 million from 3,690 million US$ in 2010 to US$ 4,121 million in 2023.

BOX 7: Evolution of Central Asia's Transboundary Water Cooperation Mechanism

In Central Asia, the Amu Darya and Syr Darya river basins form lifelines for agriculture, energy, and livelihoods across Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan. Following the collapse of the Soviet Union, the fragmentation of integrated water-energy management systems led to severe coordination challenges. Differences in national priorities for hydropower, irrigation, and/or energy security created seasonal tensions and ecological risks. In response, the region gradually pursued institutionalized transboundary water cooperation as a cornerstone of regional stability and development. The following cooperative frameworks represent key responses to these challenges.

One of the earliest frameworks emerged in 1992 with the establishment of the Interstate Commission for Water Coordination (ICWC), supported by its Scientific-Information Center, which enabled technical collaboration and seasonal allocation planning. This was followed in 1996 by the Chardjev Agreement between Uzbekistan and Turkmenistan, which allowed joint usage of the Tuyamuyun Reservoir through a model of operational control and compensation—establishing a precedent for infrastructure-based bilateral cooperation. In 1998, the Syr Darya Agreement introduced a barter mechanism under which upstream countries would release water during the summer for irrigation, while downstream countries provided energy (gas, coal, electricity) in winter. Although formal implementation weakened over time, the seasonal coordination logic remains influential. Since 2016, Uzbekistan has adopted a proactive hydro-diplomacy agenda. In 2017, a deal over the Kasan-Sai Reservoir granted Uzbekistan primary usage rights while Kyrgyzstan retained territorial ownership. In 2022, the Kempir-Abad (Andijan) Reservoir Agreement gave Uzbekistan operational control in exchange for shared management and guaranteed equal access to water. These bilateral breakthroughs have been supported by multilateral platforms such as the World Bank's Central Asia Water and Energy Program (CAWEP) and the UNECE Water Convention, which finance hydrological monitoring systems, decision-making tools, and institutional capacity-building.

As regional cooperation deepened, water diplomacy in Central Asia began to extend beyond bilateral treaties into more integrated infrastructure partnerships. A key example is the growing coordination between Uzbekistan and Tajikistan—two countries historically divided by upstream–downstream asymmetries on shared rivers.Seeking to stabilize seasonal flows and address mutual development needs, Uzbekistan initiated a new phase of cooperation with Tajikistan, proposing joint projects along the Zarafshan River, a vital transboundary water source. In 2022, the two countries signed an agreement to construct the Yavan and Fandaryo hydropower plants, with a combined capacity of 320 MW. While primarily designed to produce electricity, the initiative reflects Uzbekistan's broader strategy of using joint infrastructure to support sustainable water regulation and regional trust-building

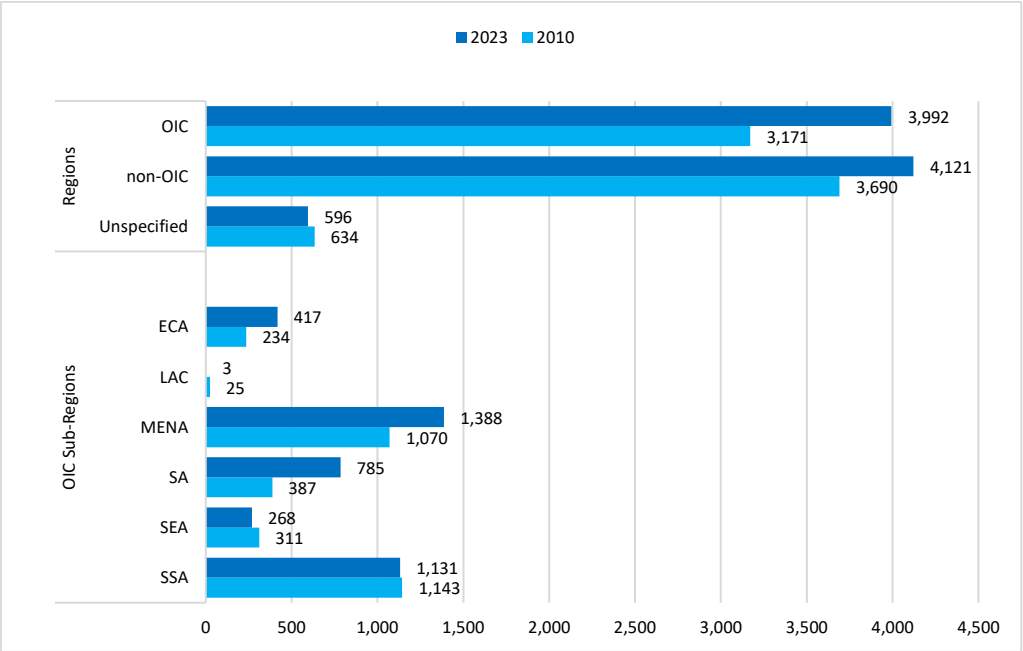
This water-focused partnership is consistent with the principles promoted through the Consultative Meetings of Central Asian Leaders, which have become a cornerstone of regional diplomacy. At the Sixth Meeting in Astana (2024), the heads of state emphasized connectivity, benefit-sharing, and joint stewardship of water–energy systems. The adopted 2025–2027 roadmap encourages basin-level collaboration and serves as a framework for resolving upstream–downstream challenges through cooperative mechanisms. Yet this cooperative model faces a significant challenge with Afghanistan's construction of the Qosh Tepa Canal on the Amu Darya, which was one of the concerns during last meeting.

Designed to irrigate over 500,000 hectares, the project could reduce downstream flow by up to 20%, affecting critical irrigation areas in Uzbekistan and Turkmenistan. With no formal water-sharing agreement and Afghanistan remaining outside regional frameworks, the canal's development has raised widespread concern. The absence of internationally recognized technical structures and administrative continuity within Afghanistan's Ministry of Energy and Water has further complicated its participation in regional coordination mechanisms. In response, Uzbekistan has prioritized technical dialogue, sending a high-level delegation to Mazar-i-Sharif in April 2025 and advocating for cooperation grounded in ecological balance, food security, and mutual benefit. While no resolution has been reached, these efforts reflect Central Asia's broader commitment to managing shared resources through diplomacy rather than confrontation.

Central Asia's experience illustrates how water diplomacy can evolve from fragmentation to pragmatic cooperation. The region's blend of legal frameworks, joint infrastructure, and seasonally adjusted trade-offs presents a valuable model for other OIC member states navigating water stress. Institutionalized cooperation, grounded in technical transparency and mutual benefit, remains key to ensuring regional stability and ecological resilience.

Sources: World Bank. (2024), UNECE. (2023), UNECE. (2024), Ministry of Agriculture of the Republic of Uzbekistan. (2025), UN Uzbekistan & UNCT. (2020), SIC ICWC, AIIB (2024)

Figure 5.6 Water and Sanitation Development Assistance as part of Official Government Spending Plans (constant 2023 million US$), 2010 vs. 2023

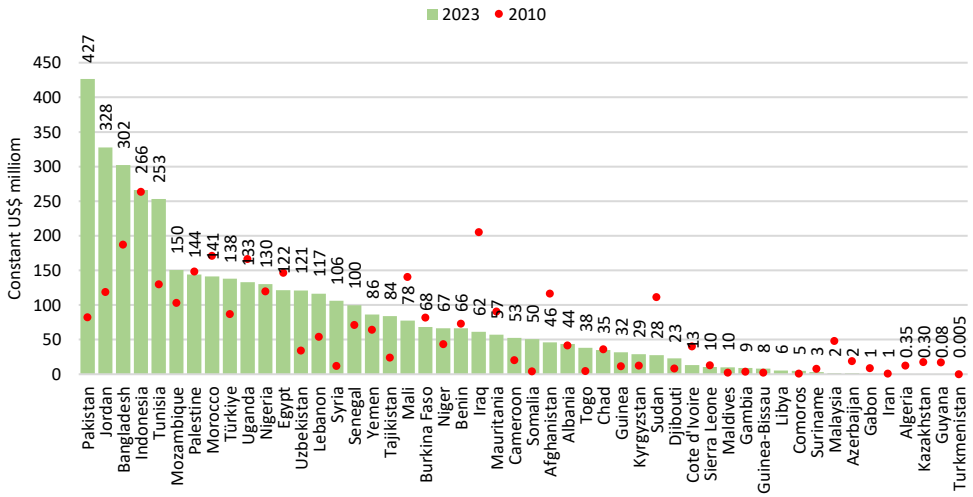


Source: World Health Organization (WHO) Global Health Observatory, last updated on May 12, 2025. Note: Group data is based on country level data for 51 OIC countries and 95 non-OIC countries.

Development Assistance to the WASH sector across OIC sub-regions showed notable variations between 2010 and 2023 (**Figure 5.6**). The Middle East and North Africa (MENA) region received the largest share in 2023, accounting for 35% of total OIC allocations, rising from US$ 1,070 million in 2010 to US$ 1,388 million in 2023. Sub-Saharan Africa (SSA) followed with 28%, though its allocation slightly declined in absolute terms over the period. South Asia (SA) recorded a substantial increase, more than doubling to US$ 785 million and accounting for 20% of the OIC total. Europe and Central Asia (ECA) also saw an increase, reaching US$ 417 million or 10% of OIC total, in 2023. In contrast, Southeast Asia (SEA) experienced a decline both in absolute terms and in its share, falling to 7%. These trends highlight a concentration of WASH-related assistance in MENA and SSA, reflecting both the scale of water and sanitation needs and regional priorities.

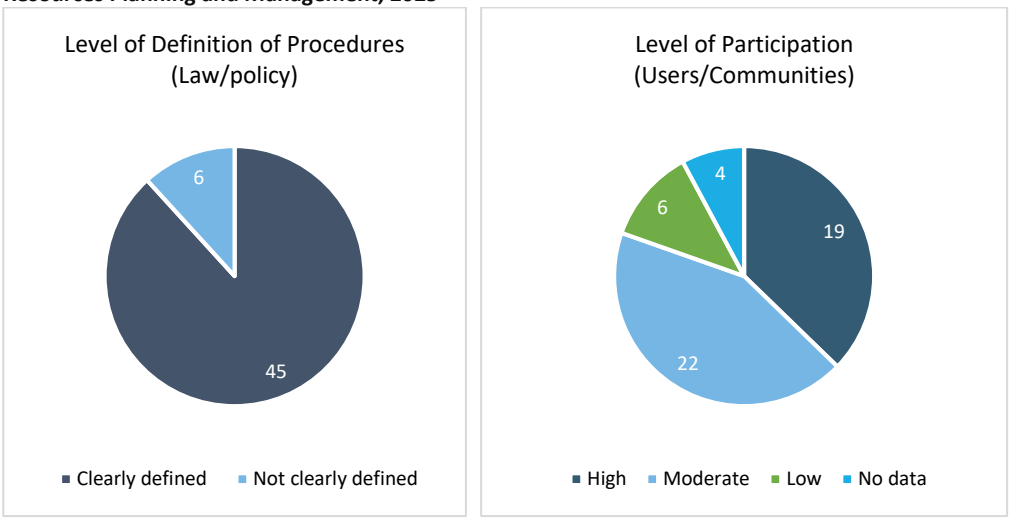
A closer look at country-level data highlights considerable variation in the scale of development assistance to WASH across OIC countries. Pakistan (US$ 427 million), Jordan (US$ 328 million), Bangladesh (US$ 302 million), Indonesia (US$ 266 million), and Tunisia (US$ 253 million) were the largest recipients in 2023. Overall, development assistance to 16 OIC countries exceeded US$ 100 million. Moreover, while ODA to the WASH sector increased in 27 OIC countries it declined in 24 countries since 2010. The most negatively affected were Iraq, Sudan, Afghanistan, Mali, and Malaysia, where decreases ranged from US$ 46 million to US$ 143 million. These trends in ODA allocation and disbursement indicate that, while ongoing efforts are being made to improve the WASH sector in OIC countries, challenges and disparities persist, particularly in accessing adequate services in Sub-Saharan Africa, South Asia, and North Africa (**Figure 5.7**).

Figure 5.7 Water and Sanitation Development Assistance as part of Official Government Spending Plans (constant 2023 million US$), in OIC Countries, 2010 vs. 2023



Source: World Health Organization (WHO) Global Health Observatory, last updated on May 12, 2025.

Figure 5.8 OIC Countries with Legal/Policy Frameworks and Community Participation in Water Resources Planning and Management, 2025



Source: SESRIC staff compilation based on data from the UNSD Global SDG Indicators Database last updated on July 14, 2025. Note: Latest year available data 2017-2025. Data is available for 51 OIC countries excluding; Algeria, Djibouti, Libya, Suriname, Türkiye, and United Arab Emirates

Lastly, in addition to capital constraints, lack of policies, political will and action and accountability are some of the major obstacles to improving the accessibility of WASH services. Policy frameworks that regulate WASH services need to take into account various factors including, but not limited to, integrated water resource management and investments in infrastructure development. In order to do so, governments need to work with private sector service providers and service users to define appropriate interventions to tackle challenges related to WASH coverage.

Within OIC countries, the OIC Water Vision lays the groundwork for policy frameworks on the use of water in the WASH sector. This is partly why a large number of OIC countries currently do have procedures in law or policy for participation by service users/communities in programs on water resources planning and management.

As shown in **Figure 5.8, Left**, 45 OIC countries had clearly defined laws/policies for user participation in water resource planning and management programs as of 2025. In contrast, such procedures are not defined in six OIC countries; Afghanistan, Gabon, Guyana, Iraq, Senegal, and Somalia. As for the level of participation in such programs, available data shows that it was high in 19 member countries, moderate in 22 member countries, low in 6 member countries, and not applicable in 4 member countries (**Figure 5.8, Right**).

5.3. Advancing the Use of Unconventional Water Resources

Unconventional water resources are gaining increasing importance in light of growing water stress and the looming threat of climate change. Projections indicate that two-thirds of the global population will likely experience water stress by 2030. In this context, unconventional water resources are expected to play a critical role in meeting society's water needs and fulfilling the mandates of the Sustainable Development Goals (SDGs) and the OIC Water Vision.

Unconventional water resources are obtained through specialized processes such as desalination or require appropriate pre-treatment and specific technologies for collection, distribution, or access. Some examples of these unconventional sources include (UN-Water, 2020b):

- Desalination of seawater and brackish groundwater
- Harvesting icebergs
- Utilizing ballast water
- Rainwater harvesting
- Cloud seeding or fog water collection
- Recycling and reusing treated wastewater, greywater, and stormwater
- Reusing agricultural drainage water

Among these sources, desalinated water, along with the reuse of municipal wastewater and agricultural drainage water, are the most commonly used in practice. For OIC countries—particularly those located in water-scarce regions—tapping into unconventional water resources is crucial for achieving sustainable development.

It is estimated that over 27.2 km^3 of water is produced from the three primary unconventional sources listed above by some OIC countries with available data, accounting for 3.1% of total water withdrawal in the region (see **Chapter 1**). Embracing these resources can help bridge the gap between water supply and demand and address pressing water challenges.

BOX 8: Key Actions to Foster the Development of Unconventional Water Resources

There is a need to consider strategies for implementing sustainable water resources management by harnessing the potential of unconventional water resources. Some of the important elements of such a strategy would require the following actions:

(1) Assess the potential of augmenting current water supplies with unconventional water resources in water-scarce areas;
(2) Revisit and make country- and area-specific unconventional water resource(s) a priority in political agendas, policies, and management of water resources in water-scarce countries and river basins, and enable their use through supportive action plans;
(3) Guide institutional strengthening and collaboration to avoid fragmented approaches and clarify the roles and responsibilities of water professionals and institutions;
(4) Understand and analyse the economics of action and inaction to overcome the perception of high costs by undertaking comprehensive analyses of innovative financing mechanisms, the cost of alternate options (such as tankers or water transportation from wells from far distances), and economic and social costs;
(5) Build capacity of skilled human resources to address the complexity of assessing and utilizing some unconventional water resources along with their environmental, ecosystem, and economic trade-offs;
(6) Encourage private sector investment in projects utilizing unconventional water resources;
(7) Engage communities to enhance local interventions with context-specific knowledge and integrate gender mainstreaming objectives and processes in community-based projects
(8) Support increased scientific funding to understand and tap the potential unconventional water resources in water-scarce regions.

Source: Adapted from UN-Water (2020b)

Despite the significant benefits that unconventional water resources offer, their potential remains largely untapped due to a lack of awareness about their importance. Moreover, various technological, economic, and political barriers hinder their widespread adoption, necessitating innovative financing, sustainable management practices, and supportive policies and institutions. For instance, the limited use of wastewater in the OIC is often a result of inadequate sewer systems that struggle to keep up with the demands of rapidly growing urban populations, leading to inefficient collection and treatment processes.

While there are increasing examples of using unconventional water resources and developing new technologies to address water scarcity in OIC countries and worldwide, there is currently no coordinated global initiative to harness their full potential. Urgent and coordinated efforts are needed within OIC countries to foster the development of unconventional water resources and technologies, especially in regions facing escalating water stress. By doing so, these endeavours will be aligned with the objectives of the OIC Water Vision and safeguard the security of water supply for both present and future generations. The measures required to promote the utilization of unconventional water resources are outlined in **BOX 8**.

5.4. Successful Practices in OIC Countries: Selected Examples

The choice of developing any specific unconventional water source depends on climatic, environmental, geographical, and economic conditions, as well as recent technological progress achieved in the sector. For instance, atmospheric water sources are appropriate in climatic zones with intensive rainfall or frequent fog. The following are four examples from different OIC countries that are among the most widely recognized practices globally.

Fog harvesting at Ait Baamrane in Morocco

Morocco is one of North Africa's most drought-prone countries, where water scarcity remains a persistent challenge—particularly in arid regions like Aït Baamrane, located in the Anti-Atlas Mountains near Sidi Ifni. The region receives an average annual rainfall of only 112 mm and frequently experiences prolonged droughts. However, due to the influence of Atlantic coastal currents, the region is covered by persistent fog for approximately 143 days per year**,** mainly between August and April (Dodson & Bargach, 2015). Taking these opportunities and challenges, the Dar Si Hmad Foundation launched a groundbreaking fog harvesting (collecting water from fog) project at Mount Boutmezguida (1225 m above the sea level) in Aït Baamrane, introducing a sustainable and community-driven water supply solution (Ait el kadi et al., 2024). Recognized as the largest operational fog harvesting initiative, the project employs the innovative CloudFisher fog-to-water system developed by the WaterFoundation. The system uses a three-dimensional fine-meshed net suspended in a durable frame to capture water droplets from fog. Engineered to withstand harsh wind conditions, each net can collect up to 21 litters of water per square meter per day, with a typical annual average yield of 1.6 to 6 litters per square meter per day (Ait El Kadi et al., 2024). The CloudFisher fog harvesting system is relatively cost-effective, with each mesh net priced between US$1,000 and 2,400, and a lifespan ranging from 5 to 20 years (Reach Alliance, n.d.). This sustainable and ecological solution provides reliable, piped access to clean water for nearly 1,000 people across 16 remote villages (Skalli, 2024). Households pay a combination of a base fee and a per-use charge, averaging US$5.50 (Reach Alliance, n.d.). Once accessed at the household level, the water is used for drinking, cleaning, and agricultural purposes.

The project has been promoted by the Moroccan government as a model of green infrastructure and climate resilience in the Southern Provinces (Provinces du Sud). It is featured as a best practice in Morocco's National Sustainable Development Strategy and is recognized under the country's National Adaptation Plan (NAP) submitted to the UNFCCC. The initiative has also received multiple international recognitions and awards, including UNFCCC Momentum for Change Award (2016) in the Climate solutions category (Dar Si Hmad Foundation, 2017), and the SEED (Supporting Enterprises for Environmental Development) Award for Sustainable Development, highlighting its role as a replicable model for addressing water scarcity through innovative, nature-based solutions.

Large Scale Rooftop Rainwater Harvesting: A Success Story from Pakistan

The 2005 earthquake in Pakistan caused widespread devastation across Azad Jammu and Kashmir (AJK) and Khyber Pakhtunkhwa (KPK), destroying over 4,000 drinking water supply schemes and significantly altering water availability due to topographical changes. This lead to severe shortage of drinking water in the region. In response, the Earthquake Reconstruction & Rehabilitation Authority (ERRA) launched a project to resolve drinking water challenges by establishing rooftop-based Rain Water Harvesting (RWH) systems. Recognizing the region's high average annual rainfall, with an average rainfall of 1500 mm, technical assessments estimated that around 140,000 litters of water could be harvested annually from a 100 m^2 rooftop at 90% efficiency (AGWA, 2022). Between 2006 and 2010, the Earthquake Reconstruction and Rehabilitation Authority (ERRA) installed approximately 12,000 rooftop rainwater harvesting

(RWH) systems across 20 union councils in Azad Jammu and Kashmir (AJ&K) and Khyber Pakhtunkhwa (KPK). These systems were designed to collect and store rainwater from building rooftops by channelling it through gutters and downpipes into storage tanks or groundwater recharge structures for later use. Moreover, installation of RWH systems was made mandatory for all newly constructed buildings, encompassing over 600,000 seismically safe homes, making rainwater harvesting a standard and efficient feature of post-disaster reconstruction (AGWA, 2022).

The project was a big success and turned out to be the largest public sector project of its kind in the world. It provided safe drinking water at minimal cost and had significant social impacts—reducing the burden on women and girls who previously spent considerable time collecting water, and increasing school attendance among girls, particularly in hilly and disaster-affected areas (AGWA, 2022). The success of the ERRA-led RWH model has inspired other governmental initiatives across Pakistan. For example, the Capital Development Authority has launched urban rainwater recharge projects in Islamabad to address declining groundwater levels. These include rooftop collection systems and deep recharge wells to both supplement water supply and mitigate urban flooding**,** especially in the context of increasingly erratic rainfall patterns due to climate change (The News, 2023).

Reuse of Treated Wastewater in Al-Ahsa Oasis, Saudi Arabia

Al-Ahsa Oasis, the largest oasis in the Saudi Arabia, is located in the Eastern Province near Al-Hofuf and Al Mubarraz. It covers an area of 200 km2, of which more than 80 km2 is dedicated to agricultural farming, supporting over 2.5 million date palms. The Oasis experiences a hot, arid climate, with summer temperatures reaching up to 46°C, an evaporation rate of 2600 mm/year, and an annual rainfall rate of 80 mm (Badr, Tawfik & Alomran, 2023). For a long period, Al-Ahsa Oasis relied heavily on Ground Water (GW) wells and natural springs for irrigation, leading to soil salinization and aquifer depletion. Since the 1990s, Al-Ahsa Irrigation and Drainage Authority (HIDA) has started to use of unconventional sources of irrigation water, such as the reuse of agricultural drainage (Alsanad, 2024), and followed by the use of tertiary Treated Waste Water (TWW) started in 2000. Presently, approximately 200,000 m3/day of TWW is used for irrigation derives from main Sewage Treatment Plants (STPs) in Al-Ahsa, namely Hofuf STP, Umran STP, Oyun STP, and Aramco STP. These STPs use both primary, secondary, and tertiary treatment processes, along with using aerobic activated sludge method (Badr, Tawfik & Alomran, 2023). The Saudi Irrigation Organization (SIO) (previously called HIDA) follows a continuous water quality monitoring program—particularly for TWW—while the Saudi National Water Company (NWC) is responsible for ongoing performance assessments of the STPs.

A key concern in using TWW is the potential for health risks and psychological discomfort among users because inadequate treatment or poor management can leave behind pathogens, heavy metals, or pharmaceutical residues. Additionally, high concentrations of salts, sodium, or boron can cause soil salinization, degrade soil structure, and reduce fertility. Despite these concerns, studies show promising outcomes in Al-Ahsa Oasis—a survey of approximately 355 farms irrigating date palms and lemons compared the use of TWW versus GW, found a productivity increase of around 16–19% when using TWW (El-sebai et al., 2021). Another survey of 344 residents in 2022–23 found that 77% supported the reuse of tertiary TWW in agriculture

because they trusted the responsible authorities and potential to augment water resources in Al-Ahsa (Alzahrani, Elsebaei & Tawfik, 2023). Additionally, TWW used for irrigation can partially substitute fertilizers, can reduce the use of water by 33%, and labour by 20% (Elsebaei & Al-shuaibi, 2016). Finally, the reuse of tertiary-treated municipal wastewater offers a strategic and viable alternative to declining groundwater resources, enhancing agricultural productivity while conserving freshwater in Al-Ahsa Oasis. However, long-term sustainability requires robust water quality monitoring, appropriate crop selection, and active engagement with farmers and the public to build trust, ensure soil health, and support wider acceptance.

Jebel Ali Desalination Plant, Dubai: A Landmark Example in Water Infrastructure

The United Arab Emirates is situated in an extremely arid region characterized by minimal rainfall, high evaporation rates, and no perennial rivers. Among its Emirates, Dubai stands out as particularly arid, with virtually no freshwater bodies. Rapid urbanization, population growth, and industrial expansion have significantly increased the demand for potable water. To address this, large-scale desalination has become essential to meet its water needs. With the Jebel Ali Power Plant and Water Desalination Complex under the Dubai Electricity and Water Authority (DEWA) serving as a landmark in the Middle East's water infrastructure. In 2021, it achieved the Guinness World Records as the largest single-site natural gas power generation facility in the world (Government of Dubai Media Office, 2022). The DEWA's plan is to ensure water security and sustainable energy integration- using Multi-Stage Flash (MSF) distillation[3] and Sea Water Reverse Osmosis (SWRO) systems[4], with a capacity of 490 Million Imperial Gallons[5] of Water per Day (MIGD) or (2,227,587 m^3/day) of desalinated water; and generating power with a capacity of 9,547MW (Government of Dubai Media Office, 2022) which integrated with solar and uses AI-based monitoring and automation system. The Reverse Osmosis (RO) consumes around 3.5–4.5 kWh/m^3, compared to thermal desalination's 10–15 kWh/m^3 (Ghaffour et al., 2013).

The DEWA's strategy aligns with Dubai Clean Energy Strategy 2050 and the United Arab Emirates Water Security Strategy 2036, promoting the transition from energy-intensive thermal desalination to membrane-based technologies such as RO. While challenges remain—such as high capital costs, brine disposal[6], and the high salinity and temperature of the Arabian Gulf—these are being addressed through digital innovation, energy recovery systems, and integration with renewable energy sources (IRENA, 2020). The Jebel Ali M facility exemplifies a model of sustainable, high-capacity desalination in arid environments. It serves not only as a cornerstone for Dubai's water and energy security but also as a replicable blueprint for other cities facing similar challenges.

[3] In MSF distillation, seawater is first heated (typically using waste heat from power plants) and then passed through a series of chambers (or stages), each maintained at progressively lower pressures. As the pressure drops in each stage, a portion of the heated seawater "flashes" or rapidly evaporates, even though it is below its normal boiling point. The resulting vapor is condensed on heat exchanger tubes, producing fresh water, while the remaining brine is progressively discharged (El-Dessouky & Ettouney, 2002).

[4] The Reverse Osmosis (RO) process is a membrane-based filtration process that efficiently separates salts and impurities from seawater. It employs a two-pass reverse osmosis system, enabling it to meet high potable water quality standards (Ghaffour, Missimer & Amy, 2013).

[5] The British imperial gallon, commonly referred to as the "gallon," is precisely defined as 4.54609 litres.

[6] Brine disposal refers to the process of safely removing and managing the highly concentrated salty wastewater (called brine), generated as a byproduct of desalination.

Chapter 6: CONCLUDING REMARKS AND POLICY RECOMMENDATIONS



6.1. Concluding Remarks

Water is a vital resource that sustains life and prosperity, and the 57 Member States of the OIC vary significantly in terms of water resources, availability, infrastructure, and management. In response to pressing environmental and social concerns, such as access to clean water and sanitation, the OIC has been actively working to address these issues. In 2010 and 2011, following discussions at meetings of an Advisory Panel of Experts in Dubai and Astana, the OIC initiated the development of a shared vision to tackle water challenges through 2025. This vision, titled the OIC Water Vision, was adopted during the 2nd Islamic Conference of Ministers Responsible for Water in Istanbul in 2012. The vision emphasizes collaboration and knowledge sharing among OIC centres of excellence on water, aiming to work together for a water-secure future.

Despite the progress made in raising water security on the political agenda and implementing various activities related to the OIC Water Vision, the current situation indicates that OIC countries are still far from achieving the intended goals. Many of these countries are facing increasing water scarcity, high water-related risks and stress, and inadequate access to drinking water and sanitation services. The situation is particularly dire for low-income and least developed OIC countries, as they face additional challenges in socio-economic development, poverty alleviation, and famine eradication.

Looking ahead, the future of water security in OIC countries will remain precarious unless significant changes occur. The vision for a water-secure future is challenged by factors such as population growth, rapid urbanization, changing consumption patterns, and the impacts of climate change, all of which exert mounting pressure on water resources.

OIC countries, particularly in Sub-Saharan Africa (SSA) and South Asia (SA), already experience a significant level of variability in water supply, with marked fluctuations between months of the year. Climate change is expected to exacerbate this variability further. Additionally, global climate change is anticipated to increase the frequency and severity of water-related extreme events, such as heatwaves, droughts, and floods. These pressures on water resources pose significant challenges to food security, access to clean water and sanitation, and the functioning of water infrastructure, including irrigation systems and hydropower, ultimately threatening the well-being and resilience of societies.

Understanding the future risks and vulnerabilities of climate change in the water sector is crucial for formulating effective and forward-looking water policies. These risks include hazards such as droughts, extreme precipitation, and rising temperatures. For example, increasing water variability may result in inadequate water supply, reduced agricultural productivity and income for rural communities, and disruption of livelihoods, particularly for those reliant on water-intensive agriculture.

The water sector in OIC countries is highly vulnerable to the impacts of climate change due to their sensitivity and high exposure to its effects, combined with a lack of adaptive capacity to cope with these impacts. Strengthening climate resilience requires enhancing governance, investing in socio-economic development, and expanding adaptive capacity across all levels of society.

To address these challenges, OIC countries need to undertake integrated mitigation and adaptation efforts. These initiatives will not only reduce stress on the environment but also yield economic and social benefits by enhancing food production and building resilience to future climate impacts. Additionally, such efforts can generate co-benefits, such as improved efficiency, reduced costs, and environmental gains, which can positively impact other sectors of the economy. Moreover, conducting in-depth local-level assessments of climate change implications and systematically sharing experiences among OIC countries on coping policies, management approaches, and technology use are of utmost importance.

Considering the strong interrelation between the water sector, environment, and food security, it is crucial to understand the linkages and potential impacts. The challenges of food security faced by OIC countries are further compounded by expected rapid population growth and urbanization in the near future. Projections by the United Nations Department of Economic and Social Affairs (UN DESA) indicate that the OIC's total population will exceed 2.8 billion by 2050. Additionally, climate change-induced natural and man-made disasters, as well as conflicts, will intensify the existing pressure on food and water systems in OIC countries. Economic growth in the region will also lead to increased wealth and purchasing power, altering consumption patterns and resulting in higher food demand. This combination of factors will create fierce competition for scarce resources, particularly water, agricultural land, energy, seeds, and irrigated land. As they lead to the expansion of water and wastewater utilities in the OIC, their impact on the environment and climate change is also expected to intensify.

Hence, there is a pressing need to adopt an integrated approach to water, energy, and food systems planning in the OIC region. Such an approach should be informed by robust data, collaborative governance, and investment in innovative technologies, ensuring that future policies and actions are both sustainable and resilient.

6.2. Policy Recommendations

Charting a Sustainable Path for Water Management

Managing water resources is a highly intricate task, given the involvement of multiple stakeholders, unique local and regional factors, cultural dynamics, and complex political and regulatory challenges. Moreover, with the added uncertainty of future climate change, policymakers must determine the most suitable approach to effectively manage water resources for the benefit of society and the environment. To establish a sustainable water management framework, OIC countries must strive for equitable distribution of water resources and services, while prioritizing environmental conservation and protection. In this endeavour, OIC countries can draw upon emerging global water management trends, such as integrated water resources management, ecological-based approaches, and adaptive management. Additionally, addressing practices like harnessing unconventional water resources and implementing efficient demand management are crucial components of a comprehensive sustainable water management framework.

Sectoral integration stands as a key aspect in water management, considering the strong interconnections between the water sector and other sectors, particularly food and energy.

Both IWRM and EBA advocate for sectoral integration, multi-stakeholder involvement, valuing ecosystem services, and fair resource allocation. Moreover, adaptive management serves as an essential tool to ensure sustainable management by fostering continuous learning and iterative processes.

Despite the advantages of these approaches, implementing them comes with challenges. Instead of adopting a one-size-fits-all approach, OIC countries should adopt a combination of approaches tailored to their specific local and regional needs. It is vital to recognize the strengths of each approach and explore how they can complement each other to achieve sustainable water management. For instance, the AM approach can enhance IWRM or EBA frameworks through its feedback mechanisms and adaptability.

In the WASH sector, policy interventions must address accessibility, availability, and quality of services. Mere expansion of WASH facilities is insufficient; they must also be safe to use, especially in disadvantaged communities, to avoid harm. In agriculture and food security domains, water plays a critical role at multiple intersections, necessitating interventions to consider both water quantity and quality.

Lastly, incorporating a social perspective in water resource regulation is essential for policy makers. Low-cost and small-scale water harvesting, irrigation, and drainage options are vital for rural communities dependent on manual labour. Supporting sustainable farming methods through subsidies and government assistance can benefit low-income households and combat poverty and food insecurity.

Innovative Approaches to Water Resources and Demand Optimization

The significance of unconventional water resources extends beyond ensuring water supply to encompass environmental protection, making their exploitation crucial for sustainable water management. OIC countries, facing inherent water scarcity and growing pressure on water security, must enhance the utilization of these resources to align with the SDGs and the OIC Water Vision.

Currently, the utilization of unconventional water resources is hindered by limited information and various barriers, including technological, economic, and policy constraints. Addressing these obstacles necessitates innovative financing, sustainable management practices, and policy support.

Moreover, to achieve efficient water management, demand-side strategies are essential. Unfortunately, OIC countries generally lack efficient water use practices, exhibiting low water productivity and significant water losses. Therefore, managing demand requires a combination of economic, technological, and behavioural changes across various sectors.

Policymakers and practitioners must focus on interventions to enhance water use efficiency in agriculture, reduce the sector's impact on freshwater resources, and boost its resilience to water risks. This can be achieved through conventional water conservation and reuse practices or adopting technology to increase crop productivity with lower water consumption. In urban water management, the burgeoning urban population in the OIC requires careful consideration of water use. Behavioural change programs, education, and awareness initiatives, along with

promoting water-efficient appliances, can encourage responsible water consumption. Furthermore, exploiting unconventional water resources for urban areas, such as wastewater reuse and storm water utilization, can alleviate stress on water bodies.

Governments in OIC countries should strengthen and enforce existing policies and regulations, provide incentives for farmers to improve water consumption and eco-friendly practices, and eliminate regulations that encourage excessive water use and harmful activities affecting ecosystems.

Enhancing Water Management Strategies in OIC Countries

The OIC Water Vision has provided valuable insights into the actions required for water sustainability. However, this report highlights five specific actions that OIC countries should prioritize to enhance their water management sustainability.

1. **Integrating water governance with climate actions and food-energy policies**: Water is directly impacted by climate change and closely linked with food and energy sectors. To address water challenges effectively, OIC countries must integrate climate mitigation and adaptation efforts with their water agenda. Similarly, policy integration in food and energy sectors is essential. A holistic framework for water resource management should ensure integration of services in areas such as WASH, energy, and irrigation, and involve experts from various sectors in the decision-making process.
2. **Reducing gender inequalities in access to WASH services**: OIC countries need to address gender disparities in access to and management of WASH services while also tackling regional and rural-urban gaps. Women and girls often bear the greatest burden due to inadequate sanitation, facing safety risks and health challenges, particularly in rural areas where WASH infrastructure is weakest. Gender-responsive programs should be prioritized to ensure equitable access, safe sanitation facilities, and hygiene education tailored to women's needs. Additionally, regional disparities must be addressed, as urban areas typically benefit from better WASH services compared to underserved rural and remote communities. To achieve sustainable progress, women should be actively involved in WASH decision-making, ensuring that policies and infrastructure designs meet the needs of all genders and geographic contexts. Investments should target high-need regions, especially marginalized rural areas, to bridge the urban-rural divide.
3. **Create a culture of hygiene and evidence-based WASH practices through education, research, and infrastructure**: Address behavioural and knowledge gaps through WASH education and research. To foster a culture of hygiene and public health awareness, WASH education should be integrated into school and university curricula. This includes teaching basic and advanced hygiene practices, the health impacts of WASH, proper water usage, and menstrual hygiene management. Encouraging research on WASH-related topics will help generate evidence for better policies and interventions. Furthermore, all educational institutions must have well-developed WASH infrastructure, including clean water, sanitation, and handwashing facilities. Medical schools should also emphasize WASH practices in their training programs, particularly in postgraduate education, to ensure future healthcare professionals prioritize hygiene in clinical and community settings.

4. **Broadening funding opportunities**: Sustainable water management projects often face financing barriers. Innovative financing strategies, such as public-private partnerships (PPPs), can be explored to generate revenue for projects where user-fees are not feasible. Integrating actions across water, climate, and food-energy sectors can leverage additional resources and funding options.
5. **Knowledge sharing and collaborative activities**: OIC countries should build multi-sectoral capacities, understand the current state of agriculture and water resources, and identify potential threats. Collaborative research, policy support, and management activities with partner organizations can help countries solve water issues and align with the OIC Water Vision objectives. The water platform of OIC serves as a crucial tool in achieving this objective (refer to **BOX 9**).
6. **Data collection and setting targets and indicators**: Understanding and predicting future risks in the water sector requires data collection and analysis. Collaborating with local communities is vital for developing inclusive policies and effective interventions. OIC countries should prepare a strategic 'Water Action Plan' with standardized measurement frameworks, implementation strategies, and monitoring mechanisms. Setting key indicators and targets, aligned with SDG targets, will enable progress tracking and inform priorities in the water sector. Continuing the OIC Water Vision beyond 2025 requires concrete actions and measurable progress. Preparing a strategic plan and incorporating SDG-related targets will ensure the sustained success of water management efforts within OIC countries.

BOX 9: OIC Portal on Water Resources

During the OIC Conference of Ministers Responsible for Water (5-6 March 2012, Istanbul, Türkiye), the creation of a web portal on water resources is strongly advocated. This portal aims to match the needs and offers of Member States in terms of training, capacity-building, experience exchange, expertise, and technical assistance. SESRIC offered to collect information from OIC member countries on their cooperation needs and offers, and subsequently established the web portal on water resources for OIC countries.

Additionally, during the Second Meeting of the OIC Water Council in Cairo, Egypt (21-22 October 2019), a set of recommendations was adopted to enhance intra-OIC cooperation for implementing the OIC Water Vision. The meeting highlighted the significance of the OIC Portal on Water Resources in facilitating the exchange of experiences, transfer of innovative techniques, and sharing success stories in the field of water.

Since 2020, SESRIC has been hosting and managing the "OIC Portal on Water Resources" (which can be accessed at https://oicwater.sesric.org/) with a view to providing a platform for OIC countries to share their water-related information, success stories, initiatives, innovative techniques and new mechanisms on water-related issues. The portal seeks to enhance cooperation and collaboration among member countries in addressing water challenges, including water scarcity, pollution, and climate change. In addition, the portal serves as an information and knowledge hub for the OIC countries in the domain of water.

REFERENCES

Chapter 1

Altaeb, M. (2022). What's next for Libya's Great Man-Made River Project? Middle East Institute, USA. https://www.mei.edu/publications/whats-next-libyas-great-man-made-river-project

Boretti, A., & Rosa, L. (2019). Reassessing the projections of the World Water Development Report. npj Clean Water, 2(15). https://doi.org/10.1038/s41545-019-0039-9

Fetouri, M. (2023, June 9). NATO's intervention threatens Libya's unique man-made river. Washington Report on Middle East Affairs. https://www.wrmea.org/north-africa/natos-intervention-threatens-libyas-unique-man-made-river.html

Hamad, S., & Saeid, F. (2025). The Great Man-Made River Project in Libya: An Overview of the Current Status and Future Prospects. In: Zurqani, H.A. (eds) Water Resources of Libya. Springer Water. Springer, Cham. https://doi.org/10.1007/978-3-031-80920-0_2

Hofste, R. W., Kuzma, S., Walker, S., Sutanudjaja, E. H., Bierkens, M. F. P., Kuijper, M. J. M., Sanchez, M. F., Beek, R. V. A. N., Wada, Y., Galvis, S., & Reig, P. (2019). Technical Note Aqueduct 3 . 0 : Updated Decision-Relevant Global Water Risk Indicators. World Resources Institute, July, 1–53.

Pleuger (n.d.). Engineering a lifeline in the desert: The Great Man-Made River. https://pleugerindustries.com/case-studies/engineering-a-lifeline-in-the-desert-the-great-man-made-river

SESRIC. (2019). Urban Development in OIC Countries. Ankara: SESRIC.

Sherif, M. I., & Sturchio, N. C. (2021). Elevated radium levels in Nubian Aquifer groundwater of Northeastern Africa. Scientific Reports, 11, Article 78. https://doi.org/10.1038/s41598-020-80160-0

UN. (2018). Sustainable Development Goal 6: Synthesis Report on Water and Sanitation. https://www.unwater.org/publications/highlights-sdg-6-synthesis-report-2018-on-water-and-sanitation

UNEP 2016. A Snapshot of the World's Water Quality: Towards a global assessment. United Nations Environment Programme, Nairobi, Kenya. 162 pp.

UNICEF (2021). "Water Security for All." Retrieved from https://www.unicef.org/reports/water-security-all

UN-Water. (2013). Water Security & the Global Analytical Brief.

WWAP (UNESCO World Water Assessment Programme). 2019. The United NationsWorld Water Development Report 2019: Leaving No One Behind. Paris, UNESCO.

Chapter 2

Borja-Vega, C., & Grabinsky, J. (2019, June 26). Gender and water collection responsibilities – A snapshot of Latin

America. World Bank Blogs. https://blogs.worldbank.org/latinamerica/gender-and-water-collection-responsibilities-snapshot-latin-america

CEDAW. (2016). General recommendation No. 34 on the rights of rural women (CEDAW/C/GC/34). https://tbinternet.ohchr.org/_layouts/15/TreatyBodyExternal/Download.aspx?symbolno=CEDAW/C/GC/34&Lang=en

Centers for Disease Control and Prevention. (2024). Global water, sanitation, and hygiene (WASH). Retrieved from https://www.cdc.gov/global-water-sanitation-hygiene/about/index.html

FAO. (2023). The status of women in agrifood systems. https://openknowledge.fao.org/server/api/core/bitstreams/cf566816-e3c6-42a3-be37-77f86e4050cf/content

FAO. (2011). The state of food and agriculture 2010–2011: Women in agriculture – Closing the gender gap for development. https://www.fao.org/4/i2050e/i2050e.pdf

FAO). (n.d.). Water and gender: Gender equality in water governance. https://www.fao.org/land-water/water/watergovernance/water-gender/en/

Fujs, T., & Kashiwase, H. (2023, August 23). Strains on freshwater resources: The impact of food production on water consumption. World Bank Blogs. https://blogs.worldbank.org/en/opendata/strains-freshwater-resources-impact-food-production-water-consumption

Masgon, M. A., & Gensch, R. (n.d.). Water, sanitation and gender. Sustainable Sanitation and Water Management (SSWM) Toolbox. https://sswm.info/arctic-wash/module-1-introduction/further-resources-sustainability-relation-water-sanitation/water%2C-sanitation-and-gender

UNESCO. (2021). UN World Water Development Report 2021: Valuing water. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000375751

UNICEF & WHO. (2024). Progress on drinking water, sanitation and hygiene in schools 2015–2023: Special focus on menstrual health. United Nations Children's Fund and World Health Organization. https://cdn.who.int/media/docs/default-source/wash-documents/jmp-wash-in-schools240525.pdf

UNICEF, & WHO. (2023). Progress on household drinking water, sanitation and hygiene 2000–2022: Special focus on gender. United Nations Children's Fund and World Health Organization. https://data.unicef.org/wp-content/uploads/2023/07/jmp-2023-wash-households-launch-version.pdf

UNICEF. (2017). Gender-responsive water, sanitation and hygiene: Key elements for effective WASH programming. New York: UNICEF.

UN-Water. (2021). Summary progress update 2021: SDG 6 — water and sanitation for all. United Nations. https://www.unwater.org/publications/summary-progress-update-2021-sdg-6-water-and-sanitation-all

UN-Water. (2020). UN Water Annual Report 2019. Geneva: UN Water. https://unsceb.org/sites/default/files/2020-12/UN-Water-2019-Annual-Report.pdf

WHO. (2024, March 22).Sanitation [Fact sheet]. WHO. Retrieved July 7, 2025, from https://www.who.int/news-room/fact-sheets/detail/sanitation

WHO. (2023, June 14). Diarrhoeal disease. https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease

WHO. (2019). Burden of disease attributable to unsafe drinking-water, sanitation and hygiene: 2019 update. https://www.who.int/publications/i/item/9789240075610

WHO. (2015). Improving nutrition outcomes with better water, sanitation and hygiene: Practical solutions for policies and programmes. Retrieved from: https://www.afro.who.int/sites/default/files/2017-06/improving-nutrition-outcomes-with-better-wash_9789241565103_eng.pdf

Chapter 3

FAO (1996). Rome Declaration on World Food Security. Rome: FAO.

HLPE. 2020. Food security and nutrition: building a global narrative towards 2030. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

SESRIC. (2023). Agriculture and Food Security in OIC Member Countries 2023. Ankara: SESRIC.

Chapter 4

Ahsan, M.M., & Özbek N. (2022). Resilience-Oriented Practices in Sea-Level-Rise-Induced Human Migration in Coastal Bangladesh and Louisiana. The International Journal of Climate Change: Impacts and Responses, 14 (2), 65-80. doi:10.18848/1835-7156/CGP/v14i02/65-80

Bueno, M.P, Patwardhan, A., Falivene Fernández, M.L., González, J.H, Laguzzi, V., Zazzarini, S. & Passet, P. (April, 2024). UAE Framework for Global Climate Resilience: key outcomes of COP28 and pathways towards COP29 and COP30. https://arg1punto5.com/wp-content/uploads/2024/04/Technical-paper-ARG-1.5-UAE-Framework-for-Global-Climate-Resilience.pdf

Caretta, M.A., A. Mukherji, M. Arfanuzzaman, R.A. Betts, A. Gelfan, Y. Hirabayashi, T.K. Lissner, J. Liu, E. Lopez Gunn, R. Morgan, S. Mwanga, and S. Supratid. (2022). Water. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 551–712, doi:10.1017/9781009325844.006.

Chen, C., Noble, I., Hellmann, J., Coffee, J., Murillo, M., & Chawla, N. (2015). University of Notre Dame Global Adaptation Index: Country Index. University of Notre Dame Global Adaptation Index Country:Country Index Technical Report, 46.

EM-DAT Database. Retrieved May 7, 2025 from https://data.humdata.org/dataset/emdat-country-profiles

IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. https://www.ipcc.ch/report/ar6/wg1/

IPCC. (2023). Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, (in press).

Li, B., Rodell, M. & Save, H. Terrestrial water storage in 2024. Nat Rev Earth Environ 6, 261–263 (2025). https://doi.org/10.1038/s43017-025-00659-w

Mahmood, R., Jia, S., & Zhu, W. (2019). Analysis of climate variability, trends, and prediction in the most active parts of the Lake Chad basin, Africa. Scientific Reports, 9(1), 1–18. https://doi.org/10.1038/s41598-019-42811-9

Porter, J. R., et al. (2014). Food security and food production systems. In Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. IPCC.

Taylor, R. G., et al. (2013). Ground water and climate change. Nature Climate Change, 3(4), 322–329.

United Nations Environment Programme (2024). Adaptation Gap Report 2024: Come hell and high water— As fires and floods hit the poor hardest, it is time for the world to step up adaptation actions. Nairobi. https://doi.org/10.59117/20.500.11822/46497

United Nations Environment Programme (2024): Global Resources Outlook 2024: Bend the Trend – Pathways to a liveable planet as resource use spikes. International Resource Panel. Nairobi. https://wedocs.unep.org/20.500.11822/44901

Werner, A. D., et al. (2013). Seawater intrusion processes, investigation and management: Recent advances and future challenges. Advances in Water Resources, 51, 3–26.

World Meteorological Organization. (2021). State of Climate Services, Water. WMO publications, Geneva. https://library.wmo.int/idurl/4/57630

Chapter 5

AGWA- Alliance for Global Water Adaptation. (2022). Water Conservation and Access with Rainwater Harvesting Implementation. https://agwaguide.org/casestudies/rainwaterharvesting/

Ait el Kadi, M., et al. (2024). Multi-aspect assessment of operational fog collection systems: A rural development perspective, insights from the Sidi Ifni project in Morocco. Journal of Arid Environments, 222, 105174. https://doi.org/10.1016/j.jaridenv.2024.105174

Allen, C. R., Fontaine, J. J., Pope, K. L., & Garmestani, A. S. (2011). Adaptive management for a turbulent future. Journal of Environmental Management, 92(5), 1339–1345. https://doi.org/10.1016/j.jenvman.2010.11.019

Alsanad, M. A. (2024). The environmental assessment of soil chemical properties irrigated with treated wastewater under arid ecosystem of Al-Ahsa, Saudi Arabia. Arab Gulf Journal of Scientific Research, 42(3), 976–990. https://doi.org/10.1108/AGJSR-01-2023-0020

Alzahrani, F., Elsebaei, M., & Tawfik, R. (2023). Public acceptance of tertiary treated wastewater reuse in agriculture in Al Ahsa Governorate, Saudi Arabia. Sustainability, 15(21), 15434. https://doi.org/10.3390/su152115434

Asian Development Bank. (2022). Climate-Adaptive Water Resources Management in the Aral Sea Basin Sector Project (Project No. 58028-001).

Badr, E.-S. A., Tawfik, R. T., & Alomran, M. S. (2023). An assessment of irrigation water quality with respect to the reuse of treated wastewater in Al-Ahsa Oasis, Saudi Arabia. Water, 15(13), 2488. https://doi.org/10.3390/w15132488

Brown, R. R., Keath, N., & Wong, T. H. F. (2009). Urban water management in cities: historical, current and future regimes. Water Science and Technology, 59(5), 847–855. https://doi.org/10.2166/wst.2009.029

Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (2016). Nature-based solutions to address global societal challenges. IUCN: Gland, Switzerland, 97(2016), 2036.

Dar Si Hmad Foundation. (2017). Women led fog harvesting for a resilient, sustainable ecosystem | Morocco. UNFCCC Momentum for Change Award Winner.

Dodson, L. L., & Bargach, J. (2015). Harvesting fresh water from fog in rural Morocco: Research and impact—Dar Si Hmad's fogwater project in Aït Baamrane. Procedia Engineering, 107, 186–193. https://doi.org/10.1016/j.proeng.2015.06.073

Efthimiou, N., Giotis, T., & Ragkos, A. (2025). Applications for non conventional water resources in the Mediterranean Basin: A literature review. Sustainability, 17(11).

El-Dessouky, H. T., & Ettouney, H. M. (2002). Fundamentals of Salt Water Desalination. Pages 271-407. Elsevier.

Elsebaei, M. N., & Al-shuaibi, A. A. M. (2016). The economic impact of using wastewater triple treatment in agricultural irrigation of Al-Ahsa Oasis in Saudi Arabia. Alexandria Science Exchange Journal, 37(2), 343–360. https://doi.org/10.21608/asejaiqjsae.2016.154309

El-Sebaei, M. N., et al. (2021). Using of triple-treated wastewater in agricultural irrigation in Al-Ahsa Oasis, Saudi Arabia. The Iraqi Journal of Agricultural Science, 52(6). https://doi.org/10.36103/ijas.v52i6.1493

ERRA. (2007). Post-earthquake rehabilitation and reconstruction strategy report. Government of Pakistan.

Evans, R. G., & Sadler, E. J. (2008). Methods and technologies to improve efficiency of water use. Water Resources Research, 44(7), 1–15. https://doi.org/10.1029/2007WR006200

Flörke, M., Schneider, C., & McDonald, R. I. (2018). Water competition between cities and agriculture driven by climate change and urban growth. Nature Sustainability, 1(1), 51–58. https://doi.org/10.1038/s41893-017-0006-8

Ghaffour, N., Missimer, T. M., & Amy, G. L. (2013). Technical review and evaluation of the economics of water desalination: Current and future challenges for better water supply sustainability. Desalination, 309, 197–207.

https://doi.org/10.1016/j.desal.2012.10.015

Giordano, M., & Shah, T. (2017). From IWRM back to integrated water resources management. In Revisiting integrated water resources management (pp. 4-16). Routledge.

Government of Dubai Media Office. (2022, October 16). DEWA's Jebel Ali Power Plant and Water Desalination Complex enters Guinness World Records for the second time. https://www.mediaoffice.ae/en/news/2022/october/16-10/dewas-jebel-ali-power-plant

GWP. (2000). Integrated water resources management. In TAC Background Papers (4). https://doi.org/10.1201/9781315153292

GWP. (2011). Dublin-Rio Principles. Water, 46(January 1992), 3–6.

GWP. (2020). The Need for an Integrated Approach. https://www.gwp.org/en/About/why/the-need-for-an-integrated-approach/

Holden, M. H., et al. (2022). Challenges in applying adaptive management in natural resource governance. Trends in Ecology & Evolution, 37(9), 800–813

IRENA – International Renewable Energy Agency. (2020). Renewable energy in the water, energy & food nexus. https://www.irena.org/publications/2020/Jan/Renewable-energy-in-the-water-energy-food-nexus

Jess Schoeman, Catherine Allan & C. Max Finlayson (2014). A new paradigm for water? A comparative review of integrated, adaptive and ecosystem-based water management in the Anthropocene, International Journal of Water Resources Development, 30:3, 377-390, DOI:10.1080/07900627.2014.907087

Margat, J., & van der Gun, J. (2013). Groundwater around the world: A geographic synopsis. CRC Press.

OECD & United Nations. (2014). Integrated Water Resources Management in Eastern Europe, the Caucasus and Central Asia. Printed at United Nations.

Reach Alliance. (n.d.). Dar Si Hmad: Harvesting water from fog. https://reachalliance.org/case-study/dar-si-hmad-harvesting-water-from-fog

Skalli, K. (2024, March 8). How fog harvesting liberates the women of Sidi Ifni in Morocco. https://towards-equality.com/alliance-2024/how-fog-harvesting-liberates-the-women-of-sidi-ifni-in-morocco/#:~:text=At%20an%20altitude%20of%201%2C225,of%20having%20to%20collect%20water.

The News. (2023, June 7). CDA makes construction of recharge wells mandatory for housing units. https://www.thenews.com.pk/print/1077889

UNEP (2021). Progress on Integrated Water Resources Management. Tracking SDG 6 series: global indicator 6.5.1 updates and acceleration needs.

UNEP. (2019). Global Environmental Outlook 6: Healthy Planet, Healthy People. Cambridge University Press. https://doi.org/10.1017/9781108627146

UNEP-DHI and UNEP (2016). Transboundary River Basins: Status and Trends. United Nations Environment Programme (UNEP), Nairobi.

UNESCO. (2021). United Nations World Water Development Report 2021: Valuing Water. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO). https://unesdoc.unesco.org/ark:/48223/pf0000375724)

UNESCO. (2023). United Nations World Water Development Report 2023: Partnerships and cooperation for water. United Nations Educational, Scientific and Cultural Organization (UNESCO). https://unesdoc.unesco.org/ark:/48223/pf0000384655

United Nations and Organisation for Economic Co-operation and Development. (2014). Integrated Water Resources Management in Eastern Europe, the Caucasus and Central Asia. Printed at United Nations: European Union Water Initiative National Policy Dialogues progress report 2013

United Nations and UNESCO (2018). Progress on Transboundary Water Cooperation. Global baseline for SDG indicator 6.5.2. https://unece.org/DAM/env/water/publications/WAT_57/ECE_MP.WAT_57.pdf

United Nations Environment Programme (2024). Progress on implementation of Integrated Water Resources Management. Mid-term status of SDG indicator 6.5.1 and acceleration needs, with a special focus on climate change.

United Nations Environment Programme. (2023). Integrated Water Resources Management (IWRM).

United Nations World Water Assessment Programme. (WWAP)/UN-Water. (2018). The United Nations World Water Development Report 2018: Nature-Based Solutions for Water. Paris, UNESCO

UN-Water. (2020b). UN-Water Analytical Brief on Unconventional Water Resources (Issue June). https://doi.org/10.13140/RG.2.2.11403.31526

USAID. (2016). Adaptability of the Water Allocation System in the Amudarya River Basin to Changing Conditions. October, 1990–1993.

Williams, B. K., Szaro, R. C., & Shapiro, C. D. (2009). Adaptive management: The U.S. Department of the Interior technical guide (2009). http://pubs.er.usgs.gov/publication/70194537

ANNEXES

ANNEX Country Classifications

OIC Member Countries (57):

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

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

Non-OIC Developing Countries (97):

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

Developed Countries** (41):			
Andorra	France	Lithuania	Slovak Republic
Australia	Germany	Luxembourg	Slovenia
Austria	Greece	Macao SAR	Spain
Belgium	Hong Kong	Malta	Sweden
Canada	Iceland	Netherlands	Switzerland
Croatia	Ireland	New Zealand	Taiwan
Cyprus	Israel	Norway	United kingdom
Czech Republic	Italy	Portugal	United states
Denmark	Japan	Puerto Rico	
Estonia	Korea, Rep.	San Marino	
Finland	Latvia	Singapore	

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

Geographical Classification of OIC Member Countries

Sub-Saharan Africa (21): OIC-SSA

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

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

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

Europe and Central Asia (8): OIC-ECA

Albania	Kyrgyzstan	Turkmenistan
Azerbaijan	Tajikistan	Uzbekistan
Kazakhstan	Türkiye	

South Asia (4): OIC-SA

Afghanistan	Maldives	Pakistan
Bangladesh		

South East Asia (3): OIC-SEA

Brunei Darussalam	Indonesia	Malaysia

Latin America (2): OIC-LAC

Guyana	Suriname



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