



Standing Committee for Economic and Commercial Cooperation of the
Organization of Islamic Cooperation (COMCEC)

Promoting a Climate-Resilient Agriculture Sector against Climate Change in OIC Member Countries

COMCEC Coordination Office · 2026



Why Climate Resilience in OIC Agriculture Matters

Agriculture operates at the interface of ecological processes and market dynamics

≈ 30-40%

of total employment in OIC countries is in agriculture; over 70% in some (SESRIC, 2023)

31.9% vs 10.4%

share of agriculture in OIC employment (215.5 million people) versus its share in GDP, 2021 — Nearly 1/3 of the workforce produces only 1/10th of the output.

2.02 °C

average surface temperature anomaly in OIC Member States in 2024 (vs 1951–1980 baseline), above the world average

Climate change as a systemic threat

- Rising temperatures, shifting raining regimes and more frequent extreme events affect yields, livestock productivity and the economic, institutional and social foundations of agrifood systems.
- Agriculture acts as a transmission channel: weather-driven productivity shocks become price volatility, food insecurity, rural indebtedness and macroeconomic **instability**.
- Repeated shocks weaken asset accumulation and adaptive capacity — climate risks can inflict lasting structural damage, not just temporary disruption.
- Many OIC Member Countries combine high climate exposure, limited adaptive capacity and strong economic and social reliance on agriculture.

Objectives, Scope and Methodology

Objective

- Examine the state of **climate resilience** in the agricultural sectors of OIC Member Countries.
- Analyse how climate risk analysis, climate-responsive planning and incentive mechanisms interact — the **Risk–Planning–Incentive Nexus**.
- Identify structural vulnerabilities, integration gaps and emerging good practices as a **basis for the policy framework and road map**.

Methods and evidence base



Literature review

International literature and global good practices in climate-resilient agriculture



Quantitative data

Environmental Performance Index (EPI 2024, 52 OIC states) and FAOSTAT (temperature, emissions, production, food security, credit)



Six country case studies

Uzbekistan, Morocco, Türkiye, Saudi Arabia, plus the Netherlands and Australia as non-OIC reference cases



Member Country survey

Experts and institutional representatives · 28 items across four dimensions



Conceptual Framework, Methodology and Review of Global Practices

From sector-specific adaptation to systemic agricultural resilience

From Adaptation to Systemic Agricultural Resilience

Resilience is defined as a dynamic capacity to anticipate, absorb and adapt to shifting climatic and economic conditions — and, when necessary, to recalibrate existing systems to meet new realities.



The evidence

- Observed **weather trends** already account for **yield declines**; **regions with lower adaptive capacity are hit harder**.
- Climate variability increases **inequality** across regions — a distributional as well as biophysical challenge.
- Weak storage, irrigation and market infrastructure amplify **price instability**.



The gap in policy design

- Responses remain largely sector-specific adaptation measures.
- Climate risks are **discussed** at a high level but **poorly integrated** into investment planning, budget allocation and incentive design.
- **Insufficient integration** between risk analysis, planning and incentives.



The proposed shift

- Move **beyond gradual adaptation** towards a comprehensive, **system-level approach to resilience**.
- A risk-informed, forward-looking and incentive-aligned **policy framework**.
- Particularly relevant for climate-exposed developing economies

The Risk-Planning-Incentive Nexus

Resilience as the product of three interdependent policy links — a policy transmission chain



Climate Risk Analysis

Identifies and characterises threats: **where** they occur, **how** they evolve, **whom** they affect. The point of entry into the policy chain.



Climate-Responsive Planning

Translates risk information into strategies, investment priorities and institutional arrangements - from strategy to implementation.



Incentive Mechanisms

Shape whether strategies are actually implemented by influencing farmers, firms, public agencies and financial actors.

Where the Chain Breaks: Policy Misalignment

Not minor implementation gaps — deeper structural inconsistencies within policy frameworks

Risk analysis ↔ Incentives

Example: Risk assessments highlight growing water scarcity, while subsidy systems continue to favour water-intensive crops.

Planning ↔ Budgeting

Example: Planning documents prioritise resilience, but budget allocations remain tied to short-term productivity objectives.

Incentives ↔ Adoption

Example: Financial incentives exist, yet uptake stays low because weak extension services or administrative burdens.

Infrastructure ↔ Governance

Example: Investments (e.g. irrigation) are embedded in poorly governed water regions and fail to raise resilience.



Implication for the analysis

Risk analysis, planning and incentives are treated as interdependent elements of a single analytical architecture — not as separate or parallel issues.

Understanding how they interact, and where they fail to align, explains why some resilience strategies succeed while others do not.

Building Blocks of Resilient Agrifood Systems

What the international evidence says works — and its limits



Climate-Smart & Climate-Resilient Agriculture

- Practices that **raise productivity**, strengthen adaptation and **reduce emissions *simultaneously***.
- Drought-tolerant varieties, conservation agriculture, soil and water management, diversification.
- Effectiveness depends on extension, finance and local fit — not technology alone.



Climate Data & Early Warning Systems

- Seasonal **forecasts** and **hazard monitoring** allow farmers to adjust planting windows, crop choice and irrigation.
- **Early warning** reduces losses from droughts, floods and heat episodes.
- Value depends on translation into farm-level, actionable and **accessible information**.



Digital Agriculture

- **Precision farming**, sensor-based irrigation, **satellite data** and **data-driven production** planning.
- Maximises resource use in water-scarce regions and supports **risk-informed decisions**.
- Adoption is uneven: cost, connectivity and skills constrain **smallholders**.

Common lesson: resilience is built on the integration of sound risk analysis, robust planning, adequate finance, reliable data and strong institutions — rather than on technology alone.

Lessons from Global Experience

Climate-resilient agricultural policies concentrate on three pillars



Technological innovation & digital agriculture

Precision farming, sensor-based irrigation, data-driven planning



Natural resource management & sustainable land use

Soil conservation, integrated water management, agroecological methods



Institutional capacity & policy integration

Coordination across agricultural, environmental and water policies

Illustrative country experiences

- **Netherlands** — controlled-environment agriculture: 6.4× yield per unit area and 0.74× water per unit of tomato vs open field, but 231× energy and 18× GHG footprint; sustainability hinges on cleaner energy.
- **Australia** — seasonal climate monitoring lets farmers adjust planting windows, crop choices and irrigation under high variability.
- **Saudi Arabia** — sensor- and satellite-based digital irrigation within a Water–Energy–Food nexus approach.
- **Morocco** — Green Morocco Plan: irrigation modernisation targeting ~550,000 ha (220,000 ha in large-scale schemes) to drip standards.

Successful adapters share holistic frameworks combining long-term planning, sound institutions and technological innovation. Priorities differ by region — water management in arid zones, flood management where precipitation is intense — so local conditions must guide transfer.



Overview and Analysis of OIC Countries in Building Resilience to Climate Crises

Structural diversity, high climate exposure and highly uneven adaptive capacity

Structural Vulnerabilities and the Water–Energy Nexus

Table 3 and Figure 4 of the report

	Water	Dependence on rain-fed agriculture → drought sensitivity
	Finance	Limited access to credit → low investment in adaptation
	Technology	Low mechanisation → loss of productivity
	Information	Weak extension → poor risk response

Source: Table 3 of the report, based on FAO (2025), IFAD (2021), IPCC (2022).

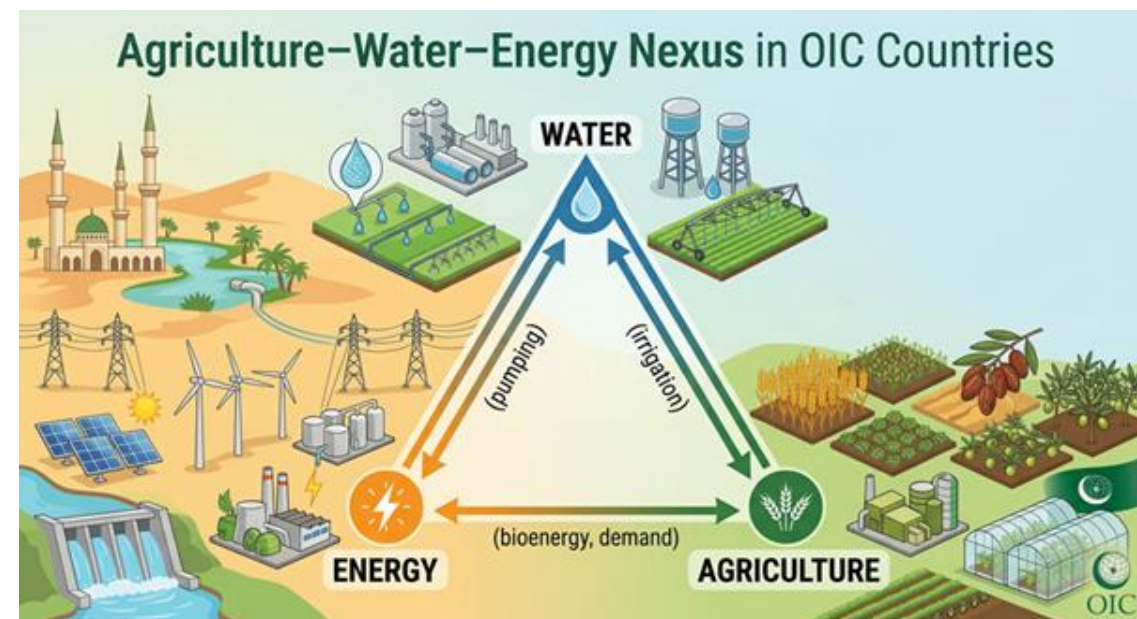


Figure 4 of the report: Agriculture–Water–Energy Nexus in OIC Countries

- OIC members span arid deserts, semi-arid zones, tropical and temperate systems — shaping water dependence and the type of risk faced.
- Demographic pressure: food demand in Africa and South Asia projected to rise by over 50% by 2050 (FAO), while arable land expansion is limited.
- Irrigation-dependent systems rely on both water and energy inputs — without integrated governance, adaptation stays fragmented.

Regional Agricultural Profiles: Five Distinct Risk Structures

Similar climate shocks lead to very different outcomes depending on production systems, assets and governance

Region	Dominant risk driver	Structural constraint	Risk type
MENA	Water stress	Resource scarcity	Resource-constrained
Sub-Saharan Africa	Rainfall variability	Low adaptive capacity	Capacity-deficit
Central Asia	Water dependency	Irrigation systems & transboundary governance	Governance-related
South Asia	Floods and heat	Population pressure	Compound climate
Southeast Asia	Floods and markets	Export concentration	Market-integrated

Source: Table 5 of the report (IPCC 2022; FAO et al. 2025; World Bank 2024b)

Principal Climate Risks Facing OIC Agriculture

Hazards do not act in isolation — they are amplified through production systems, markets and socio-economic structures



Drought & water scarcity

- Prolonged dry spells and declining river flows; groundwater over-extraction.
- Extreme water stress in the Gulf (Kuwait 3,851%, UAE 1,587%, Saudi Arabia 974%) and critical levels in MENA (Fig. 5).



Floods & extreme weather

- Monsoon-driven flooding and storms in South and Southeast Asia and parts of Africa.
- Direct crop, livestock and infrastructure losses; production volatility.



Heat stress

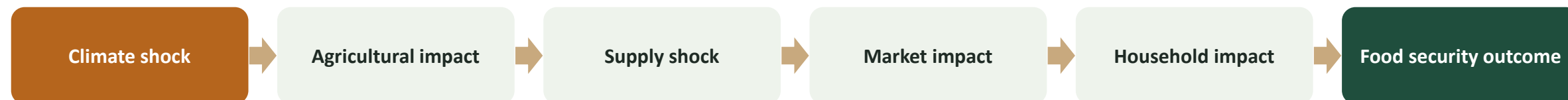
- Reduced crop yields and livestock performance; shifting growing seasons.
- OIC temperature anomaly doubled from $\approx 1.0^{\circ}\text{C}$ (2004) to 2.02°C (2024).



Land degradation & desertification

- Soil erosion, salinisation and loss of arable land in arid and semi-arid zones.
- Undermines long-term productive capacity and water retention.

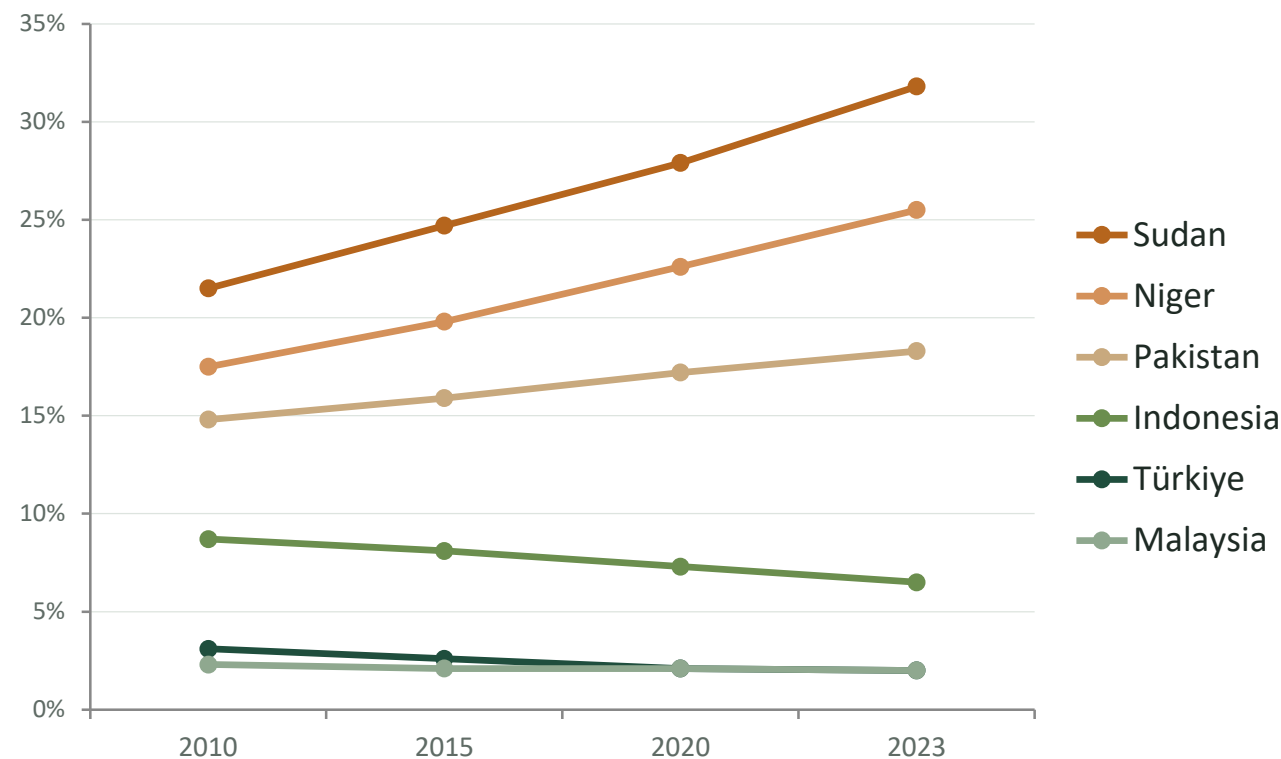
Transmission and amplification



Implications for Food Security

Climate change threatens all four dimensions — with governance as a cross-cutting determinant

Undernourishment in selected OIC countries (% of population)



Source: Figure 13 of the report (FAO data).

Availability	Yield shocks → supply instability
Access	Price spikes → reduced purchasing power; income inequality
Utilisation	Nutritional risks and dietary quality under stress
Stability	Weak coordination → system fragility over time

Common challenges: dependence on climate-sensitive systems, limited smallholder adaptive capacity, weak infrastructure and storage, population pressure, exposure to global market volatility.

Farm-Level Vulnerability: Smallholders and Large-Scale Systems

Different yet interconnected vulnerability profiles



Smallholder farmers

Sources of vulnerability

- Limited access to finance, credit and insurance
- Limited access to technology and climate information
- Land fragmentation and resource constraints
- Social and institutional vulnerabilities

Pathways to resilience (integrated, not isolated)

- Climate-resilient technologies and stronger extension services
- Financial inclusion and expanded agricultural insurance
- Rural infrastructure, early warning and climate information
- Producer organisations; participation of women and young farmers



Large-scale agricultural systems

Sources of vulnerability

- Water dependency and irrigation risk
- Climate impacts on productivity
- Supply chain vulnerability through market integration
- Financial exposure and investment risks (stranded assets)

Adaptation pathways

- Climate-resilient varieties and water-efficient irrigation
- Diversification of crops and income sources
- Digital and precision farming; early-warning systems
- Corporate governance integrating climate risk into investment planning; contract farming links with smallholders

Institutional Capacity and Governance

Two countries facing the same drought can experience very different outcomes — governance explains much of the difference

Governance challenges observed in OIC countries

- **Fragmented** roles and responsibilities across institutions
- **Insufficient coordination** between national and local authorities
- **Limited financial resources** for climate adaptation
- Weak agricultural extension and advisory systems
- Restricted access to reliable **climate data**
- **Shortcomings in monitoring** and evaluation of implementation

Elements of successful climate governance (UNDP, 2023)

-  Multi-level governance and coordination
-  Policy integration across agriculture, water, rural development and climate
-  Mobilising financial resources
-  Stakeholder engagement
-  Data-driven decision-making

Planning Instruments for Agricultural Climate Resilience

Existence of a planning tool does not guarantee effectiveness



Nationally Determined Contributions (NDCs)

Most OIC members reference agriculture in mitigation/adaptation commitments; the link to sectoral investment and budgeting is often weak.



National Adaptation Plans (NAPs)

Iterative cycle of risk assessment, prioritisation, implementation and monitoring — capacity to complete the cycle varies widely.



Agricultural Development Strategies

Increasingly incorporate climate considerations, but many remain oriented to productivity and output growth.



Regional & International Frameworks

OIC/COMCEC, IsDB, FAO, UNFCCC platforms support knowledge exchange and finance access.

The “integration gap”

The difference between the capacity to **identify climate risks** and the strength of the **financing and monitoring** mechanisms that address them.

- Relatively strong performance in identifying climate risks
- Significant gaps in linking risks to financing
- Weak monitoring and evaluation of implementation
- Effectiveness depends on institutional support, implementability and integration into budgets

Incentive Mechanisms for Agricultural Climate Resilience

Incentives shape whether strategies are implemented — or reproduce existing vulnerabilities



Subsidies & support programmes

Input and price support dominate; often favour water- and input-intensive crops and rarely condition support on climate-resilient practices.



Agricultural insurance

Index-based and public-private schemes (e.g. TARSİM in Türkiye, Morocco's drought insurance) spread risk; coverage of smallholders remains limited.



Climate finance

Multilateral funds, concessional lending and blended finance; access is constrained by project preparation capacity and weak integration with national budgets.



Early warning & risk reduction

Climate information services and EWS reduce losses when linked to farm-level advice and contingency finance.

Evaluation

- Impact depends not on existence but on alignment with climate objectives and integration into governance frameworks; the strongest outcomes arise when instruments complement one another.
- Gaps to close: integration of climate finance, alignment between financial and policy instruments, and implementation mechanisms that ease access at farmer level.
- The determining factor is whether incentive systems align producer behaviour with adaptation objectives — otherwise incentives can reproduce vulnerabilities.

Environmental Performance Index 2024: Global Ranking

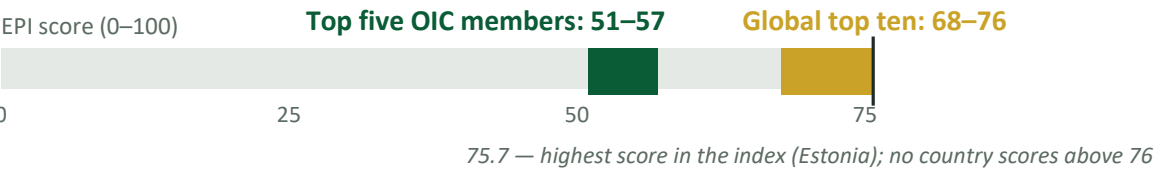
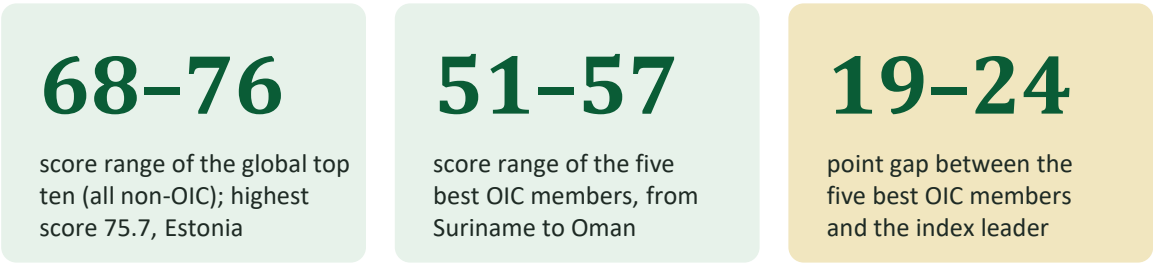
 OIC member countries (52)

Score on a 0–100 scale; 10y Δ = change in score over the past ten years (points), negative values in red

Rank	Country	Score	10y Δ	Rank	Country	Score	10y Δ	Rank	Country	Score	10y Δ	Rank	Country	Score	10y Δ	Rank	Country	Score	10y Δ
1	Estonia	75.7	17.6	31	Hungary	59.8	-2.3	61	Timor-Leste	49.9	13.7	91	Bolivia	45.3	4.1	121	Azerbaijan	40.5	0.7
2	Luxembourg	75.1	4.2	32	Belarus	58.2	10.2	62	Serbia	49.8	-4.8	91	Tunisia	45.3	0.7	122	Tonga	40.4	-6.9
3	Germany	74.5	4.6	33	New Zealand	57.3	0.7	63	Colombia	49.7	4.5	93	Vanuatu	45.0	11.8	123	Honduras	40.2	2.7
4	Finland	73.8	8.3	33	Romania	57.3	-2.6	64	Chile	49.6	3.9	94	Armenia	44.9	1.5	124	Angola	40.1	7.7
5	United Kingdom	72.6	2.1	35	United States	57.2	0.3	65	Dominica	49.3	-0.6	95	Kuwait	44.4	-2.7	125	Niger	40.0	6.9
6	Sweden	70.3	1.6	36	Suriname	56.9	9.6	66	Botswana	49.2	1.3	96	Kiribati	44.3	-1.1	126	Lebanon	39.9	6.4
7	Norway	69.9	3.7	37	Bulgaria	56.2	-1.5	67	Guyana	49.0	2.0	97	Mexico	44.2	2.7	126	Sierra Leone	39.9	4.0
8	Austria	68.9	-0.3	38	Bahamas	55.9	3.1	68	Jamaica	48.5	1.5	98	Uruguay	44.1	3.0	128	Dem. Rep. Congo	39.5	6.0
9	Switzerland	67.8	2.0	39	Antigua & Barbuda	55.6	1.0	69	Brunei Darussalam	48.3	0.5	99	Namibia	44.0	1.5	128	Morocco	39.5	2.9
10	Denmark	67.7	1.8	40	Costa Rica	55.5	2.1	70	Israel	48.0	0.4	100	Senegal	43.8	3.6	128	Paraguay	39.5	0.8
11	Greece	67.3	8.4	41	Ukraine	54.6	8.3	71	Seychelles	47.9	-4.6	101	Egypt	43.7	4.5	131	Sudan	39.1	3.4
12	France	67.0	1.7	42	St Vincent & Gren.	54.2	2.0	72	Kazakhstan	47.8	5.5	102	Tanzania	43.6	4.3	132	Central African Rep.	39.0	-5.8
13	Malta	66.9	7.9	43	Cyprus	53.9	0.8	73	Dominican Republic	47.7	-1.3	103	Bhutan	43.3	6.8	132	Mozambique	39.0	3.8
13	Netherlands	66.9	5.0	44	Gabon	53.3	5.5	73	Montenegro	47.7	1.3	104	Côte d'Ivoire	42.9	5.0	134	Sri Lanka	38.8	1.0
15	Belgium	66.8	5.5	44	Venezuela	53.3	1.8	75	Belize	47.4	1.1	105	Kyrgyzstan	42.8	13.7	135	Eswatini	38.7	-1.7
16	Ireland	65.8	2.6	46	Barbados	53.1	3.3	75	Nicaragua	47.4	0.4	106	South Africa	42.7	5.0	136	Cameroon	38.6	0.6
17	Czech Republic	65.5	0.9	47	Brazil	53.0	6.6	77	Georgia	47.3	6.3	107	Uzbekistan	42.6	-0.5	137	Comoros	38.2	-6.4
18	Slovakia	65.1	-1.4	47	Singapore	53.0	3.8	77	Jordan	47.3	9.0	108	Marshall Islands	42.5	1.8	138	Maldives	38.1	4.9
19	Iceland	64.3	3.8	49	Panama	52.9	5.1	77	Mauritius	47.3	4.1	108	Saudi Arabia	42.5	8.3	139	Cabo Verde	38.0	-1.0
20	Poland	64.2	2.5	50	Cuba	52.5	2.5	80	Samoa	47.1	4.7	110	Burkina Faso	42.2	-0.1	140	Nigeria	37.9	2.5
21	Lithuania	64.1	5.7	50	Trinidad & Tobago	52.5	3.0	81	Argentina	47.0	1.4	110	Solomon Islands	42.2	1.9	141	Benin	37.8	-0.7
22	Spain	64.0	1.5	52	Albania	52.2	5.5	82	Qatar	46.8	6.1	112	Guinea-Bissau	42.0	-0.4	142	Gambia	37.6	0.2
23	Australia	63.1	5.4	53	United Arab Emirates	51.6	9.2	83	Russia	46.7	0.8	113	Iran	41.8	0.7	143	Mongolia	37.2	5.7
24	Slovenia	62.4	-1.2	53	Zimbabwe	51.6	7.7	83	Zambia	46.7	4.7	114	Algeria	41.7	2.6	143	Türkiye	37.2	2.5
25	Croatia	62.3	3.0	55	Ecuador	51.3	7.4	85	Peru	46.5	3.8	114	Equatorial Guinea	41.7	-3.4	145	Ghana	36.9	1.7
26	Portugal	61.9	2.5	55	Oman	51.3	11.0	86	Moldova	46.1	2.7	116	El Salvador	41.6	-5.0	145	Kenya	36.9	2.1
27	Japan	61.4	4.6	57	Saint Lucia	51.1	2.6	87	Bosnia-Herzegovina	46.0	5.4	116	Republic of Congo	41.6	1.3	145	Lesotho	36.9	1.4
28	Canada	61.1	3.5	58	South Korea	50.6	5.3	87	Fiji	46.0	-2.9	118	Malaysia	41.0	7.0	145	Papua New Guinea	36.9	-6.9
29	Italy	60.3	4.0	59	North Macedonia	50.3	2.3	89	Grenada	45.8	1.7	119	Micronesia	40.8	-0.5	149	Guinea	36.5	-3.2
30	Latvia	60.2	2.6	60	Taiwan	50.1	0.3	90	Thailand	45.7	5.2	120	Turkmenistan	40.6	4.9	150	Haiti	36.4	7.5

Where OIC Countries Stand: EPI 2024 in Global Comparison

Environmental Performance Index 2024 (Yale / Columbia) · 58 indicators · 11 issue categories · 3 policy objectives · 52 of 57 OIC member states indexed



OIC members cluster heavily in the mid-to-lower deciles of the index: pressure for rapid economic expansion frequently outpaces institutional capacity for environmental enforcement.



The catch-up trend

10-year delta indicators show a subset of OIC nations improving faster than mature economies. Investing directly in climate-resilient sectors offers a route to leapfrog high-emission developmental phases and close the remaining gap.

OIC PERFORMANCE CLUSTERS (52 INDEXED MEMBERS)

16

High performance

Gulf economies scaling renewables; Suriname and Gabon as net carbon sinks; near-universal safe water and sanitation; strongest habitat and marine protection

20

Mid performance

Transition economies (Türkiye, Egypt, Morocco, Indonesia): fossil-fuel dependence and urban PM2.5 air quality; highest potential for climate-resilient agriculture

15

Low performance

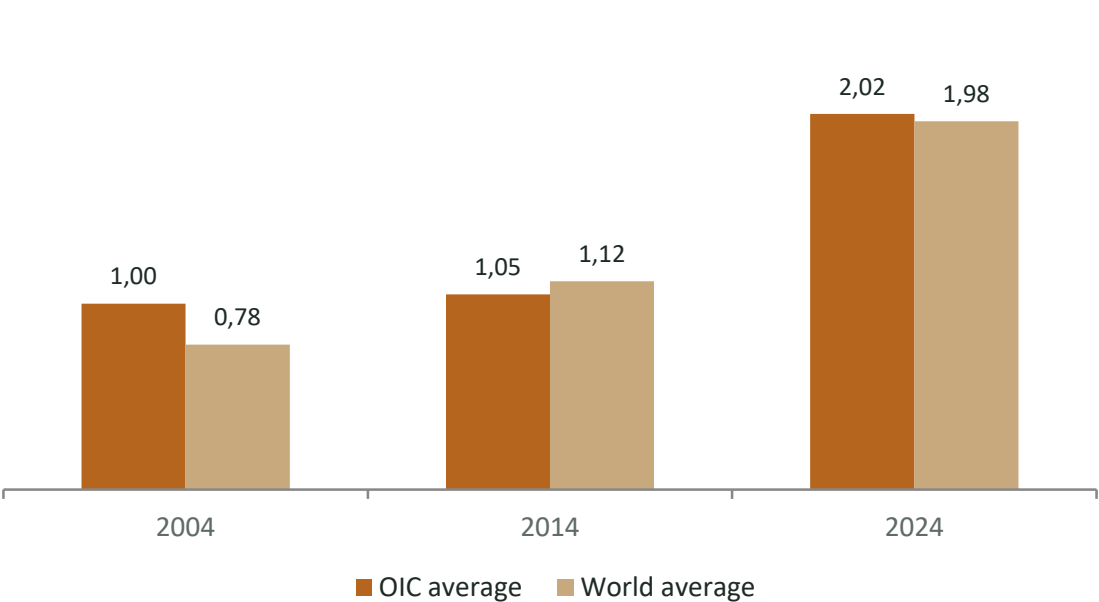
Frontline climate vulnerability (Pakistan, Bangladesh); coal and biomass reliance; systemic water and sanitation gaps; agriculture highly exposed to crop failure

Source: Environmental Performance Index 2024 (Yale Center for Environmental Law & Policy; Columbia University CIESIN). Libya, Palestine, Somalia, Syria and Yemen are not indexed due to data gaps.

FAOSTAT Evidence: Warming, Emissions and Production

The OIC geography experiences warming signals more intensely than the rest of the world

Surface temperature anomaly vs 1951–1980 (°C)



Source: Table 18 of the report, based on FAOSTAT.

18.0%

OIC share of global GHG emissions (2024, all sectors with LULUCF)

+78.2%

growth of OIC emissions 1990–2023, versus +57.2% for the world

≈ 76%

of OIC emissions come from the top ten emitters (Indonesia 21.1%, Iran 11.5%, Saudi Arabia 10.5%, Türkiye 6.5%, Pakistan 5.5%)

+25.4%

gross agricultural production growth 2014–2024 (OIC) vs +13.8% world; per capita only +4.3% — the “demographic gap”

- Anomalies nearly doubled in the last decade (OIC average 1.05 °C → 2.02 °C): localised resilience is a survival requirement for all Member States.
- Rising output is largely absorbed by population growth; credit to agriculture and the Agricultural Orientation Index remain below the sector's economic weight in most members.

Emerging Good Practices in OIC Countries

Section 2.11 — innovative approaches already strengthening resilience

Morocco

Irrigation modernisation and water efficiency

Large-scale conversion to drip irrigation under national water-saving programmes; groundwater protection

Indonesia

Climate-smart agriculture programmes

Climate field schools, adaptive cropping calendars and rice intensification for smallholders

Pakistan

Water management and climate adaptation

Canal and on-farm water efficiency, flood-risk management after the 2022 floods, provincial adaptation plans

Kazakhstan

Climate-resilient crops and land management

Drought-tolerant varieties, conservation agriculture and sustainable rangeland management on the steppe

Türkiye

Integrated agricultural policy and irrigation modernisation

GAP investments, pressurised irrigation, TARSİM insurance and climate adaptation planning

Common features of successful implementations: improved water management and irrigation efficiency · adoption of climate-resilient technologies · financial inclusion and risk-management tools · stronger institutional coordination · better access to information and extension.

Key Findings

Agricultural resilience in OIC countries is primarily a matter of governance and systems management

Four integration gaps

Governance gap — institutional fragmentation

Policy integration gap — between climate policies and agricultural development strategies

Climate finance integration gap — between financial resources and resilience objectives

Information & dissemination gap — limiting technology diffusion

- Vulnerability is largely shaped by structural factors, not climate alone; each region has its own risk dynamics.
- Technology and financing are necessary but not sufficient: outcomes depend on institutions' capacity to coordinate policies, harmonise incentives and manage risks holistically.
- Establishing climate-resilient systems requires structural transformation — governance reform, financial system development, institutional capacity and policy integration.



Thank you

Questions and discussion

Promoting a Climate-Resilient Agriculture Sector against Climate Change in OIC
Member Countries — Draft Research Report

COMCEC Coordination Office · 2026

