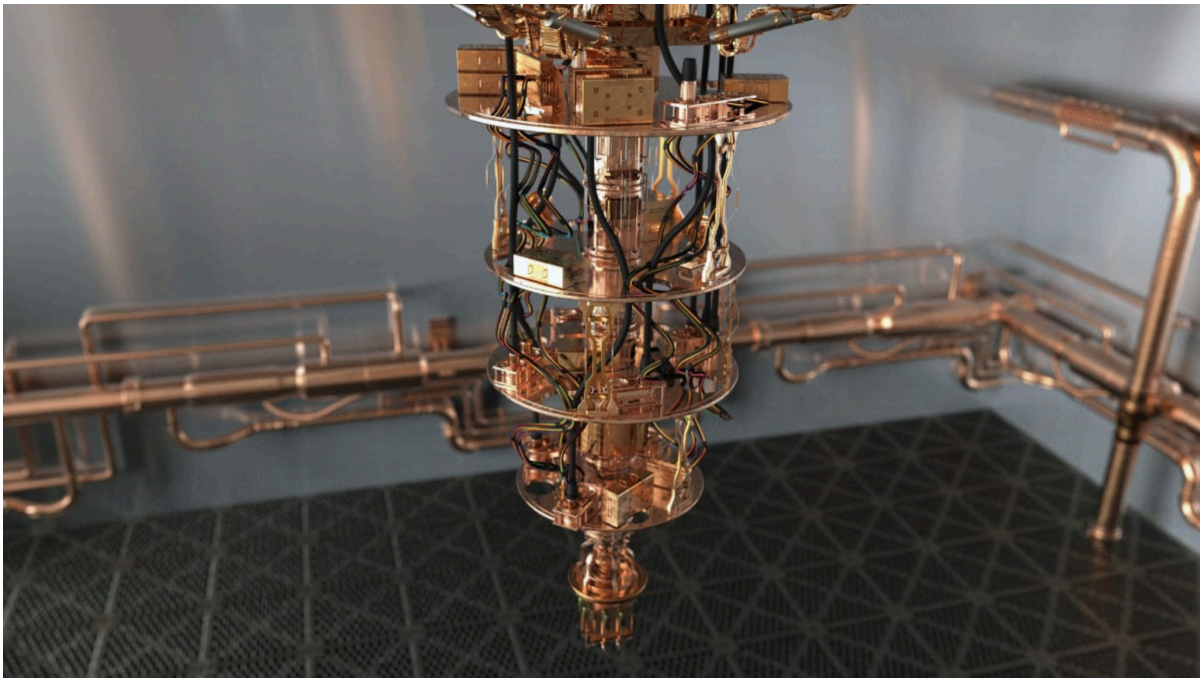
Quantum Technologies in the MENA Region



Author: Youssef Lahbiel

Executive Summary

Quantum technologies are moving from scientific research into the strategic domain. Governments worldwide have committed an estimated USD 55.7 billion to quantum science and technology since 2013, and 18 OECD members plus the European Union have adopted dedicated national strategies (Organisation for Economic Co-operation and Development [OECD], 2025b). The MENA region enters this transition from sharply unequal positions. Gulf States hold advantages in capital, infrastructure, state capacity, and international partnerships. Israel has significant scientific and technological depth, while Iran has developed research capacity despite sanctions. North African countries have strong human capital and scientific potential but face financing, infrastructure, and commercialisation constraints.

This policy paper's central empirical finding is a conversion paradox. In the 2025 Global Innovation Index (GII), the United Arab Emirates (UAE), Qatar, and Saudi

Arabia rank 30 to 33 places lower on innovation outputs than on innovation inputs, whereas Morocco, Tunisia, and Iran rank 26 to 63 places higher on outputs than on inputs (World Intellectual Property Organisation [WIPO], 2025c). The region's capital and its capacity to convert resources into knowledge sit in different places. Tunisia reports more researchers per million inhabitants than Saudi Arabia or Qatar, while the UAE and Qatar rank first worldwide for inbound student mobility, suggesting that much of their talent is imported rather than homegrown (WIPO, 2025c).

Three further findings raise the stakes. First, export-control regimes govern access to quantum hardware, and no MENA state belongs to the group eligible for licence-free US transfers (Bureau of Industry and Security [BIS], 2024b). Second, the security threat is already on a clock: surveyed experts assign a 28–49% probability of a cryptographically relevant quantum computer within ten years (Mosca & Piani, 2026), while NIST proposes deprecating today's public-key algorithms after 2030 (Moody et al., 2024). Third, partner geographies are diverging, with French, American, Russian, and purely domestic technology paths now coexisting in the region.

The policy paper recommends a MENA Quantum Cooperation Framework built around research, talent, cybersecurity, infrastructure, and cross-border applications, operationalised through six instruments: a MENA Quantum Forum, a Regional Quantum Talent Initiative, a Regional Quantum Cloud, a MENA Post-Quantum Cryptography Roadmap, Quantum Application Sandboxes, and a variable-geometry Gulf–Levant–North Africa quantum value chain.

Quantum Is Becoming a Strategic Technology

From computing paradigm to strategic capability

Public debate often reduces quantum technology to the quantum computer. The policy reality is broader. The OECD frames the field as three interdependent families: computing, communication, and sensing. Their implications range from commercial productivity to digital security and national security (OECD, 2025a). Table 1 summarises the three pillars and their specific relevance for MENA economies.

Table 1

The three pillars of quantum technology and their regional relevance

Pillar	Core function	Illustrative applications	Specific relevance for MENA
Quantum computing	Optimisation, simulation and machine learning beyond classical limits	Drug and material discovery; financial modelling; AI; energy systems; logistics	Reservoir and CO_2-storage optimisation, grid balancing, port logistics, desalination chemistry
Quantum communication	Quantum key distribution (QKD), quantum networks, secure links	Secure government, financial and critical-infrastructure communications; cybersecurity	Sovereign diplomatic and defence links; satellite-based QKD; protection of energy control systems

Pillar	Core function	Illustrative applications	Specific relevance for MENA
Quantum sensing	Ultra-precise measurement of time, fields, gravity and motion	Navigation; geospatial applications; defence; medical imaging; geological exploration	GNSS-independent navigation, subsurface resource mapping, water-table monitoring, precision timing

Note. Pillars and applications adapted from OECD (2025a); the MENA column reflects the author's assessment.

The distinction matters for strategy. **Quantum computing** remains highly capital-intensive and, across many applications, further from widespread commercial maturity. **Quantum communication** and post-quantum security have more immediate applications in secure communications and critical infrastructure. **Quantum sensing**, which has received less attention in regional debates, maps onto some of MENA's most important strategic sectors, from subsurface resources to navigation in contested airspace.

Why governments care

The strategic logic runs as a chain:

Quantum → Technological advantage → Economic competitiveness → Strategic autonomy → National security

At this point, quantum becomes a political rather than a purely technological question. Governments are deploying institutional research funding, business R&D grants, public procurement, and equity finance. The OECD's policy database already tracks close to 250 such measures across 40 countries and the EU (OECD, 2025b).

This policy paper uses the concept of quantum sovereignty to describe the state's ability to develop, access, secure, and govern critical quantum capabilities without excessive dependence on external powers. Saudi Arabia's own baseline assessment lists quantum sovereignty among its strategic opportunities (Centre for the Fourth Industrial Revolution Saudi Arabia [C4IR Saudi Arabia], 2024), while Abu Dhabi's Technology Innovation Institute links the development of in-house capability to strategic autonomy in an environment of tightening export controls (Lütken, 2025). In practice, quantum sovereignty depends not only on owning infrastructure, but also on managing three critical dimensions: **access** (to hardware, cloud time, and export licences), **assurance** (of the cryptography protecting national data) and **absorption** (of people able to use the technology productively). This “3A” lens structures the analysis that follows.

MENA's Emerging Quantum Landscape

The Gulf: capital, state capacity, and global partnerships

Saudi Arabia is attempting to combine state strategy, industrial demand, and international technology partnerships. Under Vision 2030, it became the first country to pilot the World Economic Forum's Quantum Economy Blueprint, a process led by C4IR Saudi Arabia (AlBuhairan et al., 2026). In 2025, KACST, Aramco,

and the Saudi Data and AI Authority announced a “Quantum Valley” initiative to operate the Kingdom's first quantum computer with Pasqal and IBM (C4IR Saudi Arabia, 2025). Aramco's venture arm had invested in Pasqal in 2023 (Aramco, 2024); a 200-qubit neutral-atom system was deployed at Aramco's Dhahran data centre in November 2025 (Aramco, 2025) and in May 2026 became the Middle East's first commercial quantum-computing-as-a-service (QCaaS) platform, open to enterprises and universities (Aramco, 2026). KACST's National Centre for Quantum Technologies has also signed a multi-year research agreement with Pasqal, whose first focus is quantum-safe cryptography (Pasqal, 2026).

The most revealing Saudi document, however, is self-critical. The Kingdom's baseline assessment acknowledges that national quantum efforts are dispersed across institutions, that the pool of quantum scientists and engineers is limited, that specialised laboratories are scarce, and that no large-scale effort yet builds quantum skills from early education (C4IR Saudi Arabia, 2024). WIPO data corroborate the diagnosis: Saudi Arabia ranks 106th for public research–industry co-publications (WIPO, 2025c). The Saudi approach can be described as demand-led anchoring, in which a state-owned industrial champion acts as first customer and de-risks use cases, which is a lesson the Blueprint pilot itself highlights (AlBuhairan et al., 2026).

The United Arab Emirates follows a different logic. Abu Dhabi's Technology Innovation Institute (TII), part of the Advanced Technology Research Council (ATRC), runs a Quantum Research Centre spanning superconducting computing, quantum communication, cryptography, and sensing (Technology Innovation Institute [TII], n.d.). TII reports fabricating the region's first superconducting qubit and now producing dozens of multi-qubit chips per month in its own foundry, while sourcing larger chips from partners and planning to supply quantum computing as a national “utility” (Lütken, 2025). Government experimentation started early: in 2018, the Dubai Electricity and Water Authority became the first utility worldwide to join Microsoft's quantum programme, targeting energy, and water optimisation (Dubai Electricity and Water Authority [DEWA], 2018). On security, the UAE Cybersecurity Council has moved from planning to large-scale implementation of a National Post-Quantum Migration Program built on TII cryptographic libraries and quantum key distribution (ATRC, 2025, 2026). Compared with Saudi Arabia’s partnership-led approach, the UAE places greater emphasis on developing domestic capabilities.

Qatar pursues a third, alignment-led path. Hamad Bin Khalifa University hosts the Qatar Centre for Quantum Computing (QC2), the country's first dedicated quantum research centre, with use cases in quantum chemistry, quantum machine learning, AI, and quantum-augmented cybersecurity (Quantinuum, n.d.). In May 2025, Quantinuum and Al Rabban Capital created a Qatari joint venture presented as part of strengthened US–Qatar strategic ties (Quantinuum, 2025a), laying the groundwork for up to USD 1 billion of Qatari investment over a decade (Quantinuum, 2025b). The commitment is large, but the broader innovation ecosystem still faces commercialisation constraints. Qatar ranks 113th for

venture-capital deals relative to GDP, and business finances only 9.3% of its R&D (WIPO, 2025c).

Israel: scientific and technological depth

Israel is the only regional actor strong on both innovation inputs and outputs. It leads the world in R&D intensity (6.35% of GDP in 2023) and ranks 6th for knowledge and technology outputs (WIPO, 2025c). The Israel National Quantum Initiative (INQI), launched in 2018, is a joint venture of the Council for Higher Education, the Israel Innovation Authority, and the ministries of science, defence, and finance (Israel Ministry of Economy and Industry, 2021). Its reported NIS 1.25 billion envelope funded a national quantum computing centre (Quantum Machines, 2022), and in July 2026 the Innovation Authority opened a NIS 100 million call for a new national infrastructure giving firms and universities access to several quantum processing technologies (Israel Innovation Authority [IIA], 2026b).

Depth should not be confused with scale. The Innovation Authority counts only slightly more than ten quantum companies, albeit with a record of over USD 300 million in reported investment in 2025 (IIA, 2025), and it warns that part of Israel's high-tech activity, workforce, and capital is moving abroad (IIA, 2026a). Israel's weakest GII pillars are infrastructure (45th) and institutions (36th), including operational stability for businesses (86th) (WIPO, 2025c), which are precisely the Gulf's strongest pillars.

The analytical question is therefore: can Israel's scientific depth become a regional technological node, or will geopolitical fragmentation keep it an island? Israel's strengths lie disproportionately in the most portable layers of the quantum stack, namely software, control systems and algorithms. These layers are easy to integrate across borders but equally easy to relocate. Without regional anchoring, the likelier trajectory is deeper integration with Western rather than regional value chains. Any regional role depends on political conditions that remain highly constrained, which is why the proposals at the end of the article rely on variable geometry rather than region-wide arrangements.

Iran: quantum development under geopolitical constraint

Iran presents the region's starkest mismatch: it ranks 109th for innovation inputs but 46th for outputs, the widest positive gap in this sample, and hosts one of the world's top innovation clusters (WIPO, 2025c). Its quantum activity is anchored in universities and dedicated centres such as the Centre of Quantum Science and Technology at the University of Isfahan (Centre of Quantum Science and Technology [CQST], 2023). Sanctions shape this ecosystem in two directions. UNESCO documents that the 2018 reimposition of US sanctions depressed knowledge-based exports while pushing firms towards local suppliers. The same report records that business funding has already fallen from 35% to 28% of domestic research spending between 2014 and 2016, and that 39% of university graduates were unemployed (United Nations Educational, Scientific, and Cultural

Organisation [UNESCO], 2021). The US now requires licences worldwide for quantum computers and related equipment, components, and materials, and presents its coordinated export controls as part of an effort to degrade Russia's capabilities and those of enablers such as Iran (BIS, 2024a).

The result can be called sanctioned indigenisation: strong scientific output combined with weak access to the hardware, capital, and partners needed to build platforms. Consistent with Iran's broader emphasis on technological self-reliance in security-relevant domains, its quantum effort is likely to lean towards communication, sensing, and cryptography rather than commercial computing. The combination of skilled graduates and limited domestic opportunity also makes Iran a significant potential source of regional brain drain. Official English-language documentation of Iran's quantum programme is sparse, which itself limits the country's visibility as a scientific partner.

North Africa: potential without scale

Morocco reached its best-ever GII rank (57th) in 2025 and remains an innovation overperformer, with an output rank (51st) 26 places above its input rank (77th) (WIPO, 2025b, 2025c). It spends 6.0% of GDP on education (16th worldwide) and ranks 12th for high-tech manufacturing. Yet its latest researcher count dates from 2016, no current R&D-intensity figure is reported, and it ranks 112th for public research–industry co-publications (WIPO, 2025c). This statistical blind spot is a policy problem in itself: a state cannot target quantum investment it cannot measure.

Morocco's assets are nonetheless real. The Morocco Digital 2030 strategy targets 240,000 direct digital jobs supported by large-scale training (Confédération Générale des Entreprises du Maroc [CGEM], 2024). Mohammed VI Polytechnic University hosts Toubkal, Africa's most powerful supercomputer, open to African researchers (Mohammed VI Polytechnic University [UM6P], n.d.). The Moroccan Network of Quantum Information connects researchers from at least eight universities, from Kenitra to Agadir (Moroccan Network of Quantum Information, n.d.). ICTP held a school on quantum computing and quantum information in Morocco in 2026 (International Centre for Theoretical Physics [ICTP], 2026). CERN's Open Quantum Institute is supporting a 2026 quantum hackathon at Mohammed V University in Rabat (Open Quantum Institute [OQI], 2025). The same OQI session identified the missing links: regional collaboration and formal institutional partnerships (OQI, 2025). Morocco also sits in ITU's top cybersecurity tier (International Telecommunication Union [ITU], 2024).

Egypt offers scale: R&D spending of 1.03% of GDP, 845 researchers per million, and a top-100 innovation cluster in Cairo, but only 11.9% of graduates in science and engineering (113th) (WIPO, 2025c). Its governance is moving. The national AI council now operates as the National Council for Artificial Intelligence, Quantum Computing, and Emerging Technologies (2026). The ICT ministry co-organised a national quantum technologies workshop in 2025 (Egypt University of Informatics [EUI], 2025). The Academy of Scientific Research and Technology co-hosted a

quantum computing workshop with Russia's Joint Institute for Nuclear Research (JINR, 2025). Egypt also scored 100/100 in ITU's 2024 cybersecurity index (National Telecom Regulatory Authority [NTRA], 2024).

Tunisia stands out for its strong human-capital indicators. It ranks 2nd worldwide for the share of science and engineering graduates (37.9%), and 17th for scientific articles relative to GDP, and it reports 1,704 researchers per million. Yet, it ranks 136th for public research–industry co-publications and 116th for infrastructure (WIPO, 2025c). Algeria (115th in the GII) is at an earlier stage, although Algerian, Moroccan, and Tunisian scientists take part in UNESCO's quantum computing course for African women researchers (UNESCO, 2026).

North Africa's comparative advantage is therefore unlikely to lie in quantum hardware in the near term. It lies in quantum applications, talent, software, cybersecurity, and regional research networks. Morocco has a particularly interesting entry point, combining top-tier cyber governance, an HPC base, an explicit digital-talent strategy, and industrial sectors (energy, logistics, agriculture, and fertilisers) with genuine optimisation and chemistry problems.

The MENA Quantum Disparities

Rather than a single “Gulf ahead, others behind” ranking, the disparities are best read across five dimensions. Table 2 and Figure 1 provide the quantitative base; Table 3 synthesises the qualitative assessment.

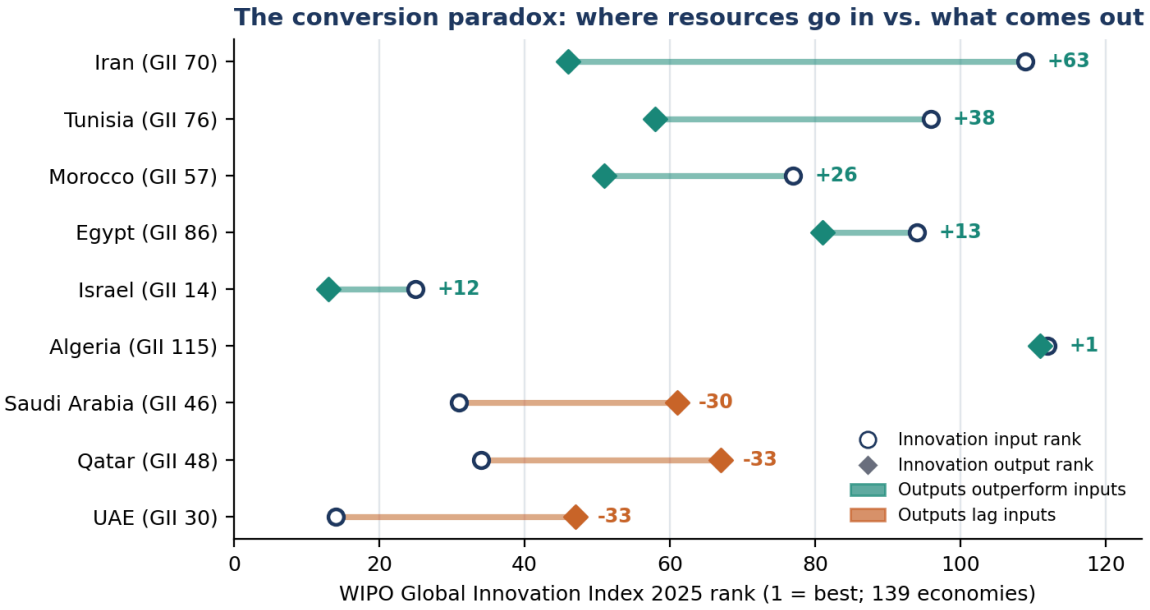
Table 2

Innovation inputs, outputs and research capacity in selected MENA economies, 2025

Economy	GII rank	Input rank	Output rank	Gap*	GERD, % GDP	Researchers (FTE/mn)
Israel	14	25	13	+12	6.35 (2023)	n/a
United Arab Emirates	30	14	47	−33	1.49 (2021)	2,607 (2021)
Saudi Arabia	46	31	61	−30	0.56 (2023)	1,121 (2023)
Qatar	48	34	67	−33	0.68 (2021)	948 (2021)
Morocco	57	77	51	+26	n/a	1,083 (2016)
Iran	70	109	46	+63	—	—
Tunisia	76	96	58	+38	0.75 (2019)	1,704 (2022)
Egypt	86	94	81	+13	1.03 (2023)	845 (2023)
Algeria	115	112	111	+1	—	—

Note. Data from WIPO (2025c). *Gap = input rank minus output rank; positive values mean outputs outperform inputs. GERD = gross expenditure on R&D. FTE/mn = full-time-equivalent researchers per million population. n/a = not reported by WIPO; - = not included in this comparison. Years in brackets indicate the latest available observation.

Figure 1
Innovation input versus output ranks, 2025



Note. Author's calculations based on WIPO (2025c). Lower rank = better performance.

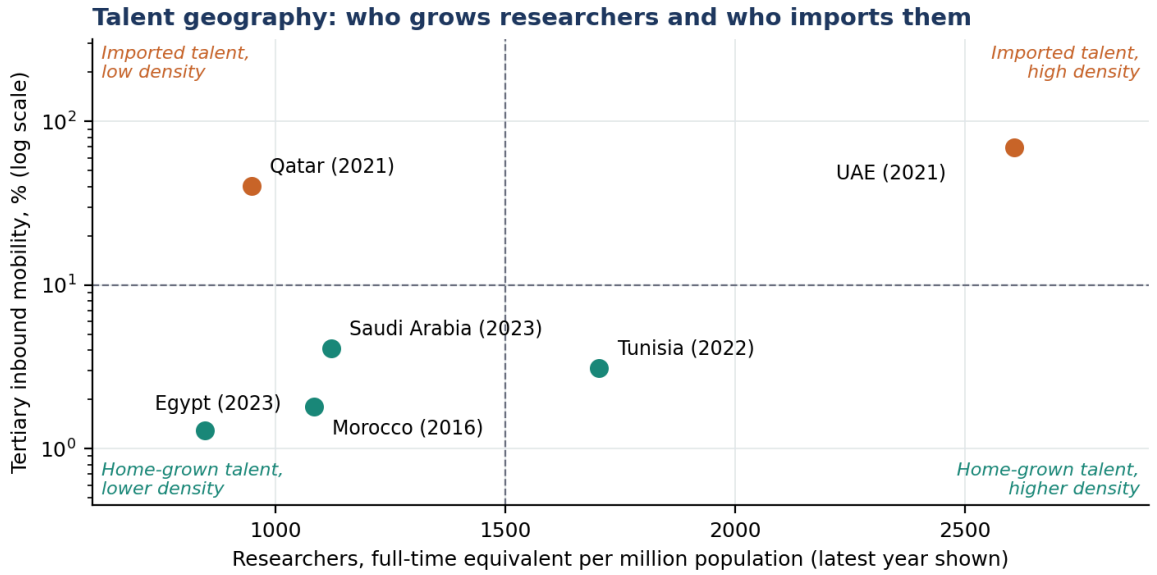
Capital

Gulf States can finance laboratories, hosted quantum systems, startups, research, and talent attraction at a scale that gives them a significant regional advantage. Israel's advantage, by contrast, lies primarily in its private technology and investment ecosystem. Capital alone is insufficient, however. WIPO classifies Saudi Arabia and Qatar among resource-driven high-income economies that perform below expectations for their level of development (WIPO, 2025a), and the conversion gap in Figure 1 shows why.

Talent

The most significant bottleneck may not be hardware but the combination of quantum physicists, computer scientists, engineers, mathematicians, and policy specialists. The Saudi Blueprint pilot stresses that the required workforce extends to algorithm designers, cryogenic, and systems engineers, and professionals who translate science into applications (AlBuhairan et al., 2026). Figure 2 maps the region's talent geography: the UAE combines high researcher density with very high inbound mobility, indicating a strong reliance on internationally mobile talent, whereas Tunisia, Egypt, and Morocco have homegrown research bases with little inbound mobility. The policy implication is symmetrical: internationally mobile talent may be difficult to retain, where limited domestic opportunities can contribute to the outward migration of homegrown talent.

Figure 2
Researcher density and reliance on imported tertiary talent



Note. Author's elaboration based on WIPO (2025c). Israel and Iran omitted for lack of comparable researcher data. Dashed lines are illustrative thresholds.

Infrastructure

Physical quantum infrastructure is concentrated in the Gulf and Israel: a hosted 200-qubit system in Dhahran, an in-house superconducting foundry and quantum communication work in Abu Dhabi, and a multi-platform national centre in Israel. Saudi Arabia has also mapped the clean-room tools available at KACST and KAUST for a future quantum foundry (C4IR Saudi Arabia, 2024). Elsewhere, cloud access and HPC-based emulation are the realistic entry points. Morocco's Toubkal supercomputer illustrates the depreciation risk of owned hardware: it ranked 98th in the TOP500 in 2020 (UM6P, n.d.) and 356th by June 2025 (Kissami et al., 2025). Quantum hardware, still in rapid evolution, is likely to become obsolete even faster.

Commercialisation

The critical question is who is actually turning quantum research into products. One indicator is telling: apart from Israel (26th), every economy in this sample with available data ranks between 60th and 136th for public research–industry co-publications (WIPO, 2025c). MENA has research capacity, but evidence of broad quantum commercialisation remains limited outside Israel.

Strategic integration

The decisive dimension is whether quantum is connected to national priorities. Saudi Arabia links it to energy, industry, AI, and national technology strategy; the UAE to AI, infrastructure, energy, government innovation, and a structured post-quantum migration programme; Israel to cybersecurity, defence, and advanced technology;

Egypt to its AI governance architecture. Morocco could link quantum to AI, logistics, energy, agriculture, and cybersecurity, but has not yet made that connection explicit.

Table 3
The MENA quantum disparities: a five-dimension scorecard

Economy	Capital	Talent	Infrastructure	Commercialization	Strategic integration
Saudi Arabia	**High**	**Low–Med**	**High**	**Medium**	**High**
United Arab Emirates	**High**	**Medium**	**High**	**Low–Med**	**High**
Qatar	**High**	**Low–Med**	**Medium**	**Low**	**Medium**
Israel	**Med–High**	**High**	**Medium**	**High**	**High**
Iran	**Low**	**Med–High**	**Low**	**Low**	**Medium**
Egypt	**Low**	**Medium**	**Low–Med**	**Low**	**Medium**
Morocco	**Low–Med**	**Medium**	**Medium**	**Low**	**Emerging**
Tunisia	**Low**	**Med–High**	**Low**	**Low**	**Low**

Note. Author's qualitative assessment based on the preceding country analyses and the quantitative evidence presented in Table 2. Ratings are relative to the regional sample, not to global leaders.

The key insight from Table 3 is that the dimensions are negatively correlated across the region: the economies richest in capital and infrastructure are poorest in homegrown talent and conversion efficiency, and vice versa. Complementarity is therefore structural, not rhetorical.

Quantum and the Geopolitics of MENA

From technological dependency to quantum sovereignty

MENA has historically depended on external suppliers for advanced technologies, and quantum could reproduce the pattern, with hardware, intellectual property, software, and talent flowing from the United States, Europe, China, and East Asia to MENA adopters. A new constraint reinforces that risk. In September 2024, the United States introduced worldwide licence requirements for certain quantum computers and related technologies in coordination with allies (BIS, 2024a), with a licence exception reserved for jurisdictions that implement equivalent controls. That group includes Australia, Canada, France, Germany, Italy, Japan, Spain, and the United Kingdom, later extended to others such as Denmark and Finland (BIS, 2024b). No MENA state is on the list, so even the region's closest US partners face case-by-case licensing.

This export-control ceiling explains why the UAE invokes strategic autonomy (Lütken, 2025) and why the Saudi pilot concluded that diversified access through cloud, partnerships, and targeted investment can matter more than full hardware ownership (AlBuhairan et al., 2026). The policy question becomes: will MENA be a consumer of quantum technology or a producer of quantum capabilities?

The emerging quantum multipolarity

Quantum competition is increasingly multipolar. The United States, China, the European Union, the United Kingdom, Canada, Japan, South Korea, and India all run dedicated programmes that use funding, procurement, R&D, and international partnerships; examples include Germany's quantum computing initiative worth close to USD 1 billion and Japanese cloud platforms that give industry access to domestic and IBM machines (OECD, 2025b). Within MENA, partner choices already diverge: Saudi Arabia works with France's Pasqal and with IBM, Qatar with US-headquartered Quantinuum, the UAE increasingly with its own foundry, Egypt with Russia's JINR alongside other partners, and Iran largely alone. Divergent partners imply divergent standards, cloud stacks, and security assumptions, creating a quiet fragmentation risk.

Four strategic models follow. **Model one, technology dependence**: MENA imports quantum technologies and services. **Model two, strategic partnerships**: MENA states become preferred partners for external quantum powers, as the Qatari and Saudi deals illustrate. **Model three, regional hub**: Gulf States become investment, research, and commercialisation hubs. **Model four, regional ecosystem**: Gulf capital combines with Israeli scientific expertise, North African talent, and broader MENA markets. The region is currently mixing Models 1 to 3. Model 4 is the most politically demanding, but it is the only one that resolves the conversion paradox, because it moves capital towards talent rather than talent towards capital.

Quantum Security: The Underestimated Dimension

The cryptographic problem

Large-scale quantum computers could break widely used public-key cryptography, a risk the OECD identifies as a direct threat to trust in digital communications and transactions (OECD, 2025a). NIST published its first post-quantum cryptography (PQC) standards in 2024 (National Institute of Standards and Technology [NIST], 2024). The implication is counter-intuitive: the quantum threat exists before the quantum computer arrives, and countries need to prepare for PQC now.

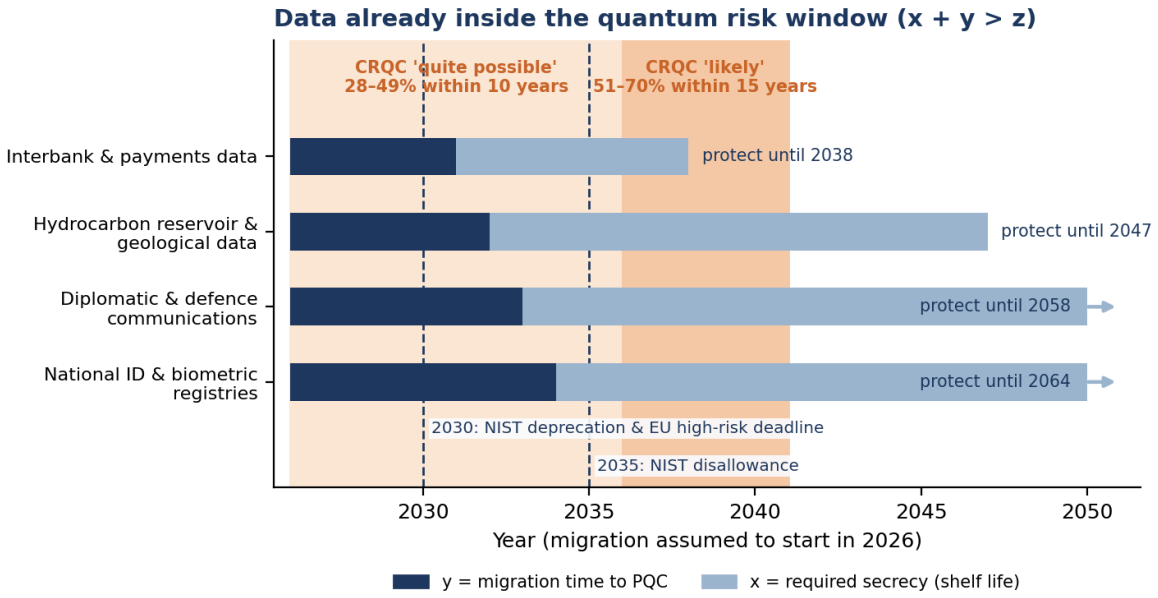
Critical infrastructure

Exposure extends to financial systems, telecommunications, government databases, energy infrastructure, defence, satellites, and diplomatic communications. MENA also presents region-specific high-value targets: sovereign wealth fund strategies, hydrocarbon reservoirs, and geological data, desalination and grid control systems, national identity registries, and long-lived satellite assets.

“Harvest now, decrypt later”

An attacker can collect encrypted data today and decrypt it once the capability exists, creating a time-horizon problem for policymakers. Mosca's inequality formalises it: if the period during which data must stay secret (x) plus the time needed to migrate (y) exceeds the time until a cryptographically relevant quantum computer (CRQC) appears (z), the data are already at risk. Surveyed experts assess a CRQC as "quite possible” (28-49%) within ten years and "likely” (51-70%) within fifteen (Mosca & Piani, 2026). NIST proposes deprecating quantum-vulnerable algorithms after 2030 and disallowing them after 2035 (Moody et al., 2024), and the EU roadmap states that high-risk use cases should not rely on them stand-alone after 2030 (NIS Cooperation Group, 2025). Figure 3 shows why several MENA data classes are already inside the risk window.

Figure 3
Illustrative “harvest now, decrypt later” exposure of MENA data classes



Note. Probability bands from Mosca and Piani (2026); regulatory dates from Moody et al. (2024) and NIS Cooperation Group (2025). Migration times and shelf-life values are the author's illustrative assumptions scaled to reflect the differing technical complexity, criticality, sensitivity, and expected longevity of each data class; the resulting 2038–2064 dates are analytical protection horizons, not regulatory deadlines.

A final, overlooked point: Egypt, Saudi Arabia, Qatar, the UAE, and Morocco all sit in ITU's top “role-modelling” cybersecurity tier (ITU, 2024; NTRA, 2024). That index measures legal, technical, organisational, capacity-development, and cooperation commitments; it is not designed to test cryptographic inventories or post-quantum migration. Tier-1 cyber status is not quantum readiness. Among the cases reviewed, the UAE is the only one with a publicly announced national post-quantum migration programme at the implementation stage (ATRC, 2025), while Saudi Arabia's KACST has begun quantum-safe cryptography research (Pasqal, 2026). For the other states, this review found no published official PQC migration roadmap.

Where Can MENA Actually Compete?

Rather than recommending that every country "invest in quantum", policy should target strategic niches. Table 4 sets out a four-tier hierarchy.

Table 4
A policy hierarchy of quantum niches for MENA

Tier	Scope	Best-positioned actors (assessment)	Entry cost / payoff
1. Frontier capabilities	Hardware, advanced processors, quantum networking, foundational research	UAE (in-house superconducting foundry, QKD); Israel (control, software, and stack components); Saudi Arabia (hosted systems, planned foundry)	Very high cost; long payoff
2. Applications	Energy, logistics, finance, materials, pharmaceuticals, AI, climate, water	Saudi Arabia, UAE and Qatar as anchor buyers; Morocco, and Egypt in logistics, energy, agriculture, and fertiliser chemistry	Medium cost; medium-term payoff
3. Security	Post-quantum cryptography, secure communications, standards, quantum-resistant government systems	All states; UAE most advanced; ITU Tier-1 cyber agencies in Egypt, Morocco, Saudi Arabia, and Qatar provide an institutional base	Low–medium cost; urgent, defensive payoff
4. Talent	University programmes, fellowships, diaspora attraction, quantum engineering, policy training	Tunisia, Morocco, Egypt, and Iran as talent suppliers; Gulf states as financiers and employers	Low cost; highest long-run return

Note. Author's assessment.

Very few actors should attempt Tier 1 frontier capabilities, and even they should specialise. Tier 2 applications offer a much broader opportunity because MENA owns distinctive problems in energy, logistics, water, climate, materials, pharmaceuticals, finance, and AI. Tier 3 security is accessible to almost every state and carries the most urgent deadline. Tier 4 talent is potentially the highest-return investment for emerging economies: trained people are portable across all other tiers and far cheaper to create than machines.

Policy Recommendations: Building a MENA Quantum Ecosystem

The six recommendations below constitute the proposed MENA Quantum Cooperation Framework. Each is designed for variable geometry: coalitions of willing states can advance without waiting for region-wide consensus.

Recommendation 1: Establish a MENA Quantum Forum

A standing platform connecting governments, universities, startups, sovereign wealth funds, telecom operators, energy companies, and cybersecurity institutions. Its first deliverable should be a regional quantum observatory that closes statistical blind spots in researcher counts, R&D spending, quantum publications, and skills, since several states lack current data (WIPO, 2025c). Neutral international platforms such as the WEF Quantum Economy Network and CERN's Open Quantum Institute can serve as conveners.

Recommendation 2: Create a Regional Quantum Talent Initiative

A MENA Quantum Fellowship Programme should fund PhDs, visiting researchers, joint laboratories, student exchanges, and industry placements. The design principle is to move capital to talent: Gulf-funded fellowships, joint chairs, and applied laboratories hosted in North African universities, with industry placements where relevant and incentives for researchers to remain in or return to the region, rather than recruitment into the Gulf alone. The programme should explicitly target Diaspora researchers and include interdisciplinary policy training.

Recommendation 3: Build a Regional Quantum Cloud

Rather than each country purchasing hardware that will depreciate quickly (Kissami et al., 2025), states should pool access to existing hosted systems such as the Dhahran QCaaS platform (Aramco, 2026) through research credits allocated competitively to regional universities, complemented by quantum emulation on regional supercomputers such as Toubkal. A collective access agreement would also strengthen the region's bargaining position with vendors and export-control authorities.

Recommendation 4: Develop a MENA Post-Quantum Cryptography Roadmap

Regional governments should:

1. Inventory critical cryptographic systems.
2. Identify vulnerable infrastructure, prioritising data with long shelf lives.
3. Begin migration to post-quantum standards, with milestones aligned to the 2030 and 2035 horizons.
4. Coordinate standards between telecom and financial regulators.

The UAE programme offers a regional template, and the Tier-1 cyber agencies of Egypt, Morocco, Saudi Arabia, and Qatar provide the institutional base. A regional crypto-agility clause in public procurement would also create demand for regional security firms.

Recommendation 5: Establish Quantum Application Sandboxes

Instead of funding quantum research abstractly, governments should fund quantum solutions to named regional problems: desalination, energy grids, oil and gas, logistics, water management, pharmaceuticals, financial optimisation, and climate modelling. A public or state-owned enterprise should act as the first customer, the mechanism the Saudi pilot identifies as de-risking investment (AlBuhairan et al., 2026). Candidate anchors include utilities, national oil companies, port authorities, and fertiliser producers.

Recommendation 6: Create a Gulf–Levant–North Africa Quantum Value Chain

The objective is not a politically integrated quantum system but a distributed regional innovation ecosystem:

- Gulf: capital, infrastructure, and industrial demand;

- Israel, where political conditions permit: research, cybersecurity, and startups;
- North Africa: talent, software, research, and lower-cost R&D;
- Wider MENA: markets and applications.

Because political conditions differ across country pairs, the chain should be assembled from modular bilateral and minilateral projects (for instance, Gulf–North Africa algorithm and software centres) that can interconnect as conditions allow. Table 5 proposes a sequencing for the Framework as a whole.

Table 5

Sequencing the MENA Quantum Cooperation Framework

Phase	Priority actions	Lead actors (indicative)	Indicators of success
0–12 months	Launch the Forum and regional quantum observatory; begin national cryptographic inventories	ICT and digital ministries; national cybersecurity agencies	Observatory baseline published; inventories under way in all participating states
12–36 months	Open the fellowship programme; allocate regional cloud credits; run first sandboxes with anchor customers	Sovereign funds; universities; state-owned enterprises	Fellows placed in industry; cloud hours used by regional universities; pilots delivered
36 months–2030	Migrate high-risk systems to PQC; interconnect modular value-chain projects	Telecom and financial regulators; research consortia	High-risk systems quantum-safe by 2030; rising joint patents and co-publications

Note. Author's proposal; the 2030 milestone aligns with Moody et al. (2024) and NIS Cooperation Group (2025).

References

Advanced Technology Research Council. (2025, November 27). *UAE Cybersecurity Council advances national readiness for future quantum threats with ATRC's QuantumGate* [Press release]. https://www.atrc.gov.ae/news/uae-cybersecurity-council-advances-national-readiness-future-quantum-threats-atrcs-quantumgate

Advanced Technology Research Council. (2026, May 11). *UAE Cyber Security Council partners with ATRC to advance national post-quantum security transition* [Press release]. https://www.atrc.gov.ae/news/uae-cyber-security-council-partners-atrc-advance-national-post-quantum-security-transition

AlBuhairan, B., Sarkar, A., & Alowayyed, S. (2026, April 20). *5 lessons from piloting the Quantum Economy Blueprint in Saudi Arabia*. World Economic Forum. https://www.weforum.org/stories/2026/04/quantum-economy-blueprint-saudi-arabia/

Aramco. (2024, May 20). *Aramco signs agreement with Pasqal to deploy first quantum computer in the Kingdom of Saudi Arabia* [Press release]. https://www.aramco.com/en/news-media/news/2024/aramco-signs-agreement-with-pasqal-to-deploy-first-quantum-computer-in-the-kingdom-of-saudi-arabia

Aramco. (2025, November 24). *Aramco and Pasqal make history with Saudi Arabia's first quantum computer* [Press release]. https://www.aramco.com/en/news-media/news/2025/aramco-and-pasqal-make-history-with-saudi-arabias-first-quantum-computer

Aramco. (2026, May 18). *Aramco and Pasqal launch commercial Quantum Computing as a Service platform* [Press release].

https://www.aramco.com/en/news-media/news/2026/aramco-and-pasqal-launch-commercial-quantum-computing-as-a-service-platform

Bureau of Industry and Security. (2024a, September 5). *Department of Commerce implements controls on quantum computing and other advanced technologies alongside international partners* [Press release]. U.S. Department of Commerce. https://www.bis.gov/press-release/department-commerce-implements-controls-quantum-computing-other-advanced-technologies-alongside

Bureau of Industry and Security. (2024b, October 16). Updated License Exception Implemented Export Controls (IEC) eligible items and destinations (Document No. 2024-23814). *Federal Register*. https://www.federalregister.gov/documents/2024/10/16/2024-23814/updated-license-exception-implemented-export-controls-iec-eligible-items-and-destinations

Center of Quantum Science and Technology. (2023). *About CQST*. University of Isfahan. https://cqst.ir/about-cqst/

Centre for the Fourth Industrial Revolution Saudi Arabia. (2024). *Quantum economy landscape in Saudi Arabia*. https://www.c4irsaudiarabia.org/docs/Quantum%20Economy%20Landscape%20in%20Saudi%20Arabia%20%20(23).pdf

Centre for the Fourth Industrial Revolution Saudi Arabia. (2025). *Wrap up report: World Quantum Day 2025*. https://www.c4irsaudiarabia.org/docs/V5.0%20Wrap%20Up%20Report.pdf

Confédération Générale des Entreprises du Maroc. (2024, September 25). *Official launch of the national strategy "Morocco Digital 2030"*. https://cgem.ma/en/actualites/official-launch-of-the-national-strategy-morocco-digital-2030/

Dubai Electricity and Water Authority. (2018, July). *DEWA is first utility in the world to work with Microsoft to utilise quantum computing* [Press release]. https://www.dewa.gov.ae/en/about-us/media-publications/latest-news/2018/07/dewa-is-first-utility-in-the-world-to-work-with-microsoft-to-utilise-quantum-computing

Egypt University of Informatics. (2025). *Quantum technologies: Opportunities and challenges, "Egypt perspective"* [Workshop with the Ministry of Communications and Information Technology, 17–18 February 2025]. https://eui.edu.eg/events/quantum-workshop-25

International Centre for Theoretical Physics. (2026). *PWF Morocco: School and workshop on quantum computing and quantum information technology (4–13 February 2026)*. https://indico.ictp.it/event/11000

International Telecommunication Union. (2024). *Global Cybersecurity Index 2024* (5th ed.). https://www.itu.int/epublications/publication/global-cybersecurity-index-2024

Israel Innovation Authority. (2025, September 17). *Israel Innovation Authority 2025 high-tech report: Record year in exits and deep-tech growth; stagnation in output, employment, and VC fundraising* [Press release]. https://innovationisrael.org.il/en/press_release/innovation-report-2025/

Israel Innovation Authority. (2026a, May 31). *Israeli high-tech annual report demonstrates strength with increase in GDP, fundraising, exits, and exports, alongside the first decline in R&D employees and an expansion of activity abroad* [Press release]. https://innovationisrael.org.il/en/press_release/israeli-high-tech-report-2026/

Israel Innovation Authority. (2026b, July 20). *Access to quantum computing R&D infrastructure* [Call for proposals]. https://innovationisrael.org.il/en/calls_for_proposal/quantum-infrastructure/

Israel Ministry of Economy and Industry. (2021, April 13). *Quantum computing in Israel*. Foreign Trade Administration. https://itrade.gov.il/hongkong/2021/04/13/quantum-computing-in-israel/

Joint Institute for Nuclear Research. (2025, October 17). *JINR and Egypt combine efforts to advance quantum computing*. https://www.jinr.ru/posts/jinr-and-egypt-combine-efforts-to-advance-quantum-computing/

Kissami, I., Basmadjian, R., Chakir, O., & Abid, M. R. (2025). TOUBKAL: A high-performance supercomputer powering scientific research in Africa. *The Journal of Supercomputing, 81*(15). https://doi.org/10.1007/s11227-025-07858-8

Lütken, A. (2025, January 9). *Shaping the future of quantum computing in the United Arab Emirates (UAE)*. Technology Innovation Institute. https://www.tii.ae/insights/shaping-future-quantum-computing-united-arab-emirates-uae

Mohammed VI Polytechnic University. (n.d.). *Toubkal supercomputer*. Retrieved September 15, 2026, from https://toubkal.um6p.ma/

Moody, D., Perlner, R., Regenscheid, A., Robinson, A., & Cooper, D. (2024). *Transition to post-quantum cryptography standards* (NIST IR 8547 ipd). National Institute of Standards and Technology. https://nvlpubs.nist.gov/nistpubs/ir/2024/NIST.IR.8547.ipd.pdf

Moroccan Network of Quantum Information. (n.d.). *Moroccan Network of Quantum Information*. Retrieved September 15, 2026, from https://quanetwork.github.io/

Mosca, M., & Piani, M. (2026). *Quantum threat timeline report 2025*. Global Risk Institute. https://globalriskinstitute.org/publication/quantum-threat-timeline-report-2025b/

National Council for Artificial Intelligence, Quantum Computing, and Emerging Technologies. (2026). *Guide to Egypt's national AI governance framework*. Arab Republic of Egypt. https://ai.gov.eg/SynchedFiles/ar/Resources/Guide%20to%20Egypt%E2%80%99s%20National%20AI%20Governance%20Framework.pdf

National Institute of Standards and Technology. (2024). *Module-lattice-based key-encapsulation mechanism standard* (FIPS 203). U.S. Department of Commerce. https://doi.org/10.6028/NIST.FIPS.203

National Telecom Regulatory Authority. (2024, September 18). *Egypt classified in Tier 1 according to ITU Global Cybersecurity Index*. https://www.tra.gov.eg/en/egypt-classified-in-tier-1-according-to-itu-global-cybersecurity-index/

NIS Cooperation Group. (2025). *A coordinated implementation roadmap for the transition to post-quantum cryptography*. European Commission. https://securitydelta.nl/media/com_hsd/report/750/document/Roadmap-on-postquantum-cryptography-PzBJxNUYyeuEdVUacWL696DofZQ-117507.pdf

Open Quantum Institute. (2025). *Driving innovation at Quantum Africa 7*. CERN. https://open-quantum-institute.cern/driving-innovation-at-quantum-africa-7/

Organisation for Economic Co-operation and Development. (2025a). *A quantum technologies policy primer* (OECD Digital Economy Papers No. 371). OECD Publishing. https://doi.org/10.1787/fd1153c3-en

Organisation for Economic Co-operation and Development. (2025b). *An overview of national strategies and policies for quantum technologies* (OECD Digital Economy Papers No. 379). OECD Publishing. https://doi.org/10.1787/5e55e7ab-en

Pasqal. (2026, August 31). *Pasqal and KACST launch strategic quantum research collaboration as Pasqal expands presence in Saudi Arabia* [Press release]. https://www.pasqal.com/newsroom/pasqal-and-kacst-launch-strategic-quantum-research-collaboration-as-pasqal-expands-presence-in-saudi-arabia/

Quantinuum. (n.d.). *Hamad Bin Khalifa University and Quantinuum partner to advance quantum computing in Qatar* [Press release]. https://www.quantinuum.com/press-releases/hamad-bin-khalifa-university-and-quantinuum-partner-to-advance-quantum-computing-in-qatar

Quantinuum. (2025a, May 14). *Quantinuum and Al Rabban Capital launch joint venture to accelerate quantum computing adoption in Qatar and the region* [Press release]. https://www.quantinuum.com/press-releases/joint-venture-to-accelerate-quantum-computing-adoption-in-qatar

Quantinuum. (2025b). *Qubits in Qatar* [Corporate blog post]. https://www.quantinuum.com/blog/qubits-in-qatar

Quantum Machines. (2022). *Quantum Machines selected to build Israel's national quantum computing center* [Company announcement]. https://www.quantum-machines.co/blog/quantum-machines-selected-to-build-israels-national-quantum-computing-center/

Technology Innovation Institute. (n.d.). *Quantum Research Center*. Retrieved September 15, 2026, from https://www.tii.ae/quantum

United Nations Educational, Scientific and Cultural Organization. (2021). Iran. In *UNESCO science report: The race against time for smarter development*. https://www.unesco.org/reports/science/2021/en/iran

United Nations Educational, Scientific and Cultural Organization. (2026, March 10). *UNESCO advances equitable access to quantum science for African women scientists*. https://www.unesco.org/en/articles/unesco-advances-equitable-access-quantum-science-african-women-scientists

World Intellectual Property Organization. (2025a). *Global Innovation Index 2025: Executive version*. https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2025-exec-en-global-innovation-index-2025.pdf

World Intellectual Property Organization. (2025b). *GII 2025 at a glance*. https://www.wipo.int/web-publications/global-innovation-index-2025/en/gii-2025-at-a-glance.html

World Intellectual Property Organization. (2025c). *Global Innovation Index 2025: Economy profiles* [Data set; profiles for Algeria, Egypt, Iran, Israel, Morocco, Qatar, Saudi Arabia, Tunisia and the United Arab Emirates]. https://www.wipo.int/web-publications/global-innovation-index-2025/en/gii-2025-economy-briefs-and-profiles.html