Gujarat Quantum Technology Strategy and Opportunity Report

A decision framework for research, industry, public infrastructure and national collaboration

Primary-source-verified planning package with clearly identified field-verification gaps

Evidence base current through 1 October 2026

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Executive conclusion

Gujarat can create national value without attempting to reproduce every quantum capability. The strongest strategy is a distributed mission that uses national hubs for specialised infrastructure, concentrates local investment on verified demand, and builds strength where Gujarat already has credible institutions and industrial users.

The recommended first portfolio combines post-quantum security, quantum sensing validation, logistics optimisation, space and communication research, semiconductor and photonic components, and a statewide talent network. Large capital facilities should follow demonstrated demand, written access analysis and independently reviewed technical results.

Decisions requested

- Establish a small mission office with a governing board, independent technical review and an evidence register.
- Authorize a 90-day capability and demand audit involving Gujarat institutions, user departments and all four National Quantum Mission hubs.
- Prepare three to five pilots with named owners, strong classical baselines, acceptance tests and stop conditions.
- Approve capital expenditure only after external access, utilisation, staffing and lifecycle-cost evidence support the case.

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1 Strategic context and evidence boundary

The Union Cabinet approved the National Quantum Mission in April 2023 with an outlay of ₹6,003.65 crore for 2023-24 to 2030-31. The mission covers quantum computing, communication, sensing and metrology, and materials and devices. Four Section 8 thematic hub companies coordinate national networks.

This report distinguishes approved policy, sanctioned projects, tenders, installed assets, operational facilities, technical demonstrations and scaled deployment. Public evidence supports the planning position described here. It does not independently validate every facility, access condition, staffing level, industrial commitment or non-public government decision.

Evidence class	What it supports	What still requires verification
Official policy or order	Authority, scope and stated intent.	Implementation order, release, contract and operating outcomes.
Mission or hub publication	Programme structure, named institutions and public entry routes.	Current window, tariff, queue, security, IP and service availability.
Institutional publication	Reported research, courses, facilities or demonstrations.	Equipment inventory, uptime, staffing, external access and reproducibility.
Industry problem statement	Demand hypothesis and operating context.	Named owner, baseline, data, budget, acceptance and procurement route.

2 Quantum opportunity map

Domain	What Gujarat can do	Near-term output	Capital posture
Quantum computing and hybrid quantum AI	Use national or cloud systems for algorithms, optimisation, simulation and benchmarking. Build reproducible hybrid workflows around Gujarat problems.	Problem libraries, benchmark suites, trained teams and hub-linked projects.	Access first. No local advanced computer until sustained demand and economics are proven.
Post-quantum cryptography	Inventory cryptographic dependencies, classify long-lived data, test standards-based migration and create procurement clauses.	GIFT and government crypto-agility cohorts with controlled migration tests.	Software, testing and assurance first. Avoid vendor lock-in.
Quantum communication	Study fibre and free-space links, QKD integration, trusted nodes, key management and network assurance.	Pre-feasibility studies and interoperability tests with the communication hub.	No network procurement before threat model, architecture and lifecycle cost are complete.
Quantum sensing and metrology	Test candidate sensors against calibrated classical instruments in geoscience, navigation, infrastructure and industrial settings.	Pre-registered field challenges with independent measurement review.	Use hub and partner instruments before creating a local laboratory.
Materials devices and photonics	Connect semiconductor, photonics, packaging and electronics teams to national fabrication and characterisation routes.	Component projects, process access and qualification plans.	Selective local capability only where repeated demand and national access gaps exist.
Talent and public capability	Create faculty cohorts, shared curriculum, cloud laboratories, internships, technician pathways and public demonstrators.	Statewide consortium with measurable course and project completion.	Prioritise instructors, usage and experiments over equipment displays.

3 National mission and access routes

National hub	Lead	Useful Gujarat route	First negotiation
Quantum computing	FQCI at IISc Bengaluru	Algorithms, computing access, translation programmes, startups and training.	Named problem, eligible programme, access model, cost, IP and first work package.
Quantum communication	Samgnya at IIT Madras and C-DOT	QKD, networks, components, startup support and talent. ISRO Ahmedabad participates in the network.	Security architecture, test environment, standards and permissible Gujarat participation.
Quantum sensing and metrology	Qmet Tech at IIT Bombay	Sensors, metrology, field validation and startup support. IIT Gandhinagar participates.	IITGN work package, calibration route, facility access and industry problem intake.
Quantum materials and devices	QMD Foundation at IIT Delhi	Materials, devices, fabrication, testing, startups and fellowships.	Process capability, commissioning, sample ownership, tariffs and component roadmap.

No public process was located for a state government to join a formed hub as a general consortium member. Gujarat should use project calls, service agreements, fellowships, startup programmes, user problems and negotiated collaboration agreements.

4 Indian state and union territory landscape

The comparison covers all 28 states and 8 union territories. The primary classification below is mutually exclusive: five jurisdictions have a named state-led initiative or instrument, four use broader enabling policy, thirteen have an NQM

institutional footprint without a separately located state initiative, and fourteen require direct state-level verification. Across categories, institutions in 22 jurisdictions appear in the official NQM annexure.

Classification	Jurisdictions	Interpretation
State-led initiative or instrument	Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and Telangana.	A named state-backed initiative, policy commitment, park, cluster or collaboration instrument was located. Delivery stages differ.
Broader enabling policy	Gujarat, Kerala, Rajasthan and Uttar Pradesh.	Quantum appears within a wider STI, IT, investment or Centre of Excellence framework. This does not establish a dedicated mission.
NQM institutional footprint	Assam, Bihar, Chhattisgarh, Delhi, Goa, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Odisha, Punjab, Uttarakhand and West Bengal.	At least one institution appears in the official NQM annexure, but no separate state initiative was located in this review.
Direct verification required	Andaman and Nicobar Islands, Arunachal Pradesh, Chandigarh, Dadra and Nagar Haveli and Daman and Diu, Haryana, Ladakh, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland, Puducherry, Sikkim and Tripura.	No institution was named for the jurisdiction, or treatment was ambiguous. This is a verification gap, not proof of no activity.

State led and enabling initiatives

State	Verified position	Planning caution
Andhra Pradesh	Amaravati Quantum Valley and Quantum Computing Centre. A January 2026 government order sanctions ₹137 crore for design-build; ten state institutions also appear in the NQM annexure.	Sanction and construction-stage evidence do not establish an operational quantum computer or open-access model.
Karnataka	IISc Quantum Research Park has Karnataka support and covers infrastructure, skills, startups and industry collaboration. Karnataka hosts the NQM computing hub.	Confirm the state contribution, present service inventory, facility tariffs, eligibility and access terms.
Maharashtra	A November 2025 Government Resolution records an MoU and planning activity for advanced quantum infrastructure. Maharashtra also hosts the NQM sensing and metrology hub at IIT Bombay.	Collaboration and roadmap activity must not be described as commissioned operational infrastructure.
Tamil Nadu	The Deep Tech Startup Policy states that government will launch the Tamil Nadu Quantum Computing Initiative. IIT Madras hosts the NQM communication hub.	Verify the implementing order, budget, accountable entity, calls and delivery milestones.
Telangana	Photonics Valley Corporation records quantum skilling, startup mobilisation and four proof-of-concept detailed project reports. Five institutions appear in the NQM annexure.	Training and project reports do not prove deployment; implementation and operating results require confirmation.
Gujarat	STI Policy 2026 includes quantum. GSV, SAC ISRO, IIT Gandhinagar and Ahmedabad University appear in the NQM annexure.	No separately approved state quantum mission or quantum-specific allocation was located.
Kerala	IT Policy 2026 includes quantum computing and proposes centres of excellence, incubation and shared infrastructure. Four institutions appear in the NQM annexure.	Treat as an enabling policy until implementing sanctions, facilities, budgets and outcomes are verified.
Rajasthan	Government vision and investment material identify quantum applications in secure communication, disaster management, skilling and advanced computing. IIT Jodhpur and BITS Pilani appear in the annexure.	No dedicated state quantum mission was located.
Uttar Pradesh	The Startup Mission Centre of Excellence framework includes quantum computing. Five institutions appear in the NQM annexure.	An enabling programme does not establish a dedicated mission, ring-fenced portfolio or operating facility.

Complete jurisdiction register

State or union territory	Planning status	Verified position or gap
Andaman and Nicobar Islands	Verify	No named institution in the official NQM annexure; verify teaching, skilling and government demand directly.
Andhra Pradesh	State-led	State initiative and sanctioned computing-centre project; ten institutions appear in the annexure.
Arunachal Pradesh	Verify	No named institution in the annexure; absence from the list does not prove no activity.
Assam	NQM footprint	C-DAC Guwahati and IIT Guwahati are named.
Bihar	NQM footprint	IIIT Bhagalpur and IIT Patna are named.
Chandigarh	Verify	Punjab Engineering College is physically in Chandigarh but grouped with Punjab; verify the UT government role.
Chhattisgarh	NQM footprint	IIT Bhilai is named.
Dadra and Nagar Haveli and Daman and Diu	Verify	No named institution; verify local demand and capability directly.
Delhi	NQM footprint	C-DOT, IIT Delhi, DTU, IIIT Delhi, Ramjas College and DRDO Solid State Physics Laboratory are named. IIT Delhi hosts the materials and devices hub.
Goa	NQM footprint	IIT Goa and BITS Pilani Goa Campus are named.
Gujarat	Enabling policy	Broader STI policy includes quantum; four Gujarat institutions appear in the annexure.
Haryana	Verify	No named institution; verify universities, industry demand and state policy directly.
Himachal Pradesh	NQM footprint	IIT Mandi is named.
Jammu and Kashmir	NQM footprint	IIT Jammu is named.
Jharkhand	NQM footprint	IIT ISM Dhanbad is named.
Karnataka	State-led	Quantum Research Park and NQM computing hub, with several named institutions.
Kerala	Enabling policy	IT Policy 2026 includes quantum; four institutions appear in the annexure.
Ladakh	Verify	No named institution; verify sensing, communications and high-altitude use cases.
Lakshadweep	Verify	No named institution; verify communications, navigation and sensing demand.
Madhya Pradesh	NQM footprint	IIT Indore, IISER Bhopal and Shri G.S. Institute of Technology and Science are named.
Maharashtra	State-led	Government resolution records collaboration and planning; state hosts the sensing and metrology hub and several named institutions.
Manipur	Verify	No named institution; field verification required.
Meghalaya	Verify	No named institution; field verification required.
Mizoram	Verify	No named institution; field verification required.
Nagaland	Verify	No named institution; field verification required.
Odisha	NQM footprint	IIT Bhubaneswar, NISER Bhubaneswar and NIT Rourkela are named.

State or union territory	Planning status	Verified position or gap
Puducherry	Verify	No named institution; verify local teaching and research activity.
Punjab	NQM footprint	Plaksha University, IISER Mohali, Guru Nanak Dev University and IIT Ropar are named. The annexure groups PEC Chandigarh with Punjab.
Rajasthan	Enabling policy	Government framework includes quantum applications and investment support; IIT Jodhpur and BITS Pilani are named.
Sikkim	Verify	No named institution; field verification required.
Tamil Nadu	State-led	Policy commitment to TN-QCI; IIT Madras hosts the communication hub and other institutions are named.
Telangana	State-led	Photonics Valley quantum activity and five institutions in the annexure; implementation tracking remains necessary.
Tripura	Verify	No named institution; field verification required.
Uttar Pradesh	Enabling policy	Startup Mission CoE framework includes quantum; five institutions appear in the annexure.
Uttarakhand	NQM footprint	IIT Roorkee is named across multiple NQM technical verticals.
West Bengal	NQM footprint	Ten institutions are named, including IIT Kharagpur, University of Calcutta, IACS, TCG CREST, S.N. Bose Centre, IISER Kolkata, ISI and SINP.

Official state comparison sources

Andhra Pradesh AQCC order: Official source
Karnataka Quantum Research Park: Official source
Maharashtra quantum collaboration resolution: Official source
Tamil Nadu Deep Tech Startup Policy: Official source
Telangana Photonics Valley quantum ecosystem: Official source
Kerala IT Policy 2026: Official source
Rajasthan vision document: Official source
Uttar Pradesh Startup Mission CoE framework: Official source
Official NQM institution annexure: Official source

5 Gujarat capability position

Gujarat node	Potential role	Evidence position	Required audit
PRL Ahmedabad	Quantum science, optics, photon sources, QRNG, QKD and sensing research.	Operational research reported.	People, equipment, calibration, uptime, projects and external access.
SAC ISRO Ahmedabad	Quantum communication, space systems and national communication-hub participation.	Demonstrations and network participation reported.	Current readiness, security constraints, node work package and state-use route.
IIT Gandhinagar	Research, teaching and national sensing-hub participation.	Operational academic capability.	Faculty, equipment, funded work, student pipeline and access.
Gati Shakti Vishwavidyalaya	Rail and multimodal logistics applications.	NQM-linked project reported.	Problem set, data, users, baselines, results and milestones.

Gujarat node	Potential role	Evidence position	Required audit
Ahmedabad University and DAU	Algorithms, computing, electronics and interdisciplinary talent.	Research and teaching signals.	Faculty, reproducible work, cloud access, courses and industry demand.
ISR Gandhinagar	Geoscience infrastructure and field-validation environment.	Operational classical sensing.	Measurement problems, sites, baselines and suitability for quantum sensor trials.
GIL GUJCOST Science City	Procurement, programme delivery, education and outreach.	Operational state institutions.	Mandate, staffing, tender status, acceptance records and mission role.
GIFT City and IFSCA ecosystem	Regulated financial and digital infrastructure demand.	Potential user and test environment.	Participating institutions, asset inventory, data classification and approvals.

6 Sector opportunity portfolio

Sector	Priority opportunity	Decision evidence	Likely horizon
Government digital systems	Crypto inventory, post-quantum migration profiles and vendor clauses.	System owners, dependency map, rollback, audit and procurement plan.	0 to 18 months
GIFT financial ecosystem	Institution cohort for crypto-agility, long-lived data and controlled migration tests.	Regulatory engagement, participating firms, threat model and test scope.	0 to 18 months
Ports rail and logistics	Benchmark hybrid optimisation for scheduling, routing, yard and network problems.	Representative data, strongest classical solvers, user metrics and reproducibility.	6 to 24 months
Power water and industry	Optimisation and sensing problems for networks, assets and process monitoring.	Asset owner, field site, calibrated baseline and operational acceptance.	12 to 36 months
Space and communications	Free-space communication, timing, navigation, photonic subsystems and secure-network research.	Mission partner, security approval, test architecture and readiness evidence.	12 to 48 months
Semiconductors and electronics	Materials, photonics, devices, packaging, test and control electronics.	Hub work package, process access, supplier demand and qualification route.	18 to 60 months
Pharma chemicals and life sciences	Molecular simulation and optimisation research with classical benchmarking.	Scientifically meaningful target, data rights, classical comparator and user value.	24 to 60 months
Agriculture environment and geoscience	Field sensing, imaging and resource-monitoring research.	Measurement need, site, reference instrument and environmental performance.	18 to 48 months

7 Mission architecture

Body	Role	Composition principle
Mission Governing Board	Approves strategy, risk appetite, portfolio budget and annual results.	Government, science, industry, user agencies and independent members.
Mission Office	Maintains evidence, coordinates hubs, manages calls, contracts and reporting.	Small professional programme team with legal, procurement and technical support.

Body	Role	Composition principle
Independent Technical Council	Reviews scientific merit, baselines, claims, security and stop or scale decisions.	Experts who disclose delivery, vendor and investment conflicts.
Four Domain Networks	Connect Gujarat teams to the four NQM technical domains.	Institutions, companies and users organised around funded work packages.
User Council	Defines operating problems, data access, acceptance and post-pilot route.	GIFT, government, utilities, ports, transport, water, health and industry owners.
Assurance Function	Owns standards, cybersecurity, metrology, IP and claims review.	Independent testing and accredited routes where certification is required.

8 Research and infrastructure strategy

Gujarat should treat infrastructure as a service decision rather than a prestige asset. The default sequence is national access, measured utilisation, capacity-gap evidence and then selective local investment.

Gate	Evidence required before local capital	Stop condition
Scientific need	Defined experiments or services that cannot be met through existing access.	Problem remains generic or duplicates available capacity.
User demand	Named users, projected hours, sample volume or service demand.	No recurring users or budget owners.
Access comparison	Written national or commercial access terms, queue, security and full cost.	External access meets the requirement at lower lifecycle cost.
Operations	Qualified staff, maintenance, calibration, consumables, uptime and safety plan.	No accountable operator or five-year operating budget.
Procurement	Specifications tied to acceptance tests and vendor-neutral outcomes.	Specification follows a preferred product without validated need.
Exit and renewal	Asset disposition, upgrade route and review date.	No credible plan for obsolescence or low utilisation.

9 Talent startups and industry

- Create a Gujarat faculty consortium with common modules, instructor development, cloud access and shared experiments.
- Use fellowships and internships tied to hub work packages and Gujarat user problems.
- Route eligible startups to the four hub programmes, while providing proposal support, customer discovery and independent testing locally.
- Fund milestones rather than labels: technical result, reproducibility, customer evidence, security review and procurement or market route.
- Develop technician and systems-engineering pathways for photonics, cryogenics, electronics, calibration, networking and cybersecurity.

Programme	Year-one measure
Faculty cohort	Participating faculty, completed modules, experiments run and shared teaching assets.

Programme	Year-one measure
Student pathway	Learners completing laboratories, projects, internships and research placements.
Startup pathway	Applications screened, hub referrals, funded milestones, independent tests and customers.
Industry challenges	Owner-backed statements, admitted tests, rejected proposals and procurement decisions.
Public literacy	Educators trained, demonstrators used and understanding measured before and after activity.

10 Initial pilot portfolio

Pilot	Owner group	Minimum test	Scale gate
GIFT post-quantum cohort	IFSCA ecosystem and participating financial institutions.	Inventory selected systems, classify long-lived data and test standards-based migration.	Repeatable implementation, acceptable performance, audit evidence and funded migration plan.
State crypto-agility	GIL and selected system owners.	Map dependencies and test migration in a controlled non-production environment.	Security approval, rollback, vendor clauses and departmental ownership.
ISR sensing challenge	ISR and relevant national hub team.	Blinded comparison with calibrated classical instruments at a defined field site.	Repeatability, environmental robustness, reliability and lifecycle-cost case.
GSV logistics benchmark	GSV and rail or logistics user.	Representative problem set against exact and leading heuristic baselines.	Meaningful reproducible improvement on user metrics and feasible integration.
Hub-linked component projects	Semiconductor, photonics and electronics partners.	Defined device, material or subsystem work package using national facilities.	Qualification result, demand signal, IP route and manufacturing case.
Teaching laboratory network	University consortium and GUJCOST.	Instructor cohort, cloud experiments and shared practical modules.	Sustained usage, completed projects and qualified instructors.

11 Funding procurement and partnerships

The state should separate mission-office cost, competitive programme funding, service access, pilots, talent and capital. Every figure should retain its status: proposed, approved, sanctioned, released, contracted and spent.

Instrument	Purpose	Control
Planning and audit grant	Capability verification, problem discovery and access negotiation.	Short duration, published outputs and evidence-room completion.
Challenge call	Compete for user-defined problems with measurable outcomes.	Stage payments linked to baseline, test and independent review.
Hub access support	Purchase facility time, expert support and training.	Written tariff, queue, deliverable, IP and security terms.
Talent consortium	Support faculty, courses, fellowships and internships.	Completion, usage, projects and placements rather than enrolment alone.
Startup milestone support	Technical validation, customer testing and regulatory preparation.	Conflict disclosure, milestone evidence and clear equity or grant terms.

Instrument	Purpose	Control
Capital programme	Create facilities only after demand and access cases are proven.	Lifecycle budget, utilisation target, operator, maintenance and exit plan.

12 Risk assurance and responsible claims

Risk	Required control
Technology overclaim	Pre-register tests, use strong classical comparators, publish negative results and require independent review.
Security failure	Threat modelling, approved cryptography profiles, key management review, rollback and incident responsibility.
Vendor capture	Vendor-neutral requirements, conflict disclosure, interoperability testing and transparent evaluation.
Fragmented spending	One portfolio register, common gates and annual reallocation based on evidence.
Unused infrastructure	Demand forecasts, booking commitments, operating staff, maintenance and utilisation review.
IP and data disputes	Written background and foreground IP, licensing, publication, confidentiality and data-residency terms.
Talent without application	Tie training to experiments, hub projects, internships and user problems.
Misleading public communication	Use controlled status vocabulary and distinguish demonstrations from operational deployment.

13 Implementation roadmap

Period	Work programme	Decision output
Days 0 to 30	Create mandate, sponsor, mission office and evidence room. Issue institution and user questionnaires.	Authority map, controlled claims register and engagement calendar.
Days 31 to 60	Inspect facilities, hold user workshops and meet DST plus all four hubs.	Verified asset register, problem portfolio and four access matrices.
Days 61 to 90	Score pilots, negotiate terms and complete independent technical, security and financial review.	Costed first-year plan and three to five authorised pilots.
Months 4 to 12	Run initial pilots, faculty cohort, startup referrals and assurance work.	Independent results, access utilisation and portfolio reallocation.
Year 2	Scale successful work, create recurring programmes and selective shared services.	Procurement decisions and evidence for or against local facilities.
Years 3 to 5	Build only justified infrastructure and expand proven specialisations.	Audited deployment, utilisation, outcomes and renewal decisions.

14 Measures and decision gates

Area	Measures
Authority and finance	Approvals, sanctions, releases, contracts and expenditure reported separately.
Capability	Active researchers, inspected assets, uptime, calibration, booked hours and external users.
Demand	Owner-backed problems, accepted and rejected tests, data approvals and post-pilot route.
Access	Applications, agreements, facility hours, queue, total service cost and work completed.
Pilots	Baseline quality, milestones, reproducibility, reliability, security and user acceptance.
Talent	Qualified instructors, completed experiments, projects, internships and placements.
Startups and industry	Hub referrals, funded milestones, independent tests, customers and procurement outcomes.
Capital	Utilisation, uptime, trained operators, maintenance coverage and recurring service demand.

15 Source directory

National Quantum Mission overview: Official source
Cabinet approval and mission outlay: Official source
NQM hubs and technical groups: Official source
Official NQM 86-institution annexure: Official source
NITI Aayog quantum economy roadmap: Official source
Gujarat STI Policy 2026: Official source
FQCI computing hub: Official source
Samgnya communication hub: Official source
Qmet sensing hub: Official source
QMD materials and devices hub: Official source
IAIRO planning portal: Official source

Use of this report

This report supports strategy, consultation and programme design. Final commitments require authorised government decisions, signed institutional responses, facility inspection, written access terms, user commitments and detailed financial approval.