









Open Quantum Institute (OQI)

Progress Report (3rd Edition)

October • 2025



Introduction

Quantum computing continues to evolve at an unprecedented pace, promising to reshape science, industry and society. Doing this with the benefit of humanity in mind is paramount, and so the Open Quantum Institute (OQI), together with its global community, has been advancing its mission to ensure that quantum computing is developed inclusively and equitably. Since the launch of the International Year of Quantum Science and Technology (IYQ) earlier this year, OQI, hosted by CERN, born at GESDA and supported by UBS, has amplified global efforts towards collaboration, innovation and impact.



OQI pilot phase

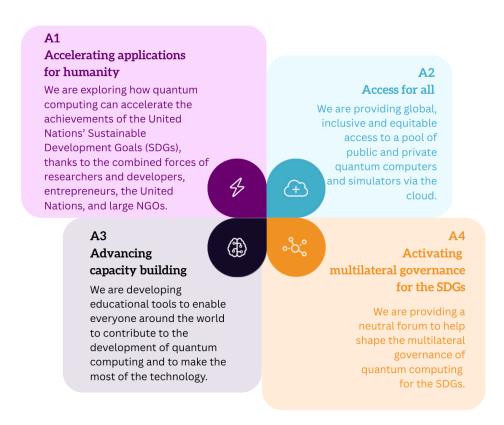
OQI is a multilateral governance initiative that promotes global and inclusive access to quantum computing and the development of applications for the benefit of humanity. As a novel science diplomacy instrument, it offers a neutral platform for international collaboration between research, diplomacy, private sector and philanthropy stakeholders.

Since its official launch in March 2024, OQI has been hosted at CERN for its pilot phase 2024-2026, where it continues to nurture a growing global community.

Within our internal community, progress continues with incubation partners in formalising OQI partnership agreements, several of them being industry leaders. So far, a total of seven partnerships have been signed, most recently with the International Centre for Theoretical Physics (ICTP) and the Fondazione Compagnia di San Paolo. In addition, the OQI community now includes 40 official members, with 12 memberships signed since the last progress report in March 2025.

More broadly, over the last 16 months, OQI welcomed over 27,000 visitors to its website from 145 countries. OQI's LinkedIn now has over 6,000 followers and in recent months OQI has onboarded over 700 individuals to its online community platform.

The support from the global OQI community continues to build momentum and drive the advancement of **OQI's mission**, which is structured by **four objectives**, known as the **four As**:





OQI in the

International Year of Quantum

The International Year of Quantum Science and Technology (IYQ) was officially launched on 4-5 February, marking a pivotal moment for the global quantum community.

The work of OQI, as a participating partner of the IYQ and beyond, aligns strongly with the IYQ's mission – through driving global access to quantum computing resources, fostering international collaboration and working towards bridging the quantum divide.

Following the official launch of the IYQ in Paris, OQI joined forces with UNESCO to celebrate the launch of the year in Geneva. During the event, OQI and UNESCO called upon stakeholders – from member states, scientific institutions, academia, civil society, and many others – to actively collaborate in realising the potential of quantum science and technology to address global challenges, while upholding ethical and human rights principles. This call to action encourages everyone to engage in the IYQ and to advance the development of quantum technology for the benefit of all.



Diplomatic panel discussion during the IYQ launch in Geneva (credit: Marc Bader)





To identify use cases with the potential for positive impact on society, OQI established a pipeline to support them through the different phases of development, and to advance them as far as possible with the current technology readiness. To date, 19 use cases have been supported, exploring the impact of quantum computing on SDG 2, 3, 6, 7, 12 and 13. Currently 10 are active along the pipeline and a few have reached the simulator phase.

OQI provides technical and project management support and connects teams with relevant experts around the world to foster interdisciplinary collaboration and access to the tools needed to build impactful use cases.

Each phase goes through a **review process** to select the most promising use cases to advance from ideation to proof of concept (PoC).



A1 Key achievements

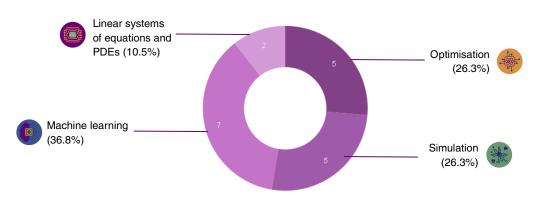
- Eight full proposals for use cases in phase two underwent external evaluation by scientific and impact panels composed of 42 experts spanning diverse academic and industrial backgrounds.
 - Use cases were evaluated on their real-world impact, alongside scientific and quantum computing relevance and quality.
 - Expert panels provided feedback, helping use case teams to continue strengthening their work and contributed to refining OQI's methodology during the pilot phase.
 - Four use cases were selected to advance to phase three and be implemented on a quantum computing simulator, addressing SDG 2, 3 and 6.



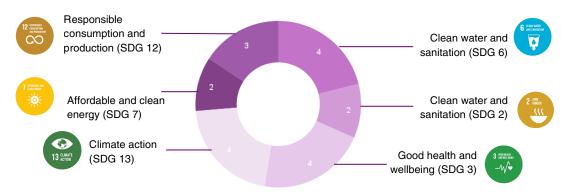
- Four new use cases have now progressed to phase two and are working on a proof of concept.
- OQI is fostering collaboration through knowledge sharing workshops for use case team members, inviting experts from the community to facilitate use case teams supported by OQI to engage with experts, exchange insights and share best practices.
- UN organisations, such as UN Habitat, UNFCCC, WHO, WFP, UNDRR, FAO, IARC and WMO have validated use cases currently in development.
- Revision and update of the OQI Quantum Application Framework, following feedback from evaluation panels.
- OQI's A1 team participated in 12 conferences and workshops, including QIP, ISC, AI for Good Summit, IEEE and Q2B.

OQI use cases leverage the **four most relevant approaches** for quantum computing applications towards the SDGs, which the scientific community has identified as having promising prospects for quantum advantage.

Quantum approaches to SDG applications



SDG relevance of quantum computing applications





OQI use case repository 2025

Reflecting OQI's commitment to **open science** means sharing all lessons learned. This includes describing each and every use case supported by OQI, irrespective of whether they have progressed past evaluation phases. For this purpose, the OQI website features a **use case repository**, showcasing all **19 use cases** that have advanced through the pipeline, including those that have been concluded as well as those that are still advancing.

Having identified use cases which are representative of **real-world SDG problems**, in this open manner, OQI aims to demonstrate where quantum computing could solve a problem on current quantum hardware devices today, within the Noisy Intermediate-Scale Quantum (NISQ) era, or within future Fault-Tolerant Quantum Computing (FTQC) hardware.





Last-Mile Food Delivery

Quantum computing optimisation of the food supply chain, in particular in the route planning of food delivery in underserved regions impacted by climate change or other crises.

COQIT, HASSAN II UNIVERSITY OF CASABLANCA, INDIAN INSTITUTE OF TECHNOLOGY, QUANTUM AI FOUNDATION, TECHNICAL UNIVERSITY OF DELFT, UNIVERSITY OF MUMBAI, WORLD FOOD PROGRAM (WFP), YALE UNIVERSITY







Plant Genomics

Quantum computing solution to improve wheat, corn and soy yield by targeted gene editing.

FOOD AND AGRICULTURE ORGANISATION (FAO), INARI, QUERA, VENTURUS







Sustainable Food Production

Improving sustainability of global food systems by making them more resilient to climate change through a quantum optimisation solution to produce more nutritious food locally in less land.

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL), GLOBALE ALLIANCE FOR IMPROVED NUTRITION (GAIN), NATIONAL INSTITUTE FOR THEORETICAL AND COMPUTATIONAL SCIENCE (NITHECS), QUANTUM BASEL







Accelerating Novel Antimicrobial Discovery

Quantum machine learning solution to accelerate the antimicrobial discovery and lower resistance to drugs.

GLOBAL ANTIBIOTIC RESEARCH AND DEVELOPMENT PARTNERSHIP (GARDP), MCMASTER, QBRAID, UNIVERSITÀ DEGLI STUDI DI CAGLIARI







MACHINE LEARNING



Predicting Gastrointestinal Cancer

Quantum machine learning solution to improve accuracy of gastrointestinal cancer diagnosis and speed up medical treatment and prevention.

UNIVERSITY OF COIMBRA, CENTRE FOR SOCIAL STUDIES, INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)







QUANTUM SIMULATION



Women's Healthcare

Quantum simulation of the molecular interaction of the biological targets and drugs involved in the treatment of endometriosis, perimenopause and menopause.

UNIVERSAL QUANTUM





QUANTUM SIMULATION



Drug Metabolism Design

Quantum simulation of electronic structures to understand metabolic processes of enzymes to reduce adverse drug reactions.

ALGORITHMIQ





QUANTUM SIMULATION



Eliminating 'Forever Chemicals' from Water Sources

Quantum simulation of the decomposition of "forever chemicals" (Poly-fluoroalkyl substances (PFAS)) for more efficient removal in water, limiting physiological and environmental harm.

SANDBOX AQ, QUANTUM SOUTH, UNHABITAT





MACHINE LEARNING



Molecular Docking to Clean Up Pollution

Quantum simulation and quantum machine learning solution to accurately model the chemical process of molecular docking involved in removing organic pollutants in water.

QUANDELA, QUNASYS, WORLD HEALTH ORGANIZATION (WHO)





OPTIMISATION



Water Leak Detection

Quantum optimisation solution to optimally position sensors and detect water leaks in urban water systems.

REPLY, QCLAVIS.IO, PASQAL, UNHABITAT









Water Resource Management

Quantum fluid dynamics solution to model aquifer systems, prevent and monitor contaminant breakthrough and assess impact of climate change on water reservoirs.

AMERICAN UNIVERSITY OF BEIRUT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY







Smart Grid Management

Quantum optimisation solution to improve the management of large energy grids and efficiently distribute energy

WOLFRAM, CLASSIQ, INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)







Illegal Mining

Quantum machine learning solution for monitoring illegal mining through satellite imagery and promoting environmental conservation, particularly in Ghana.

UNIVERSITY OF ENERGY AND NATURAL RESOURCES, UNIVERSITY OF EDUCATION, WINNEBA (GHANA)







Layout of Turbines in a Wind Farm

Quantum optimisation solution to efficiently layout of turbines in a wind farm and maximise the power produced.

UNIVERSITY OF PLYMOUTH, G. NARAYANAMMA INSTITUTE OF TECHNOLOGY AND SCIENCES, INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)







Coated Fertiliser Design

Quantum simulation to optimise the nutrient release from coated fertilisers for sustainable agriculture.

UNIVERSITÉ DU LITTORAL CÔTE D'OPALE (ULCO), MOHAMMED VI POLYTECHNIC UNIVERSITY (UM6P), UNIVERSITY OF NOTTINGHAM







Carbon Capture

Quantum machine learning solution to improve efficiency of catalysts involved in the chemical process of carbon capture.

QCENTROID, ETH ZURICH









Carbon Reduction

Quantum computing simulation to reduce carbon dioxide (CO2) in the atmosphere by improving catalysis process responsible for the fixation of carbon on the surface of materials.

ETH ZURICH, EPFL, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)







Flood risk assessment

Quantum machine learning solution to provide better accuracy in floor prediction and improve prevention mechanisms in regions at risk, particularly Malaysia.

UNIVERSITI TEKNOLOGI PETRONAS, MALAYSIA QUANTUM INFORMATION INITIATIVE, QUATI









Weather and Climate Forecasting

Quantum fluid dynamics solution to improve the reliability of weather and climate forecasts.

EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS (ECMWF), PLANQC, UNIVERSITY OF OXFORD, WORLD METEOROLOGICAL ORGANISATION (WMO)





Global participation in OQI use case development





A1 what's next

- OQI's impact design tool has been developed in collaboration with the OQI Impact Committee and included in the OQI Quantum Application Framework to anticipate the real-world benefits of the use cases. The tool also maps the conditions needed for long-term impact and ensures the engagement of relevant stakeholders, accounts for the risks and unintended consequences and maps the interlinking between relevant SDGs.
- In collaboration with the OQI Scientific Committee and the broader scientific community, we will publish a compendium on the regime of quantum advantage framework, outlining promising problems where quantum advantage could be achieved and defining the conditions that are needed for meaningful applications of quantum algorithms. This tool aims to not only benefit the OQI community but also the wider quantum community in the collective pursuit of quantum advantage.
- **Two use cases** are on track to **run on quantum hardware** by the end of 2025.
- Four full use case proposals to be evaluated by the scientific and impact expert panels in February 2026 to select those to advance to the next phase (with implementation on quantum simulators).
- Conversion of use case guidelines into educational modules, planned for December 2025.
- Continuation of ongoing monthly online knowledge sharing sessions between use case teams and invited experts from the OQI community.
- Ongoing support from the OQI team through project management, technical and financial support – to use case teams around the world.





Francesca Schiavello speaking at IEEE 2025 (left) and leading in a panel discussion at Q2B Paris Quantum Technologies Conference (right).





OQI continues to foster partnerships with quantum providers to provide open and inclusive access to a pool of quantum computers and simulators via the cloud.

A2 Key achievements

- Use case engagement is helping to build the pool of quantum devices. Beyond incubation partners Pasqal and qBraid, QuEra has become a member with additional industry providers including Quandela, Universal Quantum, Planqc, Quantum Basel and Algorithmiq actively engaging in use case development, with expertise in quantum hardware and software.
- Pooling is much more than just hardware. In addition to access to tools, libraries, educational material and documentation, several software providers are also actively engaging in use case development.
- Within the A3 educational activities, quantum simulators are also needed to run hackathon pre-training exercises, through which OQI is partnering with qBraid and QWorld.

A2 What's next?

- As use cases in our A1 pipeline advance into further development phases, testing on quantum simulators is needed. With this in mind, OQI is continuing to explore the expansion of its pool of capabilities with HPC providers.
- OQI is in ongoing conversations with quantum industry providers to perform matchmaking of use cases that best fit the different quantum computing devices, as well as providing expertise through the development of the use cases.





OQI is currently undertaking its capacity building and education activities across five continents throughout the IYQ in 2025, involving students, young researchers and developers from quantum-underserved geographies, policymakers and diplomats.

OQI is building capacity through national and regional events, where experts from across the Global North and South meet to exchange knowledge, strengthen ecosystems and shape national and regional quantum strategies and cooperation initiatives. These efforts aim to mitigate the emerging quantum divide by fostering community building and nurturing talent in the Global South, ensuring that ecosystems are equipped to build locally relevant use cases.

A3 Key achievements

Educational Consortium

OQI's educational consortium, operational throughout 2025, brings together domain experts, quantum experts and diplomatic stakeholders to align on and co-shape best practices, avoid duplication of efforts and advance capacity building initiatives – making educational tools and materials globally available.

70 global institutions





100+ experts

Hackathons

The goals of OQI hackathons are to promote inclusive quantum education and develop quantum computing applications addressing UN Sustainable Development Goals (SDGs), especially in regions with limited access to quantum computing technology.

Through the OQI hackathons, we are broadening our impact through our **open-access materials and resources**.



Five successful OQI-supported hackathons have taken place so far in 2025:



NYUAD International Hackathon for Social Good (Abu Dhabi, United Arab Emirates) - April 2025



AIMS Quantathon (Ghana) - July 2025



SEA Quantathon (Thailand) - August 2025



Alexandria Quantum Hackathon (Egypt) -September 2025



Quantum Hackathon Latam (University of Montevideo, Uruguay) - October 2025

380+
participants

320 certificates provided by QWorld

Two successful OQI-inspired hackathons have also been carried out in 2025, taking inspiration from OQI's open-access material and resources but without receiving formal support from OQI:



Quantum Computing Hackathon (American University of Beirut, Lebanon) - April 2025



Quantum Materials Hackathon (CERN IdeaSquare, Switzerland) - July 2025



Quantum Diplomacy Game

Designed to **promote anticipatory science diplomacy**, the game aims to **raise awareness** and **anticipation of the geopolitical implications of quantum computing** as an emerging technology.

Examples of the game played in 2025 include:



Quantum Diplomacy Game played as part of an EPFL Center for Quantum Science and Engineering course on sustainable quantum computing.

500+ participants in 2025

Quantum Diplomacy
Games played so far
in 2025



Research and industry communities during the Quantum Information, Science and Technology Conference (QISTCon.ph) in the Philippines.

Regional events

Ecosystem building events, aiming to link grassroots efforts with leading institutions, have so far taken place in **the Philippines** (QISTCon.ph) and **Morocco** (Quantum Africa 7).

Global OQI educational activities in 2025





- OQI has launched a pilot internship programme an initiative that intends to facilitate access to training opportunities for the winning teams of OQI hackathons.
 After each hackathon, OQI gathers and distributes CVs to tech companies taking part in the pilot programme.
 - Currently the pilot involves four quantum computing startups (Alice & Bob, Multiverse Computing, Pasqal, Quandela), with the goal to increase this number by the end of the year, inviting all interested institutions from OQI's educational consortium to take part.
- OQI's inaugural Quantum Unplugged event an initiative aimed at the diplomatic community of Geneva to explore the fundamental principles of quantum physics and quantum computing in an open and informal setting brought together diplomatic representatives from eight GRULAC (Group of Latin America and the Caribbean) Permanent Missions to the United Nations Office in Geneva.

A3 What's next?

Hackathons

- Two more hackathons are due to take place in 2025:
 - GenQ Hackathon CERN, Switzerland (OQI-inspired)
 - NCSR Hackathon Institute of Quantum Computing & Quantum Technology, Greece (OQI-supported)
- 2026 hackathon pipeline has been confirmed including hackathons taking place in Morocco, Mexico, Costa Rica, Kenya, Vietnam and Pakistan.
- We are currently gathering feedback from all 2025 hackathon hosts to improve the guidelines, expand our open access resources and adapt pre-hackathon training courses, with continued input from the educational consortium.

Quantum Diplomacy Game

- Until the end of 2025, the Quantum Diplomacy Game will be played in Germany,
 Singapore, Costa Rica, Malaysia and Kenya.
- We are currently establishing a **pipeline** of where the Quantum Diplomacy Game will be played in **2026**.

Regional events

 Two additional regional events are planned to take place in 2025, in Kenya and Malaysia.



Quantum Diplomacy Game played at the World Bank (credit: World Bank)



- OQI is designing a searchable educational material repository that contains free, online quantum computing courses and materials shared by our A3 Educational consortium. This new tool will also facilitate the submission and validation of educational materials to feature in our repository.
- The second edition of Quantum Unplugged will bring together the diplomatic community from French-speaking African countries, in partnership with ITU and supported by the Mission of Belgium to the UN in Geneva.



OQI continues to provide a neutral platform to help shape the future multilateral governance of quantum computing for the SDGs.

A4 Key achievements

- In 2025, OQI strengthened its engagement with international organisations, in particular with ITU, UNESCO, UNIDIR, OECD, and additional UN agencies to advance anticipatory governance of quantum technologies.
- Diplomatic engagement advanced through quantum diplomacy exchanges, foundational briefings and collaborations involving ambassadors, UN Permanent Missions and country delegations including Brazil, Chile, Costa Rica, Council of Europe, Cote d'Ivoire, France, India, Israel, Japan, Kazakhstan, Korea, Lithuania, Mexico, Mongolia, Pakistan, Qatar, Singapore, Slovenia, South Africa, Turkey, the UK and the USA.
- Through engagement with Permanent Missions in Geneva, OQI continues to build national support, ensure regional relevance and advance the scaling of OQI's quantum governance initiatives.
- OQI played a leading role in launching the IYQ in Geneva and Paris. Building on this momentum, the OQI and UNESCO issued a global call to action, urging all actors to champion quantum innovation centered on ethics, inclusion and the wellbeing of humanity and the planet beyond the IYQ in 2025.

OQI was also represented on the **IYQ Steering Committee**, overseeing the global activities and initiatives aligning with the IYQ.



Maricela Muñoz (left) moderating panel discussion during the IYQ launch event, UNESCO, Paris (credit: UNESCO)



- OQI contributed to the quantum track of ITU's AI for Good Summit, through
 designing panels and sessions on innovation, governance and the societal impact of
 quantum technologies, with a focus on fostering responsible international collaboration
 and advancing secure, inclusive and ethical quantum development.
- The 2025 Intelligence Report features multilateral deep dives with UNIDIR (on quantum security), UNESCO (on the quantum divide) and ILO (on quantum and the future of labour), demonstrating a collective commitment of international organisations to address equitable access, capacity building and workforce adaptation through anticipatory science diplomacy and inclusive governance frameworks.



Maricela Muñoz participating in panel discussions at the ITU AI for Good Summit.



Catherine Lefebvre participating in panel during the Plans and Prospects for the G7 2025 Kananaskis Summit Conference.

A4 What's next?

- OQI will continue to strengthen engagement with international organisations and diplomatic missions worldwide, applying insights from 2025 to drive fresh collaborations and advance quantum governance.
- Preparations for the 2026 Quantum Diplomacy in Action Conference will leverage the expanded partnerships and momentum of 2025 – aiming to broaden multilateral participation and catalyse forward-looking dialogue on global quantum governance.
- Priority will be given to monitoring the outcomes of bilateral and multilateral efforts, with a particular focus on inclusive representation of quantum-underserved regions.



Acknowledgements

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Alain Labrique (Director of Digital Health and Innovation at WHO) // Anousheh Ansari (CEO, XPRIZE Foundation) // H.E. Mr. Arindam Bagchi (Ambassador, Permanent Mission of India to the United Nations Office) // Barry Sanders (Professor (Scientific Director, Quantum City, University of Calgary) // H.E. Mr. Bilal Ahmad (Ambassador, Permanent Mission of Pakistan to the United Nations Office) // H.E. Ms. Claudia Fuentes Julio (Ambassador, Permanent Mission of Chile to the United Nations Office) // Cornelius Hempel (Group Head, ETH Zürich - PSI Quantum Computing Hub) // H.E. Ms. Désirée Schweitzer (Ambassador, Permanent Mission of Austria to the United Nations Office) // Diederick Croese (Director Centre for Quantum & Society, QDNL) // Dominik Heinrich (Director, Innovation Division, World Food Programme (WFP)) // Elica Kyoseva (Director of Quantum Algorithm Engineering, NVIDIA) // Francesco Petruccione (Professor, Stellenbosch University) // H.E. Ms. Francisca Mendez (Ambassador, Permanent Mission of Mexico to the United Nations Office) // Genya Crossman (IBM Quantum) // George Popescu (Head of Quantum Computing Laboratory, University Politehnica of Bucharest) // H.E. Mr. James Waweru (Ambassador, Permanent Mission of Kenya to the United Nations Office) // Joachim Mnich (OQI Advisory Committee-Co-Chair, Director for Research and Computing, CERN) // Julia Thiele ((EMEA Business Development and Go-To-Market Strategy for Quantum Computing at AWS)) // Manfred Plank (Group Managing Director, UBS) // Marco Gilli (President, Fondazione Compagnia di San Paolo) // Marieke Hood (ad interim CoChair, OQI Advisory Committee, and Executive Director Impact, GESDA) // Matthias Christandl (Professor for Quantum Computing, University of Copenhagen) // Matthias Troyer (Technical Fellow and CVP, Microsoft Quantum) // Nitin Arora (Lead, Stakeholders Interaction Unit, UN Framework Convention on Climate Change) // H.E. Mr. Omar Zniber (Ambassador, Permanent Mission of Morocco to the United Nations Office) // Ozge Aydogan (Director, Beyond Lab) // H.E. Mr. Paul Bekkers (Ambassador, Permanent Mission of Kingdom of the Netherlands to the United Nations Office) // Philippe Chomaz (Executive Scientific Director, Commissariat à l'énergie atomique et aux énergies alternatives (CEA)) // Prince Osei (Acting President, African Institute for Mathematical Sciences (AIMS)) // Rosario Fazio (Director of the Trieste Institute for Quantum Technologies (TQT), Abdus Salam International Centre for Theoretical Physics (ICTP)) // Ryan Babbush (Head of Quantum Algorithms, Google) // Sana Odeh (Professor, NYUAD - New York University of Abu Dhabi) // Simon Plant (Deputy Director for Innovation, National Quantum Computing Centre) // H.E. Mr. Tovar Da Silva Nunes (Ambassador, Permanent Mission of Brazil to the United Nations Office) // Urbasi Sinha (Professor, Raman Research Institute) // H.E. Mr. Vincenzo Grassi (Ambassador, Permanent Mission of Italy to the United Nations Office) // Vincenzo Savona (Professor, EPFL – Swiss Federal Technology Institute of Lausanne) // Vladimír Bužek (Professor, Institute of Physics, Slovak Academy of Sciences).

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Sandro Giuliani (former Co-Chair, OQI Advisory Committee and former CEO, GESDA) // Christian Bluhm (former Group Chief Risk Officer, UBS) // Alberto Anfossi (Secretary General, Fondazione Compagnia di San Paolo) // Massamba Thioye (Project Executive UN Climate Change Global Innovation Hub, UN Framework Convention on Climate Change (UNFCCC)) // Mira Wolf-Bauwens (former Responsible Quantum Computing Lead, IBM Research Europe, now Head of Initiatives Development, GESDA)

