G20 Quality Infrastructure Investment Case Study Survey

1. Background and context

Background

There is a widely acknowledged financing gap, for both new and existing infrastructure, with GI Hub putting the global funding gap at $15 trillion[1] in 2017. The G20 has consistently listed closing this gap as a priority, most recently focussing their efforts on encouraging and facilitating greater private investment in infrastructure through the *Roadmap to Infrastructure as an Asset Class* (the Roadmap) endorsed in 2018.

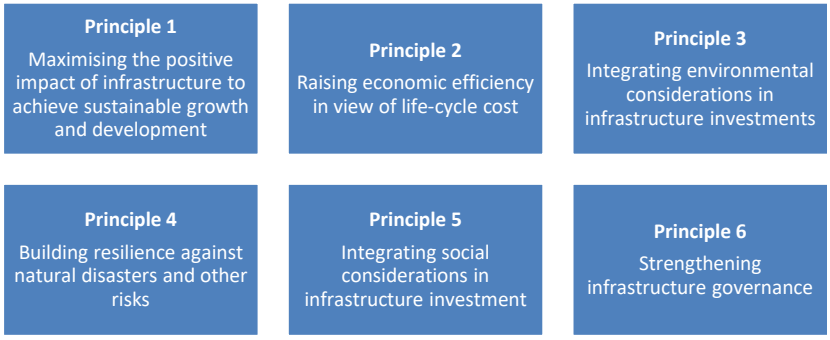
Building on the endorsement of the Roadmap in 2018 and previous G20 statements, at the Osaka Summit meeting in 2019 the G20 again acknowledged that infrastructure is a driver of sustainable economic growth and prosperity. In the Osaka Statement, G20 Leaders endorsed the *Principles for Quality Infrastructure Investment* (QII Principles) as their common strategic direction and high aspiration and a means for ensuring that investments in infrastructure by governments and the private sector also maximise the positive impacts of infrastructure. These impacts go beyond achieving sustainable growth and development to look at preserving the sustainability of public finances, raising economic efficiency in view of life-cycle costs, integrating environmental and social considerations, including women's economic empowerment, building resilience against natural disasters and other risks, and strengthening infrastructure governance.

In 2020, the G20 focussed on the role that Infratech can play in improving infrastructure quality and outcomes, culminating in the endorsement of the Riyadh InfraTech Agenda in November. Throughout 2020 the G20 also considered the work exploring potential indicators for quality infrastructure investment led by the International Finance Corporation (IFC). The GI Hub has shared the QII case study survey findings and the case studies themselves with the IFC for information.

The 2021 Italian G20 Presidency recognises the importance of implementation of the QII Principles and has committed to continuing exploration of possible indicators during their Presidency.

The G20 QII Principles

Quality infrastructure investment is that which is sustainable, inclusive, resilient, and which integrates environmental and social concerns into infrastructure investment. There are six voluntary and non-binding QII Principles (below) endorsed by the G20, which are supported by 44 sub-principles[2].



[1] https://outlook.gihub.org/

[2] https://www.mof.go.jp/english/international_policy/convention/g20/annex6_1.pdf

A survey of QII case studies

At their December 2019 meeting, the G20 Infrastructure Working Group (IWG)[3] requested the Global Infrastructure Hub develop and facilitate a survey of G20 members for case studies and examples of projects or programs which demonstrate the benefits of QII or exemplify good practice in their countries or in recipient countries. MDBs and IOs were also invited to contribute.

The Survey builds on the work undertaken by the GI Hub in partnership with the OECD and the World Bank in 2019 on the development of the QII Database, delivered under the Japanese G20 Presidency.

To deliver the survey, the GI Hub drafted a template for submissions of specific projects and/or programs that address one or more of the QII Principles. IWG members, including MDBs and international organisations, were consulted on the draft survey template, and the GI Hub worked with IWG members to finalise the template in early 2020. Due to the impacts of COVID-19 and the subsequent re-prioritisation of the G20's agenda, the survey was paused until August 2020. Opened in September 2020, IWG members, guests and international organisations were given until 24 January 2021 to submit responses.

2. Results

Responses

In response to the survey, GI Hub received 90 submissions from 20 IWG member and guest countries and IOs. Submissions covered projects or programs in all regions, across 29 countries[4].

The 90 submissions represented projects cumulatively totalling around USD 100 billion[5], and ranging in size from small-scale projects of less than ten million dollars, up to mega-projects[6] of several billion dollars.[7]

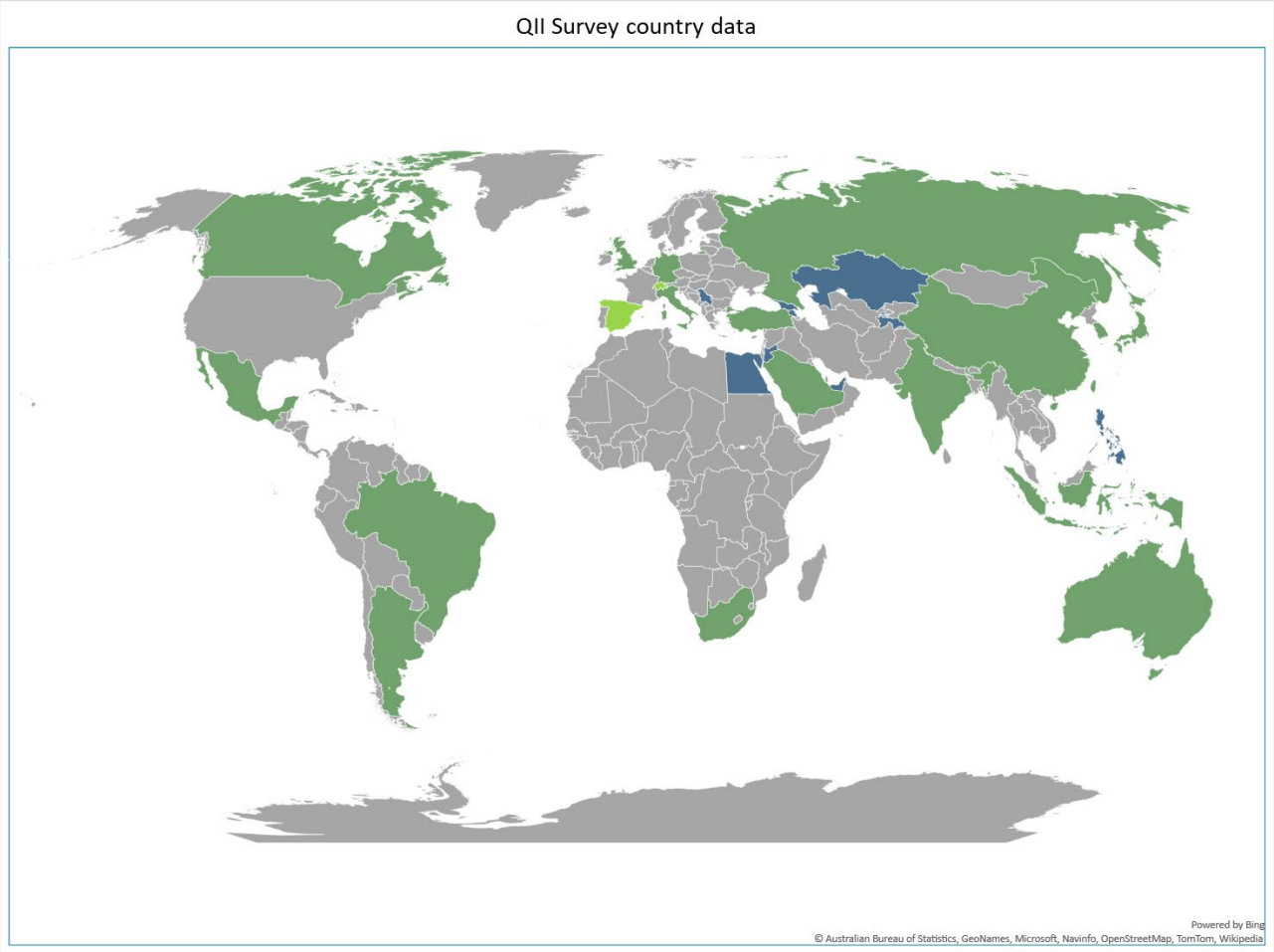
[3] For the purposes of this report, the term 'IWG members' refers to all G20 member economies, G20 guest members (permanent and non-permanent), international organisations (IOs) and multilateral development banks (MDBs).

[4] The full list of case studies can be found in Appendix A

[5] Note, this includes capital expenses and operating expenses over time periods ranging from one to thirty years

[6] Mega projects are defined as having a value of over USD 1 billion

[7] Dollar values are USD unless otherwise noted



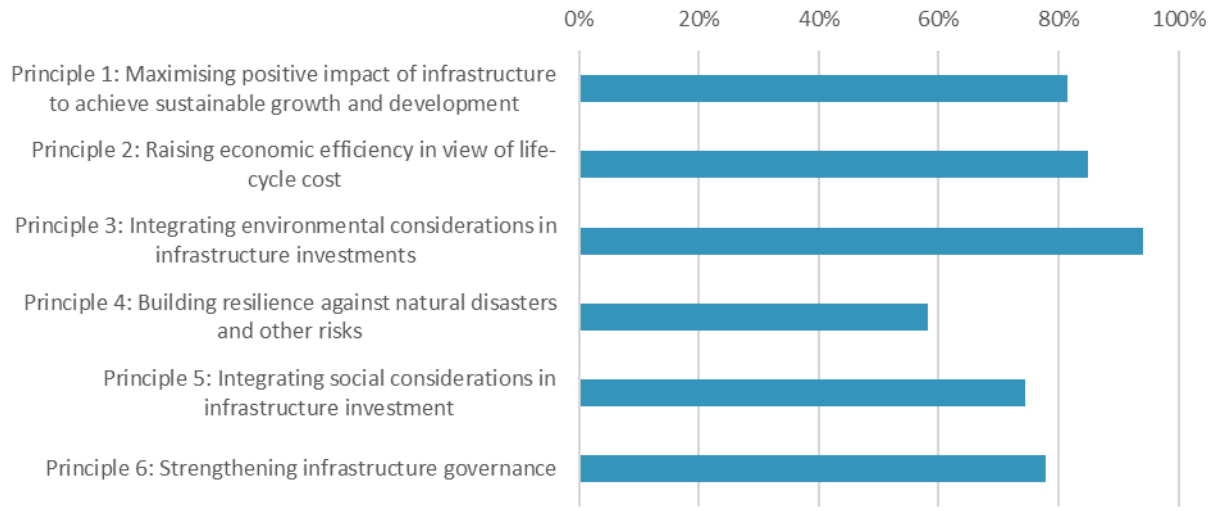
Above: G20 member case studies (green), G20 permanent guest case studies (light green), and non-G20 member case studies (blue)

Key themes

Two themes emerged from the collated survey data. The first was a global focus on projects that supported environmental sustainability. Conversely, the second theme was a relatively minimal focus on resilience.

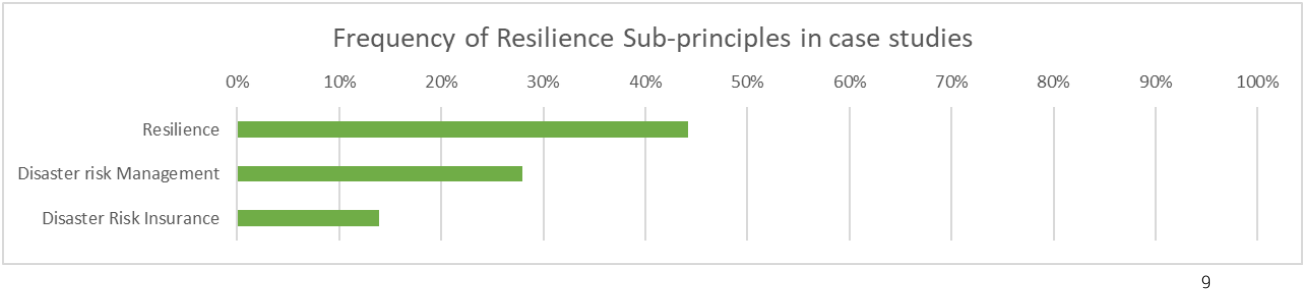
The most striking result is the focus on environmental sustainability. Nearly 95% of projects aligned with QII Principle 3 - "*Integrating environmental considerations in infrastructure investments*". This was the most frequently cited of the six QII Principles by a significant margin. Keyword analysis of the case studies also demonstrated the prevalence of environmental themes[8].

[8] For detailed keyword analysis see Appendix D



Above: Frequency of submissions addressing the six QII Principles

QII Principle 4 – *"Building resilience against natural disasters and other risks"* – was addressed by less than 60% of submissions – significantly lower than any other. Given the impact of COVID-19 and other potential crises, it may be appropriate for the G20 to focus on improving resilience as a priority.



9

Above: The Frequency of submissions addressing the three resilience sub-principles

Three sub-principles sit under the resilience Principle: resilience, disaster risk management, and disaster risk insurance. All three sub-principles are identified in less than 50% of case studies.

Lower prevalence of these principles among submitted case studies may be simply a function of market dynamics, especially regarding disaster risk insurance. Even so, it can be expected that resilience will play a greater role in infrastructure planning and delivery in the near future given the impacts of the current COVID-19 pandemic and the rising rates of natural and other disasters.

[9] A full analysis of the prevalence of all 44 QII Sub-principles is available at Appendix C

In May 2020, the mid-range estimate of the purely economic costs of COVID-19 over five years was $26.8 trillion[10]. Given such large potential costs, the costs of crises may significantly outweigh the cost of incremental investment in resilient infrastructure[11].

Many projects included environmental sustainability sub-principles, including many energy and water and waste projects. Over a quarter (29%) of the projects were in the energy sector, while a significant number were in water and waste (11%).

Case Study

Masrik 1 Solar Power Plant

Location: Masrik Valley, Armenia

A USD 51 million solar array, with the EBRD and IFC acting as lenders. The contract was a 20-year Power Purchasing Agreement with several counterparties.

The project will introduce a cost-effective renewable energy source in the country in line with its strategy to foster low carbon generation and development of renewables as part of its climate commitments. The project also addresses QII principles 2 and 4.

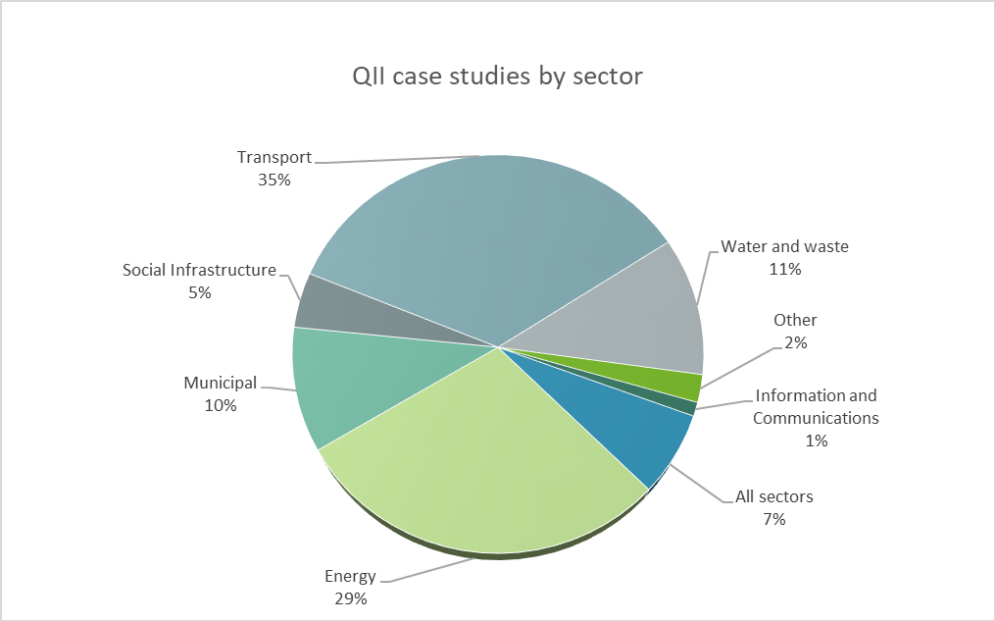
Like many of the submissions, the Masrik-1 solar plant was an energy project that addressed environmental sustainability. Like those others, it demonstrates the emphasis on environmental sustainability in the case studies submitted by IWG members, including MDBs.

The energy projects submitted were typically solar arrays, but other projects including hydroelectricity, natural gas, and smart metering, were also submitted.

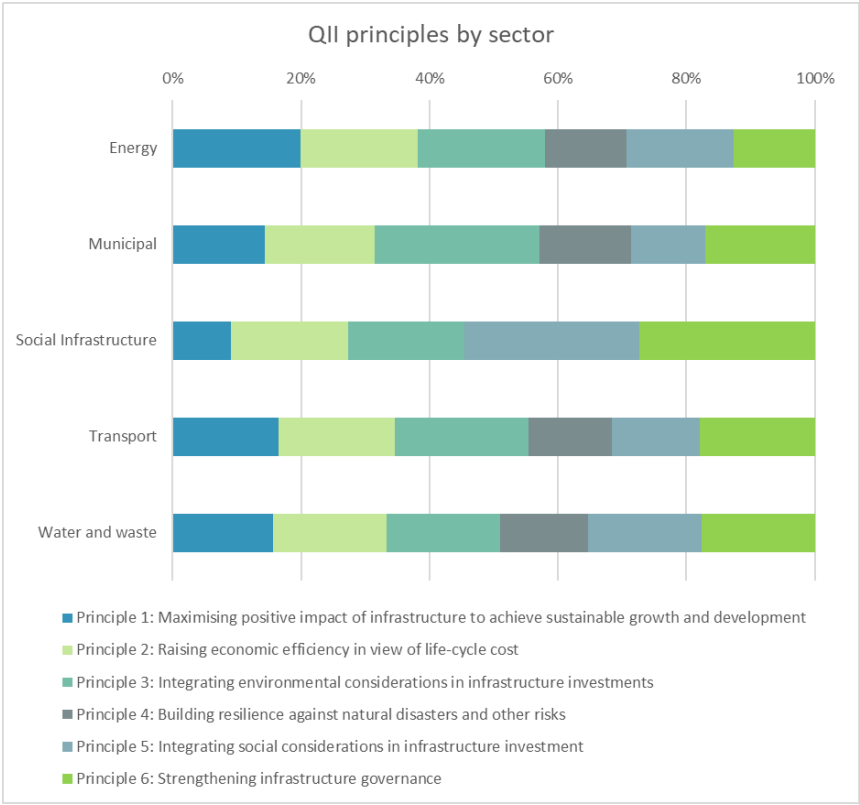
Transport was the single largest sector represented in the submissions (35%). It is worth noting that the projects put forward were largely developed and approved prior to the beginning of the COVID-19 pandemic.

[10] https://www.jbs.cam.ac.uk/insight/2020/economic-impact/

[11] From OECD (2020) *Draft Concept Note: Covid-19 and a new resilient infrastructure landscape* [unpublished]



Above: Major sectors represented in QII survey responses



Above: the frequency of QII Principles across infrastructure sectors

Looking at the distribution of QII Principles by sector highlights some potential areas for development. In particular, case studies in the social infrastructure sector did not typically nominate the QII Principles relating to sustainable growth and development or resilience.

Social infrastructure is that which contribute towards quality of life and social wellbeing, and includes education, health, community, and emergency management infrastructure. Much social infrastructure would also be considered *critical infrastructure* – that which is necessary for society to function in both normal times and emergencies.

Across all infrastructure sectors, resilience was relatively rarely identified as a relevant QII Principle within case studies, with water and waste projects the only exception.

Case Study

Federal Highway PPP Project – A3 Biebelried to Fürth

Location: Bavaria, Germany

A EUR 2.8bn, 76km Federal Highway PPP with a 30-year contract duration. The contract is to design, build, maintain, finance, and operate the road.

The A3 Highway addresses QII Principles Two (economic efficiency), Three (environmental considerations), and Six (Infrastructure Governance).

Given the key role of transport infrastructure in supporting efficiency and economic growth, the A3 and similar projects will be important to the economic recovery from COVID-19.

Creating an enabling environment for QII

Physical projects made up around 90% of the responses, with programs – such as new guidelines, standard contracts, market restructuring and an innovation competition – making up the balance. While projects – whether greenfield or brownfield – continue to make up the bulk of infrastructure investment, programs that improve elements of the infrastructure design, development and delivery process can also provide significant benefits by improving the enabling environment for infrastructure.

Case Study

Compact city development using Light Rail Transit (LRT) network as the backbone

Location: Toyama City, Japan

To address urban sprawl, Toyama city envisioned a compact city driven by an LRT network. A more compact city holds benefits for several cohorts of residents.

The project was notable for driving benefits using effective governance, including aligning with national policies, introduction of agile project organisation, and collaboration with the private sector.

Non-project specific investments can make substantial changes to the enabling environment for infrastructure, essentially facilitating the implementation of QII Principles beyond an individual project and with relatively low investment by government – for example, implementing improved environmental impact assessments and related processes (Principle 3), or the introduction of long-term infrastructure planning and prioritisation processes (Principle 6).

Case Study

National system of assessment and certification of infrastructure

Location: Russia

The National System of Assessment and Certification of Infrastructure (IRIIS) is an example of infrastructure policy that supports greater adoption of QII principles. IRIIS covers all infrastructure types.

Policy initiatives, including IRIIS, can be key drivers of project quality at relatively low-cost.

To move from the high-level QII Principles to direct impacts on infrastructure projects and programs, countries could make use of the GI Hub's *InfraCompass 2020*[12], tool which provides rankings and suggested reform opportunities to improve countries' infrastructure enabling environments.

[12] https://infracompass.gihub.org/

InfraCompass identifies potential reforms which could be a way for countries to implement the QII Principles in a manner consistent with their own jurisdictional priorities and circumstances – for example, InfraCompass identifies policy changes that could improve infrastructure planning mechanisms such as environmental impact analysis (among others). Improved environmental impact analysis would in turn '*better integrate environmental concerns into infrastructure investments*', including at early stages, thereby serving to implement QII Principle 3 beyond an individual project.

In October 2020, the OECD released the *Compendium of policy good practices for Quality Infrastructure Investment*[13]. While this work has not been formally endorsed by the G20, the comprehensive paper provides non-binding guidance for both governments and private sector participants on how to create or improve the enabling environment for quality infrastructure.

Both resources noted above could be used voluntarily by governments interested in identifying and/or remedying weak points in national infrastructure prioritisation and delivery on a case-by-case and country-specific way.

Case Study

Sustainable guidelines for new roads

Location: United Arab Emirates

This initiative represents the UAE's first Federal guidelines for sustainable transport infrastructure.

The guidelines address sustainability across the whole infrastructure lifecycle, and includes categories such as waste and materials, environment and climate change, energy, quality of life, and operations management.

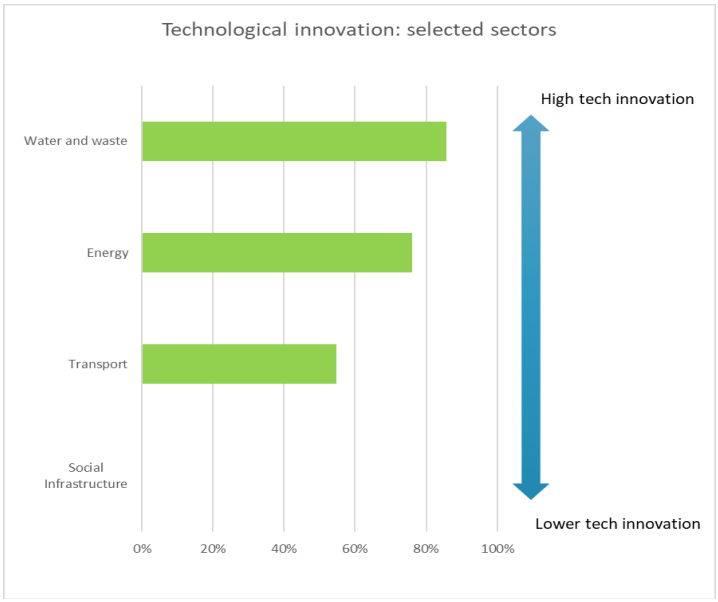
The wide-ranging sustainability guidelines address all six of the QII Principles.

Infratech

The 2020 Saudi Arabian G20 Presidency emphasised the important role of technology in infrastructure[14]. The infrastructure sector has typically been slow to adopt new technologies, especially in the digital space. It is an encouraging sign that several of the submissions provided by members have had an emphasis on Infratech and its many benefits, especially as this focus could help strengthen resilience of assets in the post-COVID context.

[13] https://www.oecd.org/finance/oecd-compendium-of-policy-good-practices-for-quality-infrastructure-investment.htm

[14] https://g20.org/en/media/Documents/2020_SaudiArabia_IWG_%20Background%20G20%20Riyadh%20InfraTech%20Agenda.pdf



Above: Sectoral differences in technological innovation within case studies

For example, Infratech can improve disaster response and management, predict disruptions, and assist with faster, safer, and more resilient rebuilding[15].

Using the QII sub-principle '*technological innovation*' as a proxy for Infratech adoption, there was a noticeable contrast in Infratech adoption across sectors. About 80% of both water and waste and energy project case studies identified innovative tech solutions, while less than 60% of transport projects did so. None of the social infrastructure case studies identified technological innovation as a relevant sub-principle.

Case Study

ANAS Smart Road Project

Location: Italy

The EUR 1 Billion ANAS Smart Road Project aims to make 3,000km of road 'smart' by 2030. The project will capitalise on vehicles that can interact with each other and road infrastructure.

Working with a range of contractors, ANAS will supply and install new technological systems that support increased vehicle flows in a way that is safe and sustainable. The project draws on EU funds as part of a broader European 'Smart Roads' project.

15 https://cdn.gihub.org/umbraco/media/3008/g20-riyadh-infratech-agenda.pdf

Greater adoption of Infratech is critical to ensuring that new infrastructure projects and upgrades of existing assets can deliver on as many of the QII Principles as possible. In September 2020, GI Hub released a library of Infratech use cases[16], that contains many more examples of using technology to enhance delivery of quality infrastructure. The World Bank has also developed two tools to support effective policy reform and enable greater Infratech adoption – the *Infratech Value Case*[17] and the *Infratech Toolkit*[18], both published in July 2020.

Operations and Maintenance

Operations and maintenance of infrastructure are a key focus for all jurisdictions, with over 65% of responses identifying operations and maintenance considerations as an element of the project. Operations and maintenance was in fact the leading sub-principle across all QII sub-principles. This was constant across all sectors except one – the municipal infrastructure sector.

Only 33% of municipal sector projects included an element of operations and maintenance, compared to 70% for all other projects. This may be indicative of municipal and local authorities being under greater fiscal stress than their provincial and national counterparts.

International agreements: Sustainable Development Goals and the Paris Agreement

Two international agreements are tracked in the QII sub-principles: the United Nations Sustainable Development Goals[19] (SDGs) and the Paris Agreement on Climate[20]. 66% of case studies submitted nominated the SDGs as a relevant sub-principle, and 41% the Paris Agreement.

66% of case studies addressed the SDGs

41% of case studies addressed the Paris Agreement

[16] https://www.gihub.org/infrastructure-technology-use-cases/

[17] https://cdn.gihub.org/umbraco/media/3062/world-bank-group-s-reference-note-on-infratech-value-case.pdf

[18] https://cdn.gihub.org/umbraco/media/3061/world-bank-group-s-reference-note-on-infratech-toolkit.pdf

[19] https://sdgs.un.org/goals

[20] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

3. Next Steps

The QII case studies are part of a living resource in the GI Hub's QII Database and will continue to be added to on an ongoing basis, providing a deep and current library of information for policy makers.

The G20 will continue work on the exploration of possible indicators for QII under the Italian G20 Presidency in 2021.

Appendix A – Submission summary

Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
Argentina	Improvement Project the Gral. Roca railway	Transport	Argentina
Argentina	CAREM 25 (prototype)	Energy	Argentina
Australia	Inland Rail	Transport	Australia
Australia	Western Sydney International (Nancy-Bird Walton) Airport	Transport	Australia
Brazil	Program "Light for All"	Energy	Brazil
Brazil	Program "More Light for the Amazon"	Energy	Brazil
Brazil	Geostationary Satellite for Defense and Strategic Communications - SGDC	Social Infrastructure	Brazil
Brazil	Concession of the BR-381/262 / MG / ES highways	Transport	Brazil
Brazil	The Iguaçu National Park Concession	Social Infrastructure	Brazil
Brazil	Fishing Terminal in Manaus (AM)	Transport	Brazil
Brazil	Pipelines for transporting fuels, especially ethanol – Duto Logum	Energy	Brazil
Canada	Energize Bridgewater	Energy	Canada
Canada	Our Food Future	Water and waste	Canada
Canada	Smart Cities Challenge	All sectors	Canada
Canada	Samuel De Champlain Bridge Corridor Project (SDCBCP)	Transport	Canada
Canada	Infrastructure Statistics Hub- Infrastructure Economic Account (INFEA)	All sectors	Canada
China	Wastewater Interception around Erhai Lake PPP Project in Dali City, Yunan Province	Water and waste	China

Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
China	Ningbo solid waste disposal centre PPP project	Water and waste	China
China	Yuan Mou efficiency water-saving irrigation project	Water and waste	China
China	Taihang mountain cross-province expressway PPP project	Transport	China
China	Urban natural gas utilisation systems engineering project	Energy	China
China	Energy internet demonstration project	Energy	China
China	New Energy Cloud Empowering Energy Digital Economy and New Infrastructure	Energy	China
China	Long-distance and clean heat supply project	Energy	China
Germany	German PPP Schools Study (2019)	Social Infrastructure	Germany
Germany	Federal Highway PPP-Project A3 Biebelried to Fürth	Transport	Germany
Germany	Federal Highway PPP-Project A49 Ohmtal to Fritzlar	Transport	Germany
India	Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) Scheme	Energy	India
Indonesia	Surakarta Public Street Lighting	Energy	Indonesia
Indonesia	South Tangerang Waste Treatment	Waste and Water	Indonesia
Indonesia	Legok Nangka Waste Treatment	Waste and Water	Indonesia
Indonesia	Pekanbaru Water Supply	Waste and Water	Indonesia

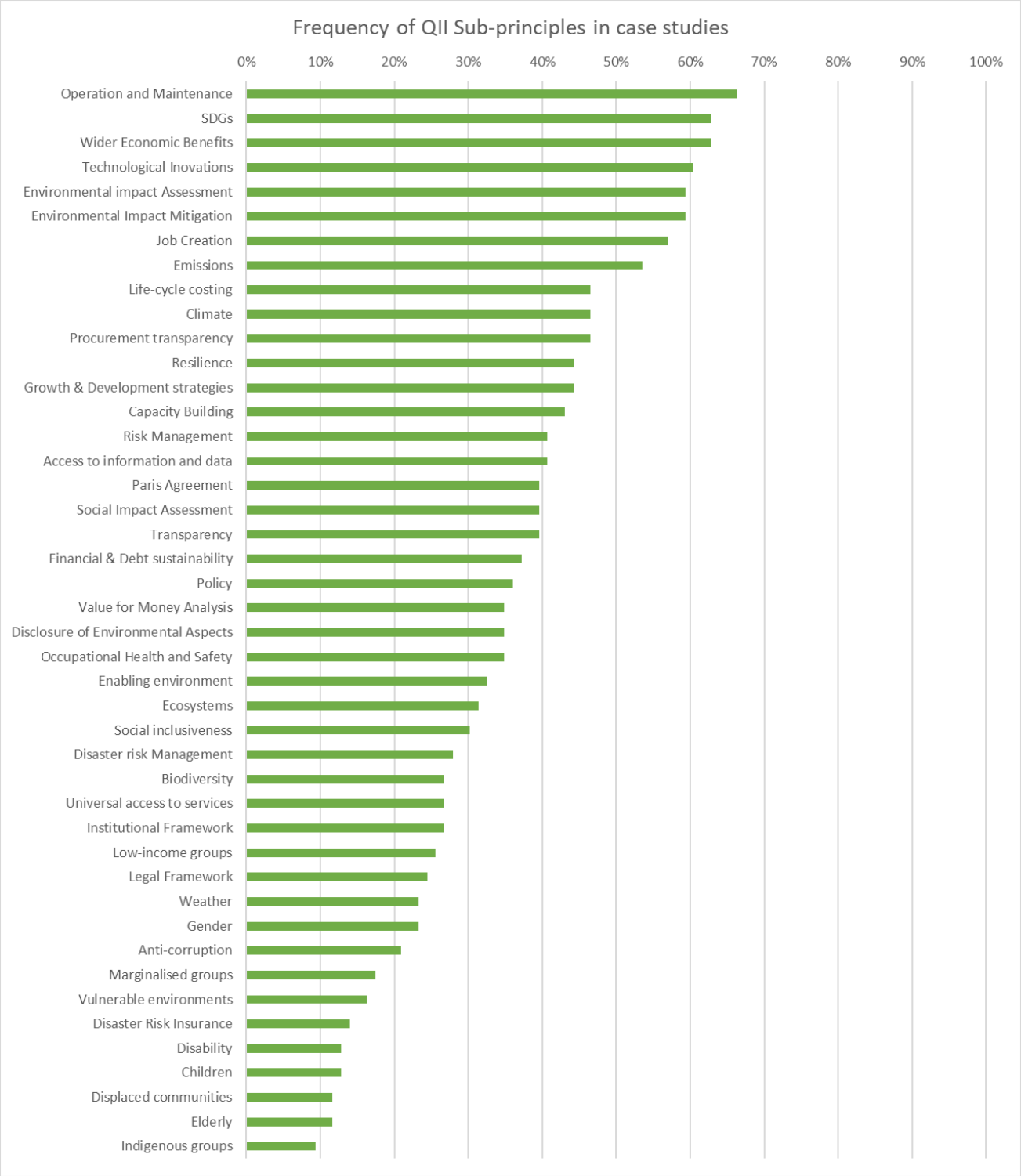
Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
Italy	Genoa bridge over Polcevera viaduct (A10 national motorway)	Transport	Italy
Italy	ANAS Smart Road project	Transport	Italy
Japan	Toyama City – Effective Governance; Compact City Development with an LRT Network as the Backbone	Transport	Japan
Japan	Fukuoka City – Life-cycle costing; Efficient Water Management through a Water Distribution Control Center, Leakage Reduction Measures, and Pipe Upgrades	Water and waste	Japan
Japan	The Manilla Metro Line 3 project	Transport	Philippines
Korea	Incheon Bridge Project	Transport	Korea
Korea	Southern Inland Rail Project	Transport	Korea
Mexico	Mayan Train (Tren Maya)	Transport	Mexico
Russia	Development of the National System of Assessment and Certification of Infrastructure	All sectors	Russia
Saudi Arabia	KSA SABIC Emissions to Value project	Other	Saudi Arabia
Saudi Arabia	Al Batha Cargo Inbound / Outbound Prototype Implementation	All sectors	Saudi Arabia
Saudi Arabia	Al Khafji Land Port Prototype Implementation	All sectors	Saudi Arabia
Saudi Arabia	Modernization and development of electrical networks systems for high, medium and low voltage at King Abdul Aziz Port in Dammam	Energy	Saudi Arabia
Saudi Arabia	Establishment of the Technical College for Boys in Sarat Abidah (second stage)	Social Infrastructure	Saudi Arabia
Saudi Arabia	Sewage treatment plant project in Al-Ahsa Governorate (first phase)	Water and waste	Saudi Arabia
Saudi Arabia	Development of Sudair industrial city	All sectors	Saudi Arabia
Singapore	Rifle Range National Park	Social Infrastructure	Singapore

Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
Singapore	Punggol Eco-Town – The Sustainable Waterfront Town in the Tropics	Other	Singapore
South Africa	Gautrain Rapid Link Project	Transport	South Africa
South Africa	South Africa's Renewable Energy IPP	Energy	South Africa
Spain	Constitution of 1812 Bridge	Transport	Spain
Spain	Sagrera Railway Station	Transport	Spain
Switzerland	New Transalpine Rail Link NEAT	Transport	Switzerland + Italy
Switzerland	Pamir Private Power Project	Energy	Tajikistan
Turkey	Istanbul Straight Road Tunnel Project (Eurasia Tunnel)	Transport	Turkey
United Kingdom	Thames Tideway Tunnel	Water and waste	UK
United Arab Emirates	Bridge Condition Index	Transport	UAE
United Arab Emirates	Positive Energy Blocks	Energy	UAE
United Arab Emirates	Climate modelling to improve materials selection and asphalt pavement performance in the UAE	Transport	UAE
United Arab Emirates	Road assets management tool for the federal roads of the UAE	Transport	UAE
United Arab Emirates	Sustainable guidelines for new roads	Transport	UAE
United Arab Emirates	Performance based maintenance contract	Transport	UAE
United Arab Emirates	Remote monitoring	Transport	UAE
EBRD	Elektro-Bijeljina smart-metering expansion	Energy	Bosnia and Herzegovina

Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
EBRD	Benban Solar (16 projects)	Energy	Egypt
EBRD	Masrik-1 Solar Power Plant	Energy	Armenia
EBRD	KazTransGas Liquidity Support	Energy	Kazakhstan
EBRD	KAZREF - Baikonur Solar Plant	Energy	Kazakhstan
EBRD	KAZREF - Zadarya Solar Power Plant CTF	Energy	Kazakhstan
EBRD	Chulakkurgan Solar	Energy	Kazakhstan
EBRD	Qairokkum Hydro Power Rehabilitation Project	Energy	Tajikistan
EBRD	Kiyikoy WPP Extension	Energy	Turkey
EBRD	Enerjisa Genco Financing	Energy	Turkey
EBRD	Talimarjan Power Project	Energy	Uzbekistan
EBRD	UzbekEnergo Muruntau Substation	Energy	Uzbekistan
EBRD	Tbilisi Bus Project	Municipal	Georgia
EBRD	GrCF2 W2 - Tbilisi Bus extension	Energy	Georgia
EBRD	GrCF - Batumi Bus	Municipal	Georgia
EBRD	Big Almaty Ring Road (BAKAD) PPP	Transport	Kazakhstan
EBRD	Pavlodar Street Lighting Modernisation	Municipal	Kazakhstan
EBRD	Isfana Water Project	Municipal	Kyrgyzstan
EBRD	Belgrade Solid Waste	Municipal	Serbia
EBRD	Belgrade Airport Concession Finance (f. Project Frame)	Transport	Serbia
EBRD	Egyptian National Railways Restructuring	Transport	Egypt

Submitting Country / MDB / IO	Project name	Primary Sector	Project / Program location
EBRD	MR3: GAM Solid Waste Crisis Response - LFG Expansion	Municipal	Jordan
EBRD	MR3: GAM Lagoon Remediation Project	Municipal	Jordan
EBRD	Small Cities Sanitation Program	Municipal	Tunisia
EBRD	Mersin International Port Bond	Transport	Turkey
EBRD	Elazig Hospital PPP	Municipal	Turkey

Appendix B – Frequency of QII Sub-principles in case studies



Appendix C – Keyword Analysis

Keyword analysis showed a strong focus on environmental themes, as well as financial and economic concerns:

Most common terms used in submitted case studies