GLOBAL QUALITY INFRASTRUCTURE INDEX

REPORT 2023

Insights and trends on economies using metrology, standards, accreditation and conformity assessment services

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GQII
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ACRONYMS AND ABBREVIATIONS

AB	Accreditation body
AFRAC	African Accreditation Cooperation
APAC	Asia Pacific Accreditation Cooperation
ARAC	Arab Accreditation Cooperation
BIPM	International Bureau of Weights and Measures (Bureau International des Poids et Mesures)
BMZ	Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirt-schaftliche Zusammenarbeit und Entwicklung)
BMWK	Federal Ministry for Economy and Climate Action (Bundesministerium für Wirtschaft und Klimaschutz)
CAB	Conformity Assessment Body
CIPM	International Committee for Weights and Measures
CMC	Calibration and Measurement Capabilities
CPI	Corruption Perceptions Index
DI	Designated Institute (recognised by BIPM)
GAC	Gulf Accreditation Centre
GATT	General Agreement on Tariffs and Trade
GQII	Global Quality Infrastructure Index
ECI	Economic Complexity Index
FAMI-QS	Feed Additives and Pre-mixtures Quality System
IAAC	Inter-American Accreditation Cooperation
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IFA	Integrated farm assurance (scheme of GlobalG.A.P.)
ILAC	International Laboratory Accreditation Cooperation
ISO	International Organization for Standardization
INetQI	International Network on Quality Infrastructure
JAS-ANZ	Joint Accreditation System of Australia and New Zealand
K&SC	Key and Supplementary Comparisons
KCDB	Key Comparison Data Base
MLA	Multi-Lateral Recognition Arrangement (the term used by the IAF)
MRA	Mutual Recognition Arrangement (the term used by BIPM and ILAC)
MS	Management Standards
NAB	National Accreditation Body
NMI	National Metrology Institute
NQI	National Quality Infrastructure
NQP	National Quality Policy
NSB	National Standards Body
QS	Quality System
OECD	Organization for Economic Co-operation and Development
SADCAS	Southern African Development Community Accreditation Service
SAE	Ecuadorian Accreditation Service (Servicio Ecuadoriano de Acreditación)
SOAC	West African Accreditation System (Système Ouest Africain d'Accréditation)
PTB	German Federal Metrology Institute (Physikalisch-Technische Bundesanstalt)
RAG	Regional Accreditation Groups
SDG	Sustainable Development Goals
QI	Quality Infrastructure
TC	Technical Committee
UK	United Kingdom
UNIDO	United Nations Industrial Development Organization
USA	United States of America
WHO	World Health Organization
WTO	World Trade Organization

ACKNOWLEDGEMENTS

Creating the Global Quality Infrastructure Index (GQII) is a collective endeavour. It is good practice to begin the GQII report by thanking the various supporters.

The GQII 2023 uses publicly available data published by national, regional and international quality infrastructure (QI) institutions. The GQII team's work primarily consists of collating data from various sources and making it comparable at a country or economy level.

A particular challenge is collecting accreditation data broken down by economy. In this context, we have sent a data collection form to all accreditation bodies worldwide, in which they enter the number of accredited bodies published on their websites. We want to thank the staff of all accreditation bodies and accreditation focal points for submitting their data. We would also like to thank the ten additional accreditation bodies that validated our count of their data.

The support of the regional and international accreditation organisations who forwarded our request to their members was crucial for the excellent data response. Our special thanks go to Yolanda Vinicombe (African Accreditation Cooperation, AFRAC), Graeme Drake (African Accreditation Cooperation, APAC), Brahim Houla (Arab Accreditation Cooperation, ARAC), Victor Gandy (formerly Inter-American Accreditation Cooperation, IAAC and now International Accreditation Forum, IAF), Emanuele Riva (IAF) and Etty Feller (International Laboratory Accreditation Cooperation, ILAC).

Counting the data from the accreditation bodies' websites is particularly time-consuming. Thanks to Anett Matbadal, Ann Sara Ramkissoon, Annelien Cunningham, Beatriz Paniagua, and Christian Schoen for carefully collecting and checking the information.

The exchange with the International Network on Quality Infrastructure (INetQI) representatives and participation in the United Nations Industrial Development Organization (UNIDO) expert working group on the QI4SD ranking, which relates the global QI data to the Sustainable Development Goals (SDGs), were also essential for interpreting the data. Another new source of information is the International Accreditation Forum (IAF) cert search database, which Nigel Johnson has informed us about.

There have been changes in the GQII core team. Emiliano Waltos has joined as a new analysis expert. He succeeded Juan José Oteiza, one of the two pioneers of GQII, who still supports this issue in an advisory capacity and elaborates on the country profiles. This marks the end of the collaboration with Analyticar, which laid the methodological foundations for GQII. Ulrich Harmes-Liedtke, the founder, and Monica Muñoz, responsible for data communication, are core team members.

Again, our special thanks go to the Trade Department of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the International Cooperation Department of the Physikalisch-Technische Bundesanstalt (PTB) under the direction of Marion Stoldt, for their financial support.

FOREWARD

SHAWN PAULSEN, P. ENG.

Chair on the International Network on Quality Infrastructure (INetQI)
Past Chair of the IEC Conformity Assessment Board (CAB)

WHY IS GLOBAL QUALITY INFRASTRUCTURE IMPORTANT?

Welcome to the world of Quality Infrastructure (QI), where the foundation of excellence supports the structures of progress and prosperity. In today's interconnected and fast-paced global economy, the importance of Quality Infrastructure cannot be overstated. As we navigate through an era defined by innovation, sustainability, and resilience, the role of QI emerges as a cornerstone for sustainable development and competitiveness.
Quality Infrastructure encompasses various elements, including standardization, metrology, accreditation, conformity assessment, and market surveillance. Together, these components create a robust framework that ensures the quality, safety, and interoperability of goods, services, and systems across borders and industries.

One of the primary benefits of Quality Infrastructure is its ability to build trust. By establishing internationally recognised standards and conformity assessment procedures, QI instils confidence among consumers, businesses, and governments, fostering transparency and reducing risks and barriers to trade.

Moreover, Quality Infrastructure plays a pivotal role in driving innovation and competitiveness. By providing a common language for quality and performance, standards enable interoperability, promote technological advancement, and facilitate market access for innovative products and services.

In addition to promoting economic growth, Quality Infrastructure contributes to sustainable development and environmental protection. Through initiatives such as green standards and ecolabelling, QI supports the transition towards more sustainable production and consumption patterns, mitigating environmental impacts and addressing climate change challenges.

Furthermore, Quality Infrastructure serves as a cornerstone for inclusive growth and social development. QI promotes public health, safety, and well-being, particularly in developing countries, by ensuring the quality and safety of essential goods and services, such as product safety, food, healthcare, and infrastructure.

The data and research in this forward-thinking Global Quality Infrastructure Index (GQII) 2023 delves into the myriad benefits of Quality Infrastructure to economies, industries, and societies worldwide. From enhancing product safety and reliability to fostering import and export trade facilitation and market access, the information presented in the GQII serves as a critical and strategic guide for policymakers and leaders as a catalyst for safety and reliability, economic growth, sustainable development, trade competitiveness, reduction in barriers to trade, global connectivity, and overall quality of life.

As we embark on a journey towards environmental sustainability and an all-electric and connected society, the importance of Quality Infrastructure cannot be overstated. Let's not forget as well the impacts of digital transformation that many organisations are undertaking will impact each of the QI components. The GQII 2023 serves as a guiding light, illuminating the transformative power of QI in fostering economic prosperity, social inclusion, and environmental sustainability.

Together, let us embrace the principles of Quality Infrastructure and harness its full potential to build a better world for future generations.

ALEJANDRO RIVERA-ROJAS

Industrial Development Officer, UNIDO

In an era where global trade thrives, facilitated by technological advancements and intricate supply chains spanning continents, the significance of Quality Infrastructure (QI) cannot be overstated. Despite its undeniable impact, the empirical evidence substantiating QI's contribution to international trade remains sparse. With QI's significance comes the need to ensure that reliable and quality data on QI is available to relevant stakeholders such as QI institutions, policymakers, industries, and service providers of related QI services.

Existing tools to measure QI are relatively few – two initiatives, however, have been developing in parallel to meet similar objectives. They are the Global Quality Infrastructure Index (GQII), developed by the German Consultancy Company Mesopartner, co-financed and support by the Physikalisch-Technische Bundesanstalt (PTB) and the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Quality Infrastructure for Sustainable Development (QI4SD) Index, developed by the United Nations Organization for Industrial Development (UNIDO) in collaboration with the International Network on Quality Infrastructure (INetQI).

Both indices recognize the importance of lobbying for publicly available data from QI institutions and overall data transparency. By sharing data and insights, we can collectively illuminate the intricate interplay between QI and international trade, paving the way for informed policies and strategic initiatives. Moreover, the GQII invites stakeholders across different sectors to contribute to the collective understanding of QI's impact beyond international trade. It is with great pleasure to have the opportunity to introduce the 2023 edition of the GQII, following previously published editions in 2019 and 2011. The GQII draws on data collected from 185 economies, shedding light on the symbiotic relationship between QI and global trade, illuminating how QI organizations have catalyzed trade growth by mitigating transac-tion costs and fostering trust among trading partners. The GQII is the first concerted effort to compile existing data on QI, with the aim of measuring the development of QI at national and global scales. By leveraging sources from prominent QI organizations, the GQII pioneers a path toward a deeper understanding of QI's influence on trade dynamics.

Looking to the future, UNIDO, Mesopartner and PTB will be collaborating towards the development of a single, integrated QI index. There is value addition in collaboration, as the strengths of each index will be built upon, and there are positive outlooks for a longerterm perspective and sustainability. A single, well-designed index will provide a consistent and unified assessment of quality infrastructure worldwide, avoiding conflicting rankings that could lead to confusion or misperceptions. The aims of both the GQII (assessing QI performance) and the QI4SD Index (the contribution of QI to sustainable development and the specific SDGs) will be integrated as one. We congratulate Mesopartner and PTB on this new edition and look forward to continued partnership and collaboration.

1 INTRODUCTION

Quality infrastructure (QI) is still a young phenomenon, even though its constitutive elements, such as metrology, standardization and conformity assessment, have existed for over a hundred years. Accreditation, the most recent QI element, emerged after the Second World War and can look back on almost 80 years of development.

Although the QI systems were initially developed at the national level, there were early endeavours to achieve international cooperation and recognition. Today, the essential elements of QI can be found in almost every country. In the GQII ranking, we have collected data from 185 economies.[1]

The development of QI is intimately related to global trade. According to the World Trade Organisation (WTO), global trade volume today is around 45 times higher than in the early days of the General Agreement on Tariffs and Trade (GATT) (4500% growth from 1950 to 2022 (see Figure 1 and footnote). Except for a few significant slumps, most recently due to the COVID-19 pandemic, the value of world trade has increased steadily.

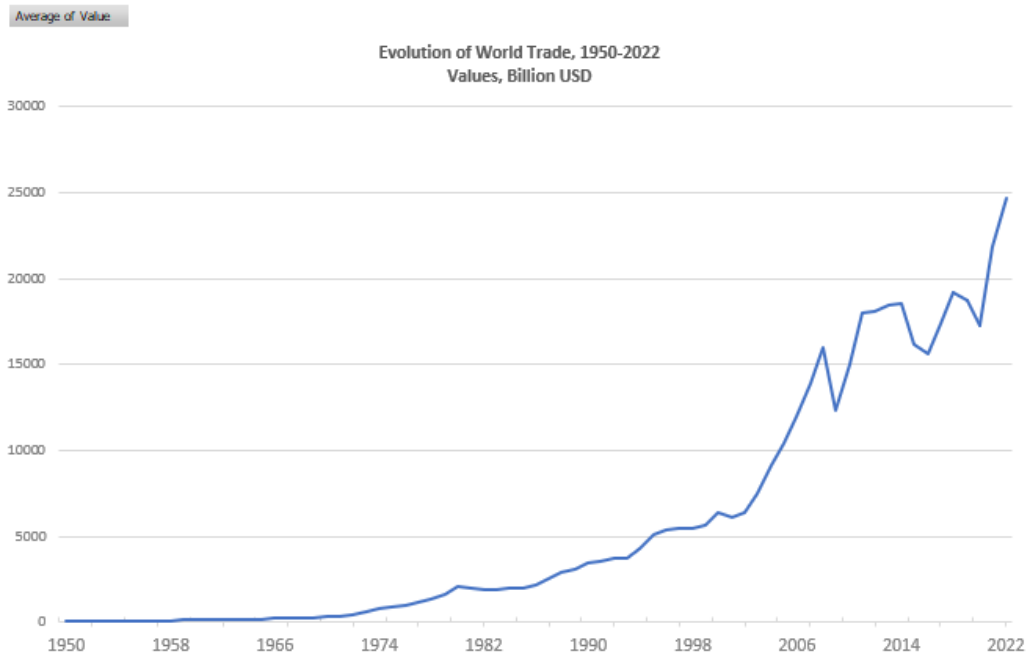


Figure 1: Evolution of World Trade, 1950-2022, Values, Billion USD

Source: WTO[2]

[1] Among the members of the United Nations, the data of Kiribati, Palau, South Sudan and Tuvalu were not included. The data for Bermuda, Cayman Islands, Gibraltar, Hong Kong, Kosovo, Taiwan, Macao, Puerto Rico and Palestine, which are not internationally recognised states and are treated as economies, are also included.

[2] https://www.wto.org/english/res_e/statis_e/trade_evolution_e/evolution_trade_wto_e.htm (Retrieved 02/04/24)

QI organisations have significantly contributed to trade growth by reducing transaction costs and increasing trust between trading partners by providing conformity assessment and mutual recognition services. QI thus makes a significant contribution to the reduction of non-tariff trade barriers and to free global trade. In this respect, QI can also be seen as the backbone of international trade.

Unfortunately, the empirical basis for proving QI's contribution is thin. Although various QI organisations collect relevant data, a more extended time series of data from the individual QI areas still needs to be available.

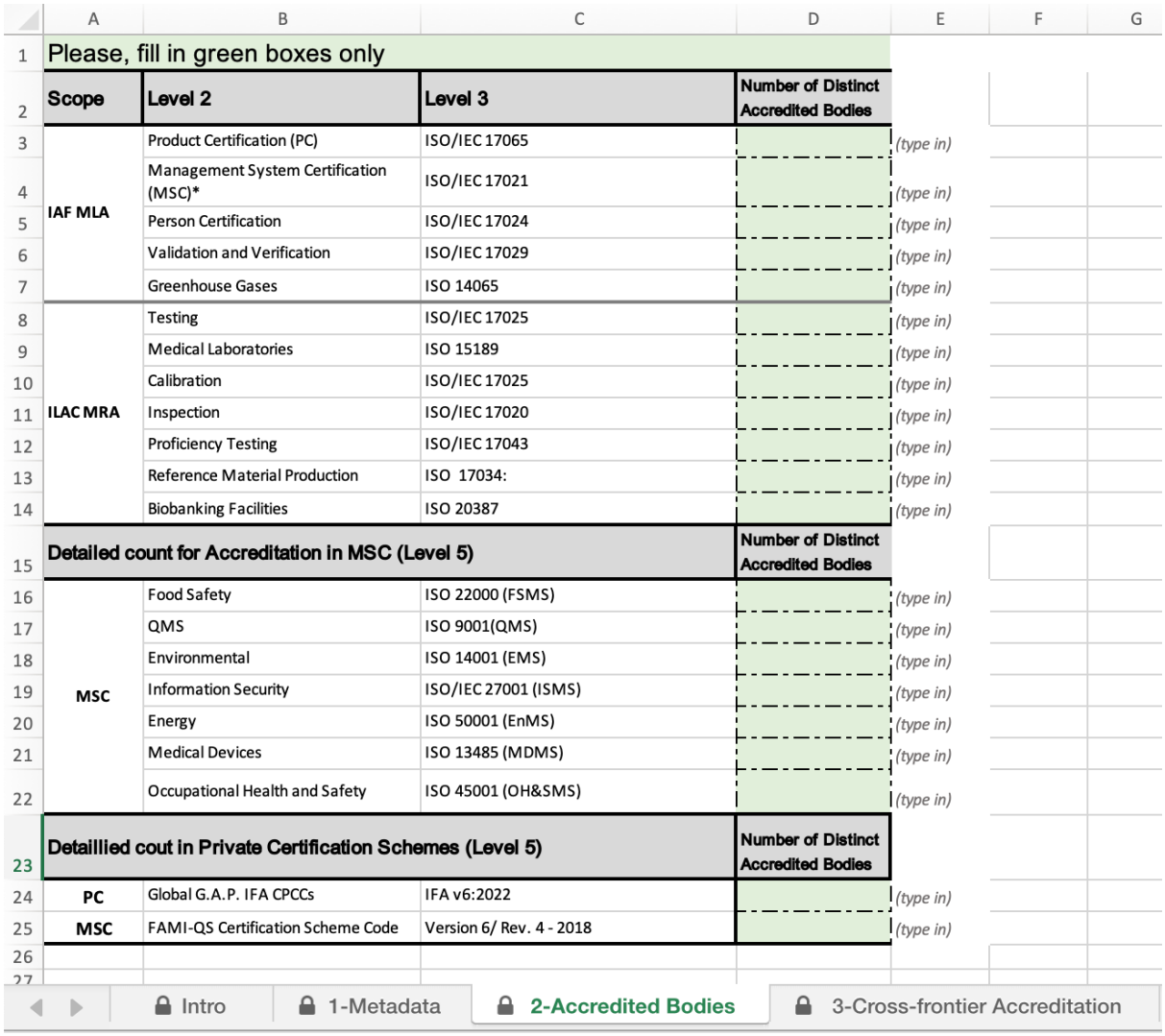
In this respect, the GQII is the first attempt to compile existing data on QI to make the development status of QI in individual countries and the development of the overall system measurable. The GQII is based exclusively on sources available on the Internet from QI organisations. These include the websites of the International Bureau of Weights and Measures (BIPM) with its Key Comparison Data Base (KCDB), the International Standards Organisation (ISO) with its ISO Survey on Management Standards, the International Electro-technical Commission (IEC) and the accreditation organisations IAF and ILAC as well as their Regional Accreditation Groups (RAC) and the websites of the national accreditation bodies (NAB).

The most significant data collection effort was collecting data from 166 accreditation bodies and focal points[3].[4] Although the accreditation bodies report this data to their RAC and the IAF and ILAC annually to record membership fees, this data has yet to be published and broken down by country.

The GQII team has developed its form for data collection (see Figure 2). This form follows the structure and scopes of the IAF MLA and the ILAC MRA. For the GQII, we record the number of accredited bodies at Level 3 and only for management systems at Level 5.

For a better understanding, IAF MLA and ILAC MRA distinguish between five levels:
- Level 1 - ISO/IEC 17011 specifies the criteria for accreditation bodies.
- Level 2 - Accreditation activities.
- Level 3 - Endorsed generic normative documents used by accreditation bodies.
- Level 4 - Endorsed sector-specific normative documents used by accreditation bodies.
- Level 5 - Endorsed normative documents used by conformity assessment bodies.

[3] National Accreditation Focal Points (NAFP), although they are not involved in the accreditation process, promote accreditation in the context of regional accreditation networks (KINDLER/ MIESNER 2015).
[4] The IAF website lists 95 accreditation bodies (https://iaf.nu/en/home/) and ILAC lists 119 signatories del MLA (https://ilac.org/ilac-mra-and-signatories/) (retrieved 19/04/2024). Most of the IAF members are also mem-bers of ILAC. In addition, there are the ABs that are members of regional accreditation groups (AFRAC, APAC, ARAC, EA, IAAC and SADCA). In some countries there are several accreditation bodies, while other countries do not have their own accreditation body.



	A	B	C	D	E	F	G
1	Please, fill in green boxes only						
2	**Scope**	**Level 2**	**Level 3**	**Number of Distinct Accredited Bodies**			
3	IAF MLA	Product Certification (PC)	ISO/IEC 17065		(type in)		
4		Management System Certification (MSC)*	ISO/IEC 17021		(type in)		
5		Person Certification	ISO/IEC 17024		(type in)		
6		Validation and Verification	ISO/IEC 17029		(type in)		
7		Greenhouse Gases	ISO 14065		(type in)		
8	ILAC MRA	Testing	ISO/IEC 17025		(type in)		
9		Medical Laboratories	ISO 15189		(type in)		
10		Calibration	ISO/IEC 17025		(type in)		
11		Inspection	ISO/IEC 17020		(type in)		
12		Proficiency Testing	ISO/IEC 17043		(type in)		
13		Reference Material Production	ISO 17034:		(type in)		
14		Biobanking Facilities	ISO 20387		(type in)		
15	**Detailed count for Accreditation in MSC (Level 5)**			**Number of Distinct Accredited Bodies**			
16	MSC	Food Safety	ISO 22000 (FSMS)		(type in)		
17		QMS	ISO 9001(QMS)		(type in)		
18		Environmental	ISO 14001 (EMS)		(type in)		
19		Information Security	ISO/IEC 27001 (ISMS)		(type in)		
20		Energy	ISO 50001 (EnMS)		(type in)		
21		Medical Devices	ISO 13485 (MDMS)		(type in)		
22		Occupational Health and Safety	ISO 45001 (OH&SMS)		(type in)		
23	**Detaillied cout in Private Certification Schemes (Level 5)**			**Number of Distinct Accredited Bodies**			
24	PC	Global G.A.P. IFA CPCCs	IFA v6:2022		(type in)		
25	MSC	FAMI-QS Certification Scheme Code	Version 6/ Rev. 4 - 2018		(type in)		
26							

Figure 2: GQII 2023 Accreditation data collection sheet

The data corresponds to the figures published on the website of the respective accreditation body. In the period from May to July 2023, we received 83 forms. In the remaining 52 cases, the GQII team extracted the data from the websites and shared it with the accreditation bodies. Of these, 12 accreditation bodies validated their data. These numbers include data from 31 economies multi-economy accreditation bodies, i.e. the Gulf Accreditation Centre (GAC) (7), the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) (2), the Southern African Development Community Accreditation Services (SADCAS) (14) and West African Accreditation System (Système Ouest Africain d'Accréditation, SOAC) (8).[5]

The GQII 2023 data shows high stability at the top of the global QI ranking. Germany, China, the United States, the United Kingdom and Japan have remained at the top of the ranking since 2020. In contrast, there is an inevitable volatility in the middle and bottom of the ranking. Few countries have changed their positions drastically. Countries that have risen include Uzbekistan, Saudi Arabia and Mongolia, while countries that have fallen include the Russian Federation, Sudan, Albania and Algeria.

[5] Data from accreditation bodies that do not publish their data on the Internet could not be included. These include the Australian Laboratory Accreditation Body (ALAB), Federation For Development Of Accreditation Services (FDAS), Libya-Libya Accreditation Body (LIBAC), Federal Service for Accreditation (RUSACC), Russian Federation - Scientific and Technical Centre 'Industrial Safety' (STC), Sudanese Accreditation Council (SDAC), San Marino Accreditation Service (SMAS), National Centre for Accreditation (NCA) of Tajikistan. These institutions need to be updated signatories of MLAs/MRAs.

Two years have passed since the last publication of the GQII2021. During this time, many QI organisations and some of the lead ministries responsible for monitoring them have shown an interest in the GQII data. Various countries use the GQII to monitor the QI system's development and set targets for future growth. Several academic publications have used the GQII data to analyse trade and economic development issues.

Finally, Mesopartner and PTB have collaborated closer with the United Nations Industrial Development Organization (UNIDO). In cooperation with INetQI, UNIDO has published the Quality Infrastructure for Sustainable Development (QI4SD) (UNIDO 2022). Both indexes have different focuses; while the GQII concentrates exclusively on the development of the QI, the QI4SD focuses primarily on the contribution of the QI to the Sustainable Development Goals (SDGs).

All GQII 2023 data is available in EXCEL format and can be downloaded from the GQII website.[6] The GQII's authors invite all data users to share their data with us. This will help us better understand the impact of quality infrastructure and its contribution to international trade.

[6] See https://gqii.org/gqii-2023/ (Retrieved 03/04/2024)

2 GLOBAL QUALITY INFRASTRUCTURE DEVELOPMENT

GENERAL DEVELOPMENT

Before we discuss the ranking, it is essential to understand the development of the Global QI System and the dynamics within each of the three aggregated components:

QI Evolution by Areas

QI Areas	2020	2021	2023	
Metrology				
CMCs	25.536	25.944	25.832	-0,4%
Key&Suppl. Comp.	11.883	12.671	13.174	4,0%
CABs - Calibration Labs*	10.828	12.381	13.957	12,7%
Standardization				
ISO Tech. Comm.	21.504	21.960	21.872	-0,4%
IEC Tech. Comm.	n.d.	5.576	5.690	2,0%
ISO MS Certificates	1.345.381	1.578.961	2.366.186	49,9%
Accreditation				
CABs - Product Certification*	3.572	3.987	3.786	-5,0%
CABs - MS Certification*	2.330	3.061	3.407	11,3%
CABs - Testing Labs*	60.655	57.652	61.696	7,0%

Table 1: Evolution of QI areas

In metrology, the number of accredited calibration laboratories increased significantly from 12,381 to 13,957, i.e. by 12.7%, between 2021 and 2023. In contrast, the number of Calibration Measurement Capabilities (CMCs) has remained almost constant, and the number of Key and Supplementary Comparisons (K&SC) has increased slightly by 4%.

In standardization, the number of participants in technical committees remains the same. From 2021 to 2023, the number of participants in ISO Technical Committees fell slightly by 0.4% from 21,960 to 21,872, while the number of participants in IEC committees rose by 2% from 5,576 to 5,690. In contrast, the number of companies certified with ISO management systems rose massively, from 1,578,961 to 2,366,186, an increase of 49.9%. The substantial increase in MS certification may also be because the ISO Survey took the IAF Cert Search data into account for the first time.[7]

The data on accreditation confirms the increase in management system certification. Between 2021 and 2023, the number of accredited certification bodies for management systems increased by 11.3% from 3,061 to 3,407. The number of accredited test laboratories also increased by 7% from 57,652 to 61,696. In contrast, certified product certification bodies fell by 5.0% from 3,987 to 3,786.

7. *https://www.iafcertsearch.org (Retrieved 03/04/2024)*

MAPPING AND RANKING

The world map provides an overview of the level of QI development in 185 countries and economies. The deep, blue-coloured economies are mainly well-developed, followed by the light blue- and grey-coloured areas. In contrast, QI is least developed in the deep and less developed in the light, orange-coloured territories.

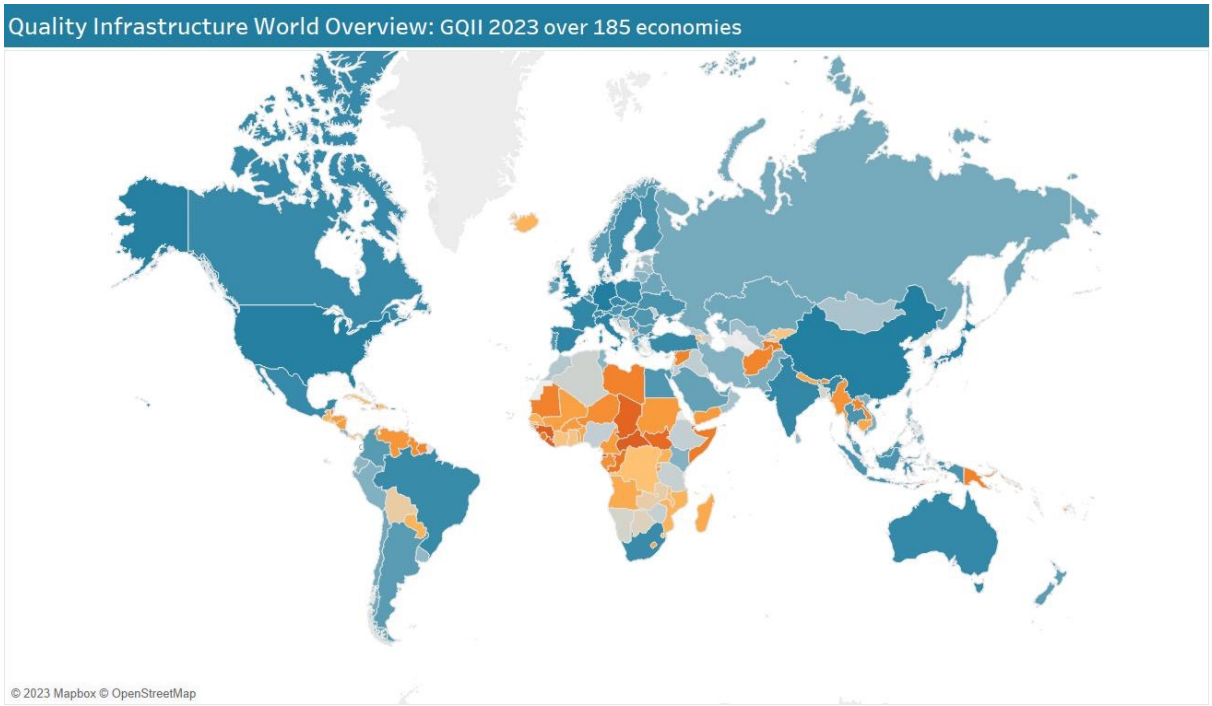


Figure 3: Global QI development map. Source: GQII

QI is particularly pronounced in North America, Europe, and China, followed by the other BRICS countries (Brazil, Russia, India, China, South Africa), Japan, Australia, and New Zealand, as well as parts of South America, Central Asia, and some Arab countries. There is considerable potential for development in various parts of Africa, as well as in Central America, the Caribbean and parts of Asia.

However, not all countries need to have all QI services available to meet the needs of its economy. One example is Iceland, which is not a signatory to the Metre Convention but does have metrological expertise in the form of the Metrology Division of the Consumer Agency in the Housing and Construction Authority (HMS). Iceland also has the primary national QI bodies, Icelandic Standards, and the Icelandic Board for Technical Accreditation (ISAC). In this respect, smaller countries naturally occupy lower positions in the GQII ranking.

The following tables 2, 3 and 4 show the ranking of the economies based on the data collected in 2023. The first column shows the country's name with the three-digit ISO country code (based on ISO 3166). The following columns list the general and ranking positions for metrology, standardization, and accreditation subcomponents.

GQII 2023: Global Ranking and Subrankings by QI area (185 Economies)

Economy Name	Economy Code	GQII Rank 2023	Rank Metrology 2023	Rank Standardization 2023	Rank Accreditation 2023
Germany	DEU	1	2	2	2
China	CHN	2	3	1	6
United States	USA	3	1	7	1
United Kingdom	GBR	4	5	3	9
Japan	JPN	5	4	5	16
Italy	ITA	6	15	4	3
Spain	ESP	7	13	9	8
Korea, Republic of	KOR	8	6	6	36
France	FRA	9	7	26	11
India	IND	10	20	8	5
Australia	AUS	11	9	13	18
Poland	POL	12	18	16	7
Canada	CAN	13	8	23	17
Czech Republic	CZE	14	17	12	13
Mexico	MEX	15	11	40	4
Switzerland	CHE	16	14	11	22
Brazil	BRA	17	10	18	24
Türkiye	TUR	18	16	24	12
Netherlands	NLD	19	19	10	14
South Africa	ZAF	20	12	25	20
Sweden	SWE	21	21	15	29
Hungary	HUN	22	27	22	21
Finland	FIN	23	25	20	35
Slovak Republic	SVK	24	23	38	25
Austria	AUT	25	28	19	38
Ukraine	UKR	26	24	46	18
Indonesia	IDN	27	38	37	10
Thailand	THA	28	29	30	32
Singapore	SGP	29	22	45	27
Belgium	BEL	30	42	21	22
Romania	ROU	31	33	14	49
Denmark	DNK	32	34	29	32
Malaysia	MYS	33	40	27	29
Egypt	EGY	34	30	42	32
Portugal	PRT	35	32	28	40
Bulgaria	BGR	36	36	34	44
Serbia	SRB	37	39	32	43
Greece	GRC	38	45	39	26
Colombia	COL	39	41	44	31
Argentina	ARG	40	31	43	51
Norway	NOR	41	43	35	42
New Zealand	NZL	42	35	50	45
Ireland	IRL	43	54	36	50
Saudi Arabia, Kingdom of	SAU	44	47	41	54
United Arab Emirates	ARE	45	50	52	41
Slovenia	SVN	46	44	54	55
Belarus	BLR	47	37	47	71
Kazakhstan	KAZ	48	46	66	28
Chile	CHL	49	60	53	48
Russian Federation	RUS	50	26	17	105
Pakistan	PAK	51	67	48	59
Viet Nam	VNM	52	66	62	37
Croatia	HRV	53	48	49	84
Peru	PER	54	64	55	58
Iran	IRN	55	61	31	87
Kenya	KEN	56	51	64	64
Philippines	PHL	57	69	51	60
Lithuania	LTU	58	57	70	57
Israel	ISR	59	53	33	99
Taiwan (Province of China)	TWN	60	52	118	15

Table 2: GQII2023 Top 60 Ranks

Germany, China, and the United States are at the top of the ranking. Overall, Germany maintained its leading position. However, the USA leads the ranking in metrology and accreditation and China in standardisation.

The GQII takes a global view and focuses on international standards. The USA has a diversi-fied standardization system that plays a vital role in various sector-related private standards organizations (OLTHOFF 2022). The GQII even tends to underestimate the importance of US standards, as private standards such as ASTM International (OECD 2021) were not covered.

In Table 2, countries from all countries are represented in the list of the 60 leading economies. With 21 countries, the European Union (EU) is the most strongly represented. However, different countries from North and South America, Asia, and Africa are also prominently represented.

A comparison of the overall ranking with the individual rankings reveals some significant differences.[8]

Year/ Rank	GQII	Metrology	Standardization	Accreditation
2023	8	6	6	36
2021	7	6	7	16
2020	6	7	14	6

Table 3: GQII Rank Comparison for the Republic of Korea in 2023, 2021, and 2020

Table 3 shows the stability of metrology and the overall ranking of the Republic of Korea. However, from 2020 to 2021, the country improved from rank 14 to rank 7 around standardization to position itself further at rank 6 in 2023. In terms of accreditation, the economy now only occupies 36th place, whereas in 2021, it occupied 16th place, and in 2020 even 6th place. We attribute these fluctuations to errors in data collection. This again shows how important it is for the national accreditation bodies to provide and validate their data.

Year/ Rank	GQII	Metrology	Standardization	Accreditation
2023	10	20	8	5
2021	10	21	9	5
2020	10	19	9	7

Table 4: GQII Rank Comparison for India in 2023, 2021 and 2020

Conversely, Table 4 shows stability in all areas in the case of India. The country consistently occupies 10th place in all years of comparison. In metrology, the rank ranges between 19th (2020) and 21st (2021). Indian standardization increased from rank 9 (2020 and 2021) to 8 (2023). The accreditation rank improved similarly from 7 (2020) to 5 (2023).

8. A comparison of the ranking positions for 2023, 2021 and 2020 can be downloaded from the following link https://gqii.org/wp-content/uploads/2024/04/gqii_rank_years.xlsx

GQII 2023: Global Ranking and Subrankings by QI area (185 Economies)

Economy Name	Economy Code	GQII Rank 2023	Rank Metrology 2023	Rank Standardization 2023	Rank Accreditation 2023
Ecuador	ECU	61	55	87	53
Tunisia	TUN	62	58	67	62
Costa Rica	CRI	63	49	88	56
Uruguay	URY	64	56	81	65
Sri Lanka	LKA	65	79	63	52
Hong Kong, China	HKG	66	63	96	47
Uzbekistan	UZB	67	80	80	39
Latvia	LVA	68	71	86	46
Luxembourg	LUX	69	86	57	67
Estonia	EST	70	59	69	88
Qatar	QAT	71	83	58	74
Oman	OMN	72	88	60	69
Mongolia	MNG	73	75	78	61
North Macedonia	MKD	74	74	79	66
Morocco	MAR	75	62	68	103
Kuwait, the State of	KWT	76	84	65	82
Cyprus	CYP	77	119	71	70
Georgia	GEO	78	73	113	68
Jordan	JOR	79	110	72	75
Iraq	IRQ	80	68	61	114
Moldova, Republic of	MDA	81	78	102	72
Nigeria	NGA	82	118	56	95
Ethiopia	ETH	83	95	83	79
Zimbabwe	ZWE	84	87	95	76
Tanzania	TZA	85	101	89	77
Mauritius	MUS	86	92	91	80
Bosnia and Herzegovina	BIH	87	70	74	102
Albania	ALB	88	98	115	63
Azerbaijan	AZE	89	72	97	90
Algeria	DZA	90	99	59	108
Bahrain, Kingdom of	BHR	91	104	77	86
Montenegro	MNE	92	65	90	112
Namibia	NAM	93	89	116	81
Bangladesh	BGD	94	82	82	107
Botswana	BWA	95	93	109	85
Zambia	ZMB	96	90	134	78
Bolivia, Plurinational State of	BOL	97	77	98	110
Jamaica	JAM	98	85	93	109
Panama	PAN	99	76	91	124
Ghana	GHA	100	91	75	130
Kyrgyz Republic	KGZ	101	107	150	73
Malta	MLT	102	94	85	120
Côte d'Ivoire	CIV	103	146	76	104
Democratic Republic of the Congo	COD	104	133	103	92
Armenia	ARM	105	120	109	98
Malawi	MWI	106	130	122	89
Dominican Republic	DOM	107	106	106	106
Cuba	CUB	108	96	103	116
Eswatini	SWZ	109	122	141	83
Iceland	ISL	110	133	84	131
Paraguay	PRY	111	81	133	115
Guatemala	GTM	112	110	112	111
Mozambique	MOZ	113	124	136	91
Uganda	UGA	114	124	73	138
Senegal	SEN	115	133	107	113
El Salvador	SLV	116	108	114	123
Trinidad and Tobago	TTO	117	100	99	135
Seychelles	SYC	118	130	144	93
Angola	AGO	119	148	139	96
Lebanese Republic	LBN	120	124	94	136

Table 5: GQII2023 Ranks 61 to 120

Some smaller high-income countries such as Cyprus, Estonia, Iceland, Kuwait, Qatar and Trinidad and Tobago are ranked 61st to 120th. Also included are upper-middle-income countries, mainly from Latin America and the Caribbean, lower-middle-income countries from Africa and Central Asia, and a few low-income African countries (Democratic Republic of Congo, Ethiopia, Malawi, Mozambique and Uganda).

GQII 2023: Global Ranking and Subrankings by QI area (185 Economies)

Economy Name	Economy Code	GQII Rank 2023	Rank Metrology 2023	Rank Standardization 2023	Rank Accreditation 2023
Madagascar	MDG	121	148	139	97
Nepal	NPL	122	124	105	133
Cambodia	KHM	123	97	120	132
Benin	BEN	124	121	130	119
Lesotho	LSO	125	148	159	93
Mali	MLI	126	148	117	129
Rwanda	RWA	127	133	101	140
Palestinian Territories	PSE	128	130	129	126
Cameroon	CMR	129	148	100	141
Nicaragua	NIC	130	110	151	118
Burkina Faso	BFA	131	146	126	125
Yemen	YEM	132	148	162	100
Honduras	HND	133	133	132	128
Sudan	SDN	134	133	111	146
Fiji	FJI	135	102	124	166
Venezuela, Bolivarian Republic of	VEN	136	105	160	121
Barbados	BRB	137	113	122	166
Myanmar	MMR	138	124	124	142
Togo	TGO	139	148	143	127
Saint Lucia	LCA	140	109	127	156
Gabon	GAB	141	133	119	156
Niger	NER	142	148	157	122
Guyana	GUY	143	103	148	148
Burundi	BDI	144	148	121	166
Macao, China	MAC	145	124	145	137
Bahamas	BHS	146	148	127	146
Bhutan	BTN	147	148	136	139
Brunei Darussalam	BRN	148	133	138	142
Comoros	COM	149	148	182	100
Lao People's Democratic Republic	LAO	150	148	142	142
Afghanistan	AFG	151	148	135	166
Suriname	SUR	152	113	153	153
Papua New Guinea	PNG	153	148	147	149
Syrian Arab Republic	SYR	154	123	108	172
Dominica	DMA	155	113	158	156
Libya	LBY	156	133	152	151
Mauritania	MRT	157	148	149	153
Somalia	SOM	158	148	154	149
Kosovo	XKX	159	148	182	117
Sierra Leone	SLE	160	148	154	152
Belize	BLZ	161	113	170	153
Grenada	GRD	162	113	173	156
Guinea-Bissau	GNB	163	148	178	134
Liechtenstein	LIE	164	148	165	145
Gambia	GMB	165	148	160	166
Tajikistan	TJK	166	145	163	165
Congo	COG	167	148	166	156
Maldives	MDV	168	148	167	156
Cabo Verde	CPV	169	148	168	156
Solomon Islands	SLB	170	148	179	156
Samoa	WSM	171	148	180	156
Saint Kitts and Nevis	KNA	172	142	146	172
Haiti	HTI	173	176	131	172
South Sudan	SSD	174	148	182	166
Saint Vincent and the Grenadines	VCT	175	142	164	172
Chad	TCD	176	176	154	172
Antigua and Barbuda	ATG	177	142	174	172
Guinea	GIN	178	176	169	172
Liberia	LBR	179	176	171	172
Djibouti	DJI	180	176	172	172
Central African Republic	CAF	181	176	175	172
Equatorial Guinea	GNQ	181	176	176	172
Vanuatu	VUT	183	176	177	172
Tonga	TON	184	176	180	172
Timor-Leste	TLS	185	176	182	172

Table 6: GQII2023 Ranks 123 to 185

The last group, ranked 121 to 185, includes some high-income small countries and island states such as Antigua and Barbuda, Barbados, Brunei Dar es Salaam, Lichtenstein and St. Kitts and Nevis. Smaller middle-income states such as Belize, Fiji, Nicaragua and Tonga are also represented. Almost half of this group, 27 countries, are currently categorised as least developed countries.

In summary, economically strong and larger countries rank higher, whereas very small or less developed countries tend to rank lower. Rudimentary elements of QI, such as ISO-certified companies or accredited test laboratories, can also be found in the countries at the bottom of the GQII ranking.

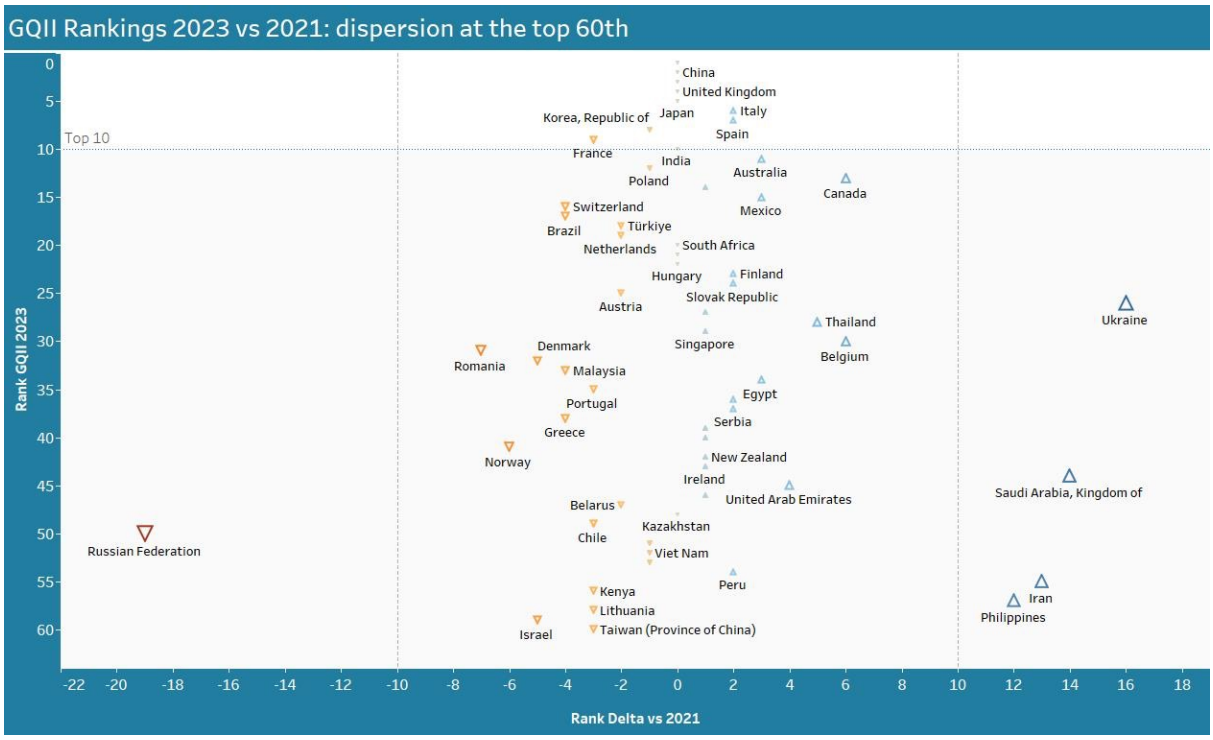


Figure 4: Changes in the rankings of the top 60 economies

The development of a national QI system is a process that takes many years, meaning that the ranking positions of individual countries are pretty stable in the short period under review from 2020 to 2023. Figure 4 shows the QI development status and its changes for the top 60 countries in the ranking. The vertical line reflects the level of QI development; the more developed a country's QI is, the higher it is positioned. The horizontal line shows the changes in the ranking positions between 2021 and 2023, with those climbing up on the right and those moving down on the left.

Ukraine, Saudi Arabia, Iran and the Philippines had the most significant rise in rank positions, while the Russian Federation lost considerable ground. However, if we look at the development since 2020, there has yet to be a clear trend for the Philippines, Iran and Ukraine.

For Russia, the data for the 2023 survey could only be collected by one accreditation body (the Association of Analitical Centers 'Analitica'). No data on the accredited bodies was available for RusAccreditation and STC-IS Joint Stock Company Scientific Technical Center. Despite the Russian war of aggression in Ukraine, the IAF emphasizes that accredited conformity assessment activities, as well as the activities of certified organizations of the Russian Federation, can continue as long as sanctions are not violated.

Only in the case of Saudi Arabia can it be assumed that the considerable investments in national QIs in recent years have visibly borne fruit.

CORRELATIONS

A constitutive component of the GQII reports is the correlation graphs with important development indicators and rankings. It is important to note that correlations are statistical and do not necessarily imply causation. Nevertheless, the correlations can provide relevant information to understand the potential contributions of QI to the development of economies and aim to encourage further indepth research using the full GQII data base.

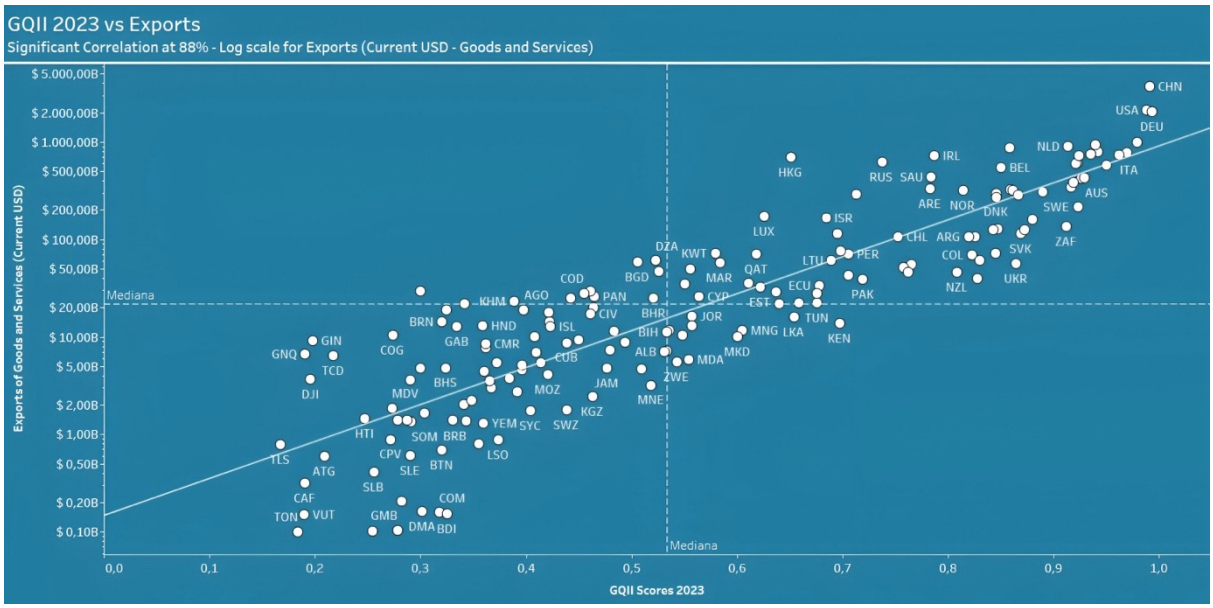


Figure 5: Correlation between the GQII and exports

Figure 5 shows the correlation between the GQII value (abscissa) and exports of goods and services on a logarithmic scale (ordinate). Given the large number of countries, we select a few random examples to illustrate the patterns.

The correlation is significantly positive at 88%. The countries that lie above the correlation line (e.g. Hong Kong, Ireland, and Algeria) achieve above-average exports with the given QI, whereas countries such as Ukraine, Kenya and Burundi export below average for their QI level.

[9] *See IAF Blog entry Q9, 26/10/2023, https://iaf.nu/en/faq/does-the-additional-statement-on-the-situation-in-ukraine-provided-to-iaf-members-on-20220513-mean-that-iaf-members-abs-abs-accredited-cbs-etc-are-no-longer-allowed-to/ (Retrieved 19/04/2024).*

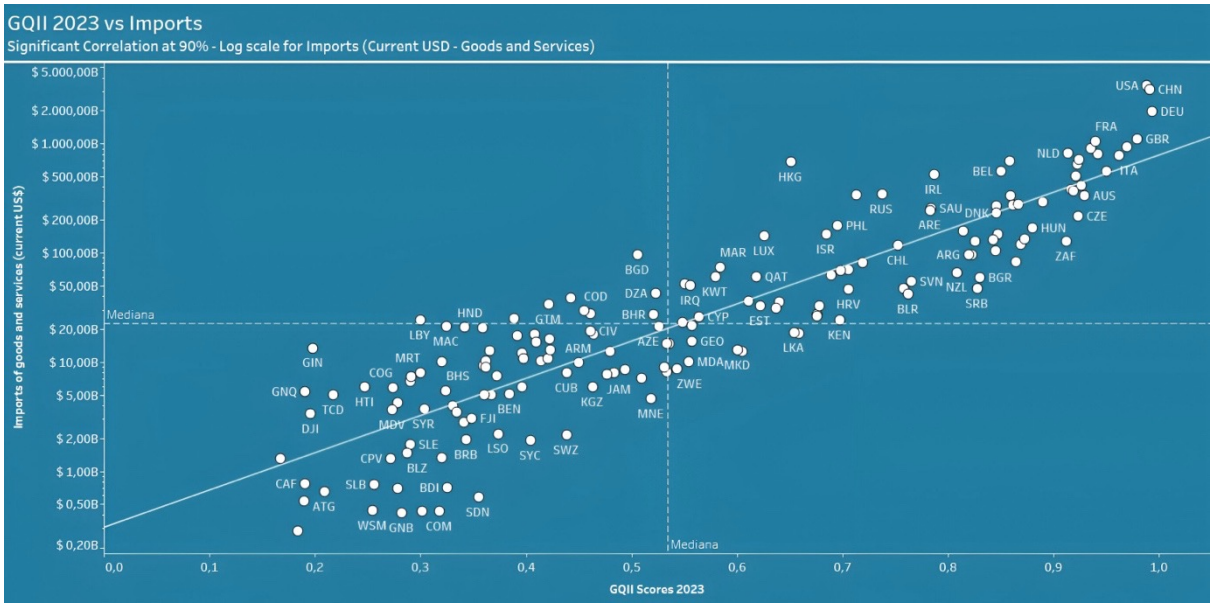


Figure 6: Correlation between the GQII and imports

The correlation between QI development and imports (Figure 6) is even more significant than that of exports, with a positive coefficient of 90%. In this respect, it can be assumed that QI will also be developed and expanded to protect domestic consumers. Both correlations confirm the importance of QI for foreign trade.

Figure 7: Correlation between the GQII and ECI

Figure 7 shows that the demand for national QI increases with the economy's complexity. The Economic Complexity Index (ECI) of Harvard University's Kennedy School of Government Growth Lab[10] (Hausmann 2013) can be used for benchmarking. The index ranks countries according to their productive knowledge. Countries that can export many products that few others export achieve exceptionally high rankings.

Figure 8 displays that the correlation between GQII 2023 and ECI 2021 is also significant at 78%. In the case of China, Portugal, and Qatar, the level of development of the QI corresponds to the level of complexity of the national economy. Given the complexity of their economies, Japan, Israel, and Panama have relatively underdeveloped QIs. In contrast, countries such as Australia, Ecuador, and Nigeria have highly developed QIs, considering the degree of complexity of their economies.

This data is useful for QI organizations seeking to build new relations or collaborations with other national sectors. Correlations can initiate discussions around the role of QI in promoting international trade, such as ensuring compliance with new regulations related to sustainability or the circular economy.

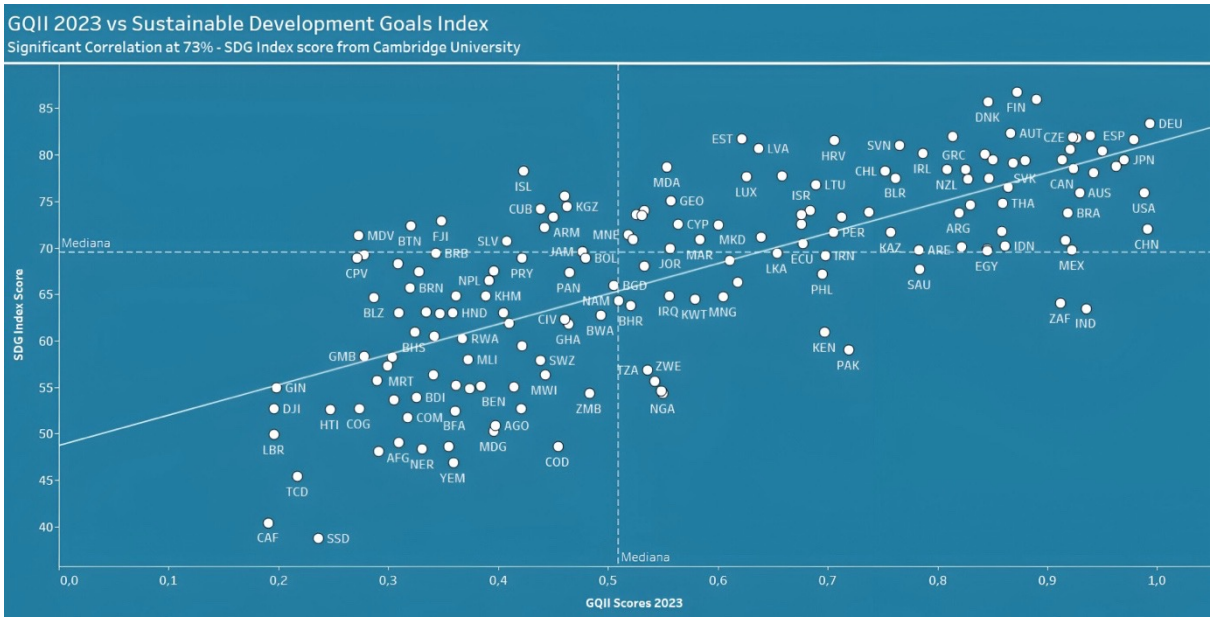


Figure 8: Correlation between the GQII and SDGs

The QI organisations see themselves as enablers for achieving the Sustainable Development Goals (SDGs), essential to protecting the planet, ensuring a dignified life for all, and achieving inclusive economic growth and prosperity (UNIDO 2019).

Figure 8 depicts the level of development of the national QI concerning the SDGs. The y-axis records the SDG achievement using data from 2022 by Cambridge University's SDG Index[11]. The correlation with the GQII2023 is positively significant at 73%. Countries such as Finland, Estonia, and the Republic of Moldova, whereas countries such as India, Pakistan, and Nigeria, have invested relatively little in achieving the SDGs concerning their QI.

Our results are similar to those of the QI4SD Index, which looks for QI's readiness to contribute to SDG achievement (UNIDO 2022). The QI4SD assigns the 17 SDGs to the so-called "3 Ps": People, Planet and Prosperity. Aggregating to this level allows a more precise analysis according to the canonical "pillars" of sustainable development: social (people), environmental (planet), and economic (prosperity).

Each country has a score representing the state of QI in the People, Planet, and Prosperity pillars, using data relating to social, environmental, and economic issues. These scores are calculated using indicators for metrology, standards, accreditation and conformity assessment.

[10] *The datasets are based on latest trade data of the year 2022, https://atlas.cid.harvard.edu/data-downloads (Retrieved 01/11/2023).*
[11] *https://dashboards.sdgindex.org/rankings (Retrieved 01/11/2023).*

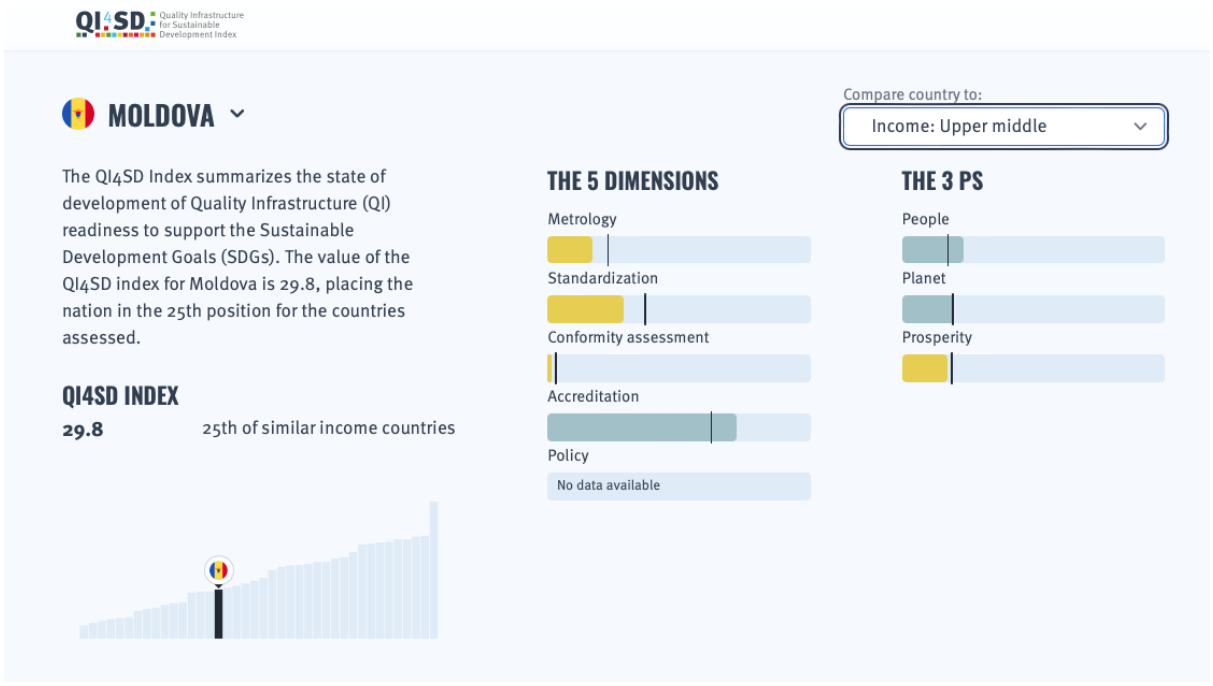


Figure 9: QI4SD country profile Republic Moldova

For comparison, we choose Moldova and Nigeria, with similar, average GQII ranking positions, but considerable differences in the SDG index score and rank. Moldova ranks 81 in the GQII and 25 in the SDG index (score 78.6); Nigeria ranks 83 in the GQII and 146 in the SDG O index (score 54.3). Figure 9 shows that compared to other upper-middle-income countries, Moldova achieves an above-average score in the People dimension of the SDG. In contrast, the country performs averagely in the Planet dimension and clearly below average in the Prosperity dimension. In the area of QI, the Republic of Moldova has comparatively low values in metrology, standardization and conformity assessment, whereas accreditation has a relatively high value.

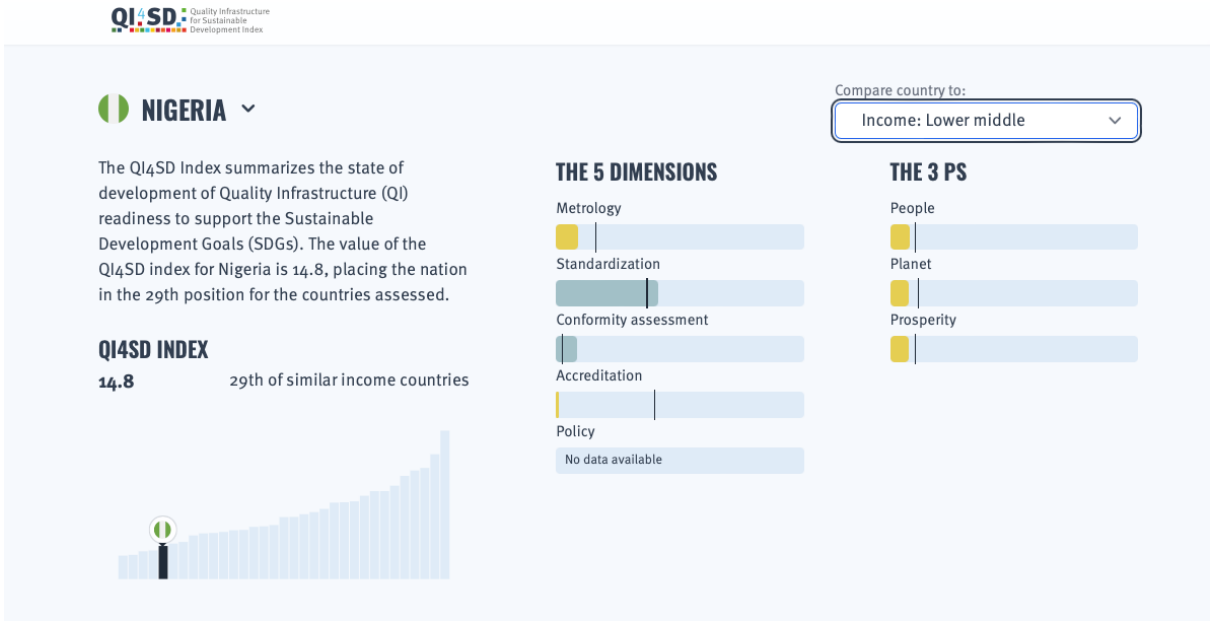


Figure 10: QI4SD country profile Nigeria

[12] https://hub.unido.org/qi4sd/MDA (Retrieved 19/04/2024).

Figure 10 shows that Nigeria is below the SDG average in all 3 Ps compared to other low-income countries.[13] Regarding QI, the country achieves above-average values in standardization and conformity assessment. In contrast, it performs below average in metrology and accreditation.

QI supports transparency in trade and ensures trust between trading partners. Nevertheless, there are always opportunities to exploit and manipulate the system to one's advantage in legally regulated and voluntary areas. Corrupt practices such as falsified certificates in testing, inspection and certification or manipulated measuring devices can undermine the credibility of the QI.

The QI system is designed to develop technical standards in participation-orientated procedures. The auditors and certifiers should be technically competent and independent. As an extra layer, accreditation checks the checkers.

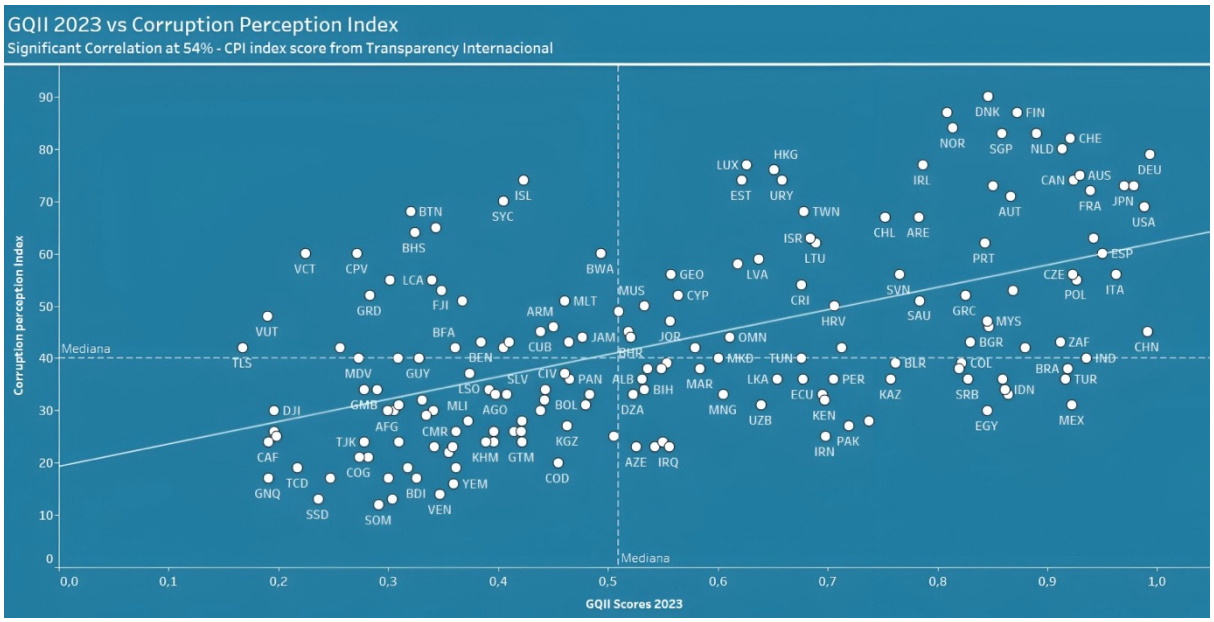


Figure 11: Correlation between the GQII and CPI

We assume that a country's culture of honesty or corruption influences the functioning of a QI. For this purpose, we compare the countries' positions in the GQII with those of the Corruption Perceptions Index (CPI) published by the non-governmental organization Transparency International.[14] The CPI ranks countries on a scale of 0 (highly corrupt) to 100 (very clean) according to their perceived level of corruption in the public sector. It is based on expert assessments and opinion polls. The CPI generally defines corruption as abusing entrusted power for private gain.

Figure 11 shows a comparatively weak correlation between the expansion of QI and a country's position in the Corruption Perceptions Index (CPI). The correlation is positive, with a coefficient of 54%. If we select any GQII score, we can also see from the y-axis that the countries differ greatly in perceived corruption. In the case of a GQII score of 0.7, we see Hungary (HRV) exactly on the correlation line, whereas a similar GQII score in Hong Kong and Uruguay shows less perceived corruption and more perceived corruption in Kenya, Pakistan and Iran. The question of the extent to which corruption affects the functioning of national QI systems remains open. One measure to combat corruption through QI is ISO 37001—Anti-bribery management systems. This standard can be used within the QI bodies and by companies and organisations in the country. Finally, the systematic introduction of accreditation and the strict peer evaluation of accreditation bodies should also stop corruption in the QI system.

13. https://hub.unido.org/qi4sd/NGA (Retrieved 19/04/2024).
14. https://www.transparency.org/en/cpi/2023 (Retrieved 03/04/2024).

VISUALISATIONS

We have summarized the GQII information for individual countries in country profiles. Each country profile provides the key QI indicators at a glance, including international comparative values. These data sheets can be used to inform decision-makers and provide other interested parties with a quick overview of a country's quality infrastructure.

Using India and Saudi Arabia as examples, the reader can see the GQII ranks of the countries' QI and the three main components of metrology, standardization, and accreditation. Selected metrics are broken down for each category, and the absolute numerical value and, in turn, the ranking position is shown. At the same time, the respective average value of all economies is displayed, making it easier to categorise the country value.

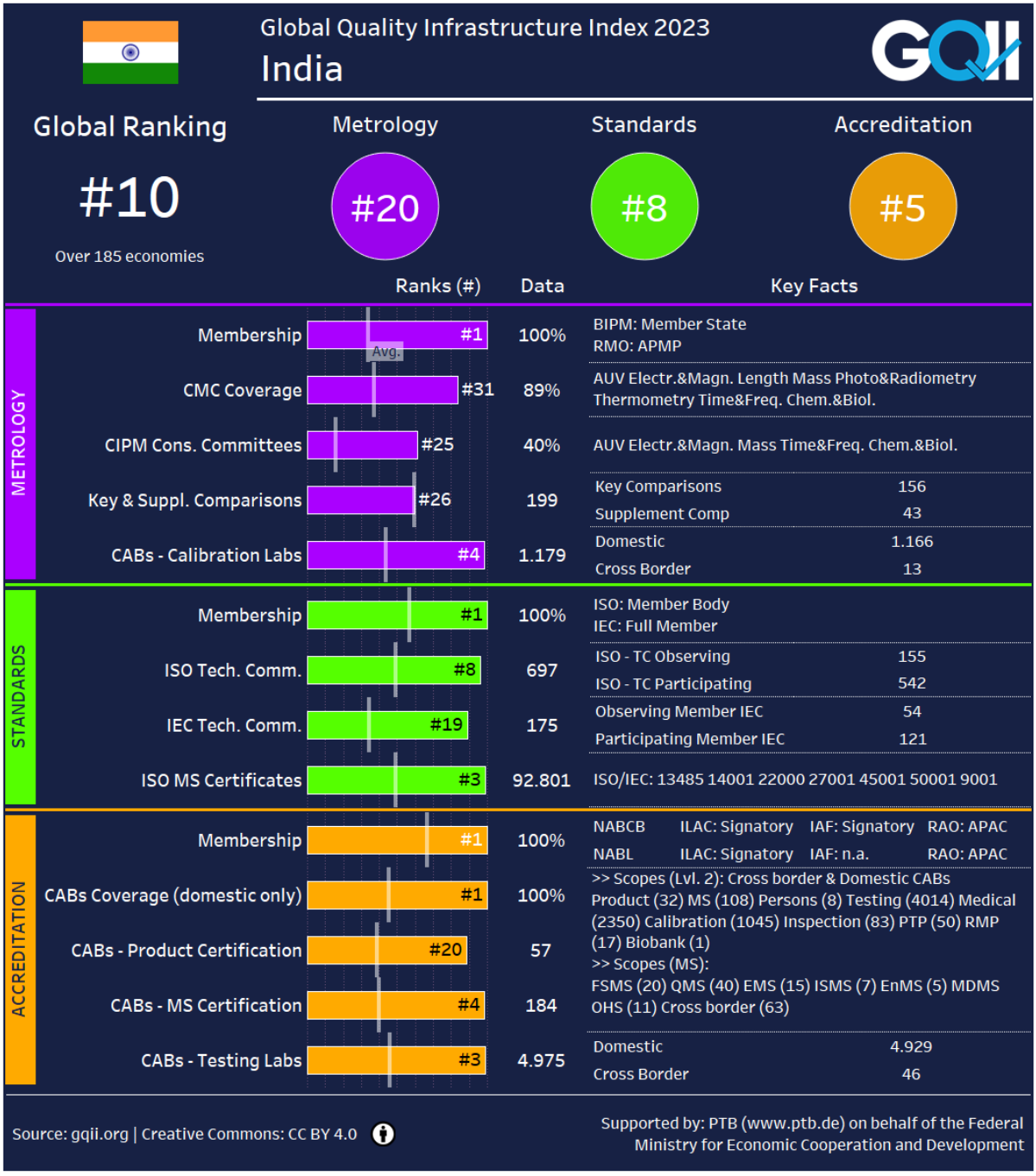


Figure 12: Country profile India

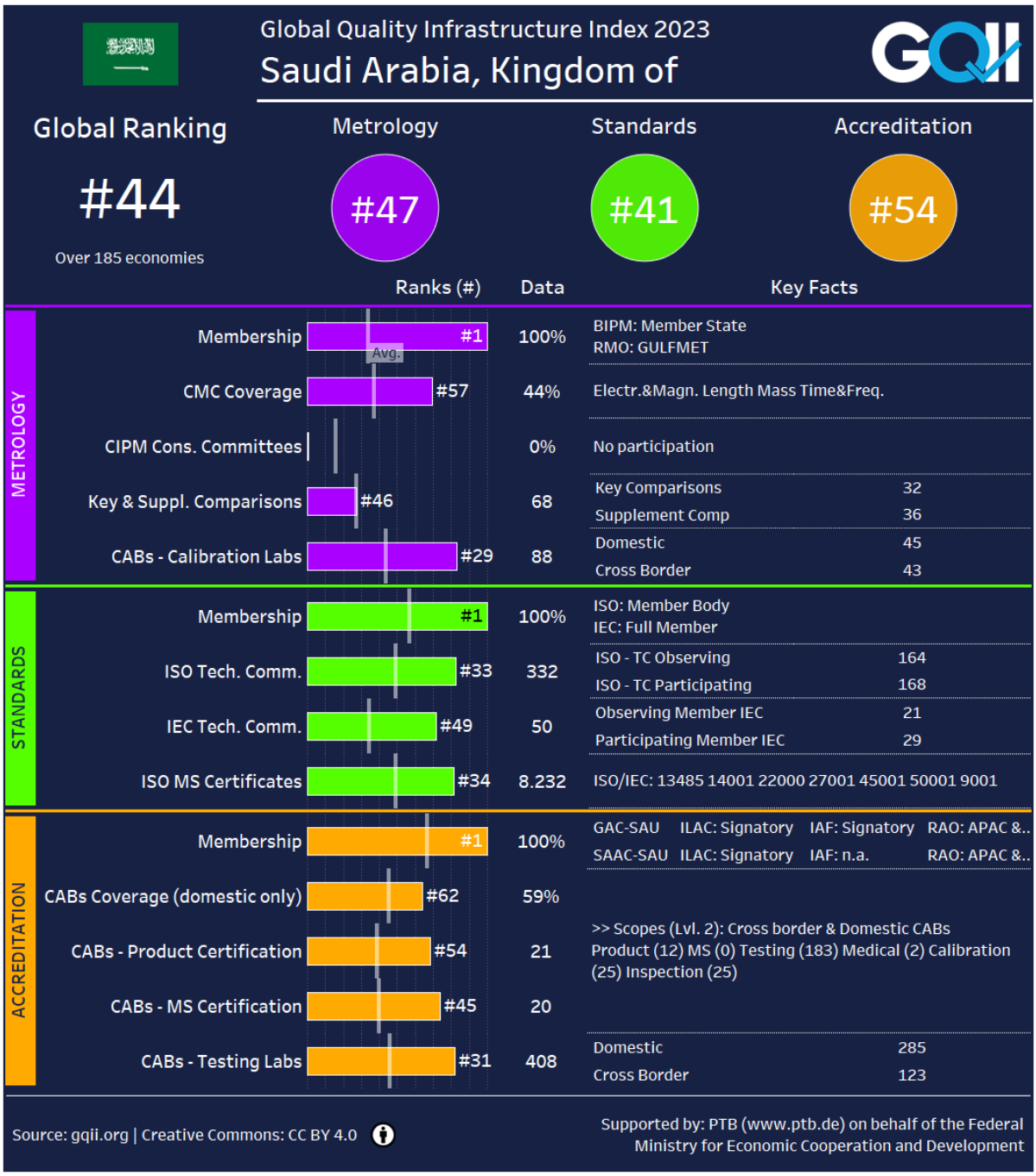


Figure 13: Country profile Saudi Arabia

In addition to the visualization of the QI indices, some QI bodies also show an increasing interest in making their data transparent. An outstanding example is the provision of data on accredited bodies by the Ecuadorian Accreditation Service (SAE). On the Tableau Public platform,[15] interested parties can find detailed figures on accreditation, including a break-down by scheme and sector. SAE provides information on cross-border accreditation on maps.

15. https://public.tableau.com/app/profile/saeecuador/viz/Reportes-SAE/SAEenCifras (accessed 24/04/2024).

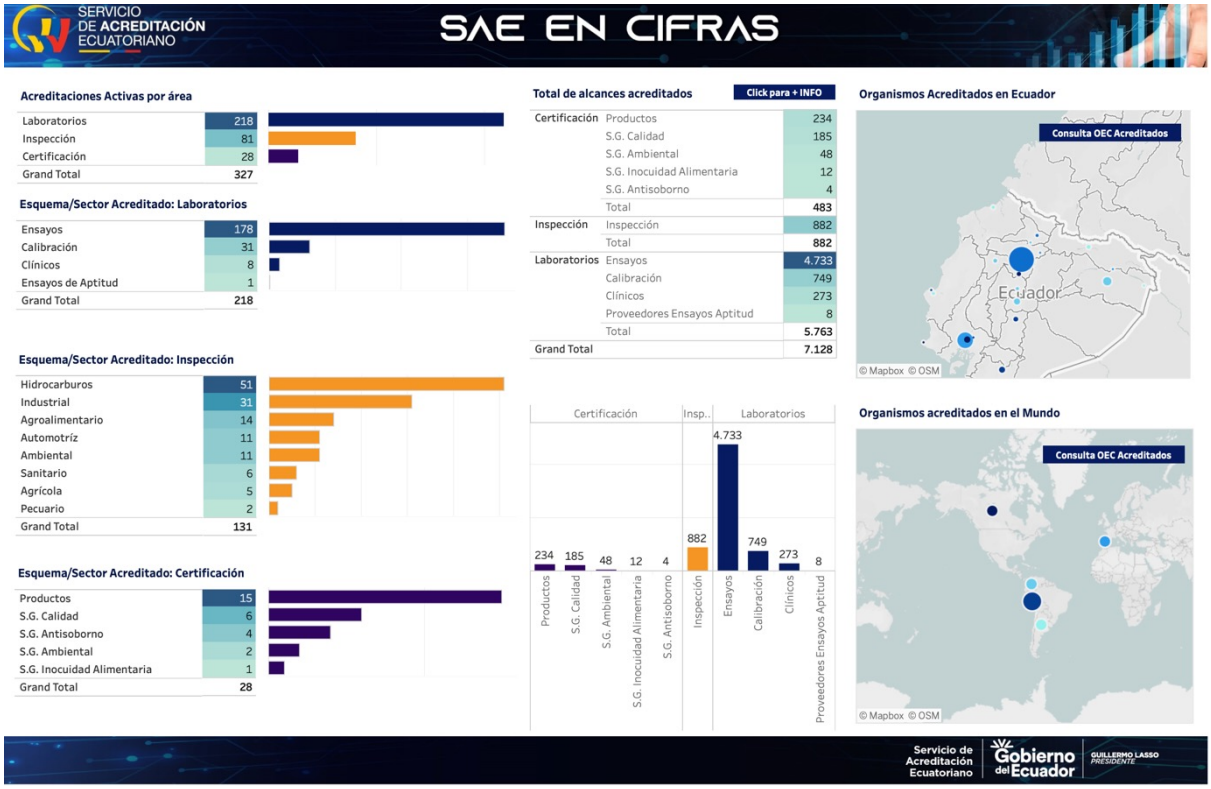


Figure 14: https://public.tableau.com/app/profile/saeecuador/vizzes

RESEARCH

The reception of the GQII in technical and scientific publications is also vital for disseminating the GQII. For example, the GQII was used for case studies on QI for countries such as India, Iran, Mexico and the United Kingdom (BHATNAGAR 2023; KHAKIFIROOZ 2023; OCEGUEDA 2024, RAB 2023). The GQII was also used to analyse the impact of QI on the participation of African companies in global value chains (GVC) (RAMKISSOON 2024). Finally, the authors of the QI4SD Index also mention the GQII and compare the results (UNIDO 2022).

AUTOR	RESEARCH QUESTION	MAIN FINDINGS
BHATNAGAR, RAB, WAN, & YADAV 2023	What is the role of quality measurements and relevant Indian infrastructure?	For establishing, implementing, and confirming the quality criteria for goods and services, a QI is an effective tool. For domestic markets to operate effectively as well as to have access and to be recognized on the global stage, high-quality infrastructure is essential. Along with promoting and preserving economic development, it is crucial for social and environmental harmony.
KHAKIFIROOZ & TAVAKOLI GOLPAYGANI 2023.	What is Iran National Quality Infrastructure (NQI) and how it is positioned in the GQII?	The GQII plays as a good indicator to measure the growth and the performance of QI of any economy. It provides valuable data that can be used for different types of analysis by QI body representatives, policymakers, and other leaders to informed business decisions making.
OCEGUEDA & ACEVES 2024	What is the scope of the quality concept, the integrating elements of the Quality Infrastructure System in Mexico?	The challenges that Mexico must overcome to obtain acceptable indicators in the Quality Infrastructure System Indices; the perception of the factors that generate Mexico's recent low indices in the Global GQII, and the encouraging future of Mexico in terms of QI.
RAB & BROWN 2023	What is the importance of the UKQI for national growth?	For a nation's overall development, a strong QI is crucial. The UKQI continues to serve as an example for others seeking to develop from first principles, or further develop, a national QI. The benefits of the United Kingdom QI system have been evidenced by the contribution of UKQI organisations to a number of case studies demonstrating support for industry and innovation.
ONAC 2024	How is Colombia's performance in the GQII?	Colombia exhibits a strong foundation in quality infrastructure, positioned as the third-leading country in Latin America. Persistent investment and adherence to global best practices will be crucial for Colombia to sustain and improve its competitive edge internationally.
RAMKISSOON 2024	Does QI have an impact on GVC participation? Is it necessary for African countries to develop their QI ecosystems to become more integrated into GVCs?	QI plays an important role in GVC engagement and that all countries seeking to become embedded in GVCs should invest in the development of their QI ecosystems. If QI services are not locally available, firms may be forced to use QI services in third countries to prove that their products and processes comply with specific standards or technical regulations.

Table 7: Overview of research work related to the GQII

3 CONCLUSIONS AND OUTLOOK

The GQII 2023 report is a further attempt to document the state of development of the global quality infrastructure. In 2023, QI maintained its level of services in most countries and was partially able to expand them, particularly in management system certification.

Today, 185 countries and economies are included in the GQII. The ranking of countries mainly remained stable during the observation period, although massive investments in QI are slowly bearing fruit in some cases.

The GQII has already inspired several researchers to look at the development of QI in different countries and its contribution to sustainable development. The GQII provides valid data for empirical analysis and comparative data over a few years.

Data availability and quality remain a significant challenge. Quality infrastructure organisations are slowly discovering the benefits of providing data for monitoring and strategically analysing QI. However, the growing interest in data from stakeholders within QI and its regulators, policymakers, and academia is encouraging.

The aim for the future should be to join forces to work with QI data and to initiate a broad debate. The multiple benefits of a reliable data basis should be emphasised. The digitalisation of the quality infrastructure is an enabling factor in this regard.

ANNEX 1: GQII FORMULA AND DATA SOURCES

The GQII ranking is computed according to the following formula:

$$GQII_i = \Big\{\big[Metro.Membership_i + CMC\ Coverage_i + CIPM\ Cons.Comm._i + K\&SC_i + CABs\ (Calbr.\ Labs.)^*_i\big] \times \frac{1}{5}$$
$$+\ \big[Stdzn.Membership_i + ISO\ Tech.\ Comm._i + IEC\ Tech.\ Comm._i + ISO\ Survey_i\big] \times \frac{1}{4}$$
$$+\ \big[Acred.Membership_i + CAB\ Coverage_i + \big(CABs\ (ISO\ 17065)_i + CABs\ (ISO\ 17021)_i + CABs\ (Tst.\ Labs.)^*_i/3\big)\big] \times \frac{1}{3}\Big\} \times \frac{1}{3}$$

Notes: All values in the formula are expressed in Percentile Ranks. *ISO/IEC 17025

This formula was also used in the previous editions of the GQII in 2020 and 2021.
The following tables explain the data sources and weighting:

Indicator	Weighting	Calculation
Metro. Membership	BIPM Member: 1 BIPM Associate member: 0,5 RMO Member: 0,1	The membership values of a country (maximum 1)
CMC coverage	Each of the 9 metrology areas is weighted equally	Sum of CMC areas covered by the NMI and DI divided by 9
CIPM Cons. Comm.	Member: 1 Observer: 0,5	Sum of the scores of the 10 committees (maximum 10)
K&SC	Total number	Total number by country
CABs (Calibr. Labs)	Total number	Number of accredited calibration labs by all ABs in a country plus the CABs accredited by foreign ABs.

Table 8: Metrology data

Indicator	Weighting	Calculation
Stdzn. Membership	ISO: Member body 1 Correspondent member: 0,5 Subscriber members: 0,5 IEC: Full member: 1 Associate member: 0,5	
Techn. Comm.	ISO + IEC P member: 1 O-member: 0,5	The membership values of a country in both organisations are added up (maximum value 2).
ISO Survey	Total number	Summary of certificates of all management standards per country

Table 9: Standardization data

Indicator	Weighting	Calculation
Accred. Membership	IAF Member 0,5 + MLA Signatory 0,5 = 1 ILAC member 0,5 and MRA: Signatory 0,5 = RAC Member 0,5 + RAC MRA signatory 0,5* * Is an AB member of several RACs the highest individual score is considered (maximum value 1)	Membership values are added (maximum 3)
CAB Coverage	Each of the 18 accreditation scopes covered is assigned an equal weighting.	Number of accreditation scopes covered by all ABs of a country (counting at least one CAB)/18. These consist of 4 IAF MLA (level 3) *, 7 IAF MLA (level 5) and 7 ILAC MRA scopes (level 3). As ISO 14065 is superseded by ISO/IEC 17029, both are considered one scope.
CABs (ISO 17065)	Total number	Number of CABs accredited by all ABs in a country plus the CABs accredited by foreign ABs.
CABs (ISO 17021)	Total number	Number of CABs accredited by all ABs in a country plus the CABs accredited by foreign ABs.
CABs (Tst. Labs)	Total number	Number of CABs accredited by all ABs in a country plus the CABs accredited by foreign ABs.

Table 10: Accreditation

ANNEX 2: CHRONICLE OF THE GQII 2022/ 2023

After the GQII2021 report was published, it was presented on various occasions and used by quality infrastructure organisations:

Date	Activity
23/11/21	Presentation of GQII at 13th INetQI MEETING
23/11/14 and 15	Participation of Dr. Ulrich Harmes-Liedtke on UNIDO Expert Working Group on QI4SD, Vienna
23/11/08	Online Presentation of GQII at Quality Congress of FONDONORMA, Caracas/ Venezuela
22/11/07	Presentation of GQII at Regional Policy Dialog of the Inter-American Development Bank (IADB) Network of Science, Technology and Innovation, virtual event
23/11/02	Presentation GQII at SASO, Riyadh/ Saudi Arabia
23/10/13	Presentation GQII with ONAC and SICAL in Bogotá/ Colombia
23/07/02	Online Presentation GQII at TTLABS Accreditation Workshop, Port of Spain/ Trinidad and Tobago
23/06/20	Presentation of GQII at PTB Asian-Europe Meeting, Braunschweig/ Germany
23/05/31	The Vietnamese Ministry of Science and Technology commits to improving its position in the GQII ranking, https://vietq.vn/bo-sung-noi-dung-quy-dinh-ve-ha-tang-chat-luong-quoc-gia-nqi-d211092.html
23/04/27	First QI Research Workshop organised by PTB and TU Berlin, Berlin/ Germany
23/03/01	TÜRKAK publishes that "Türkiye is one of the top 10 countries in the field of accreditation", https://www.turkak.org.tr/en/news/turkiye-is-one-of-the-top-10-countries-in-the-field-of-accreditation.html
23/02/09	Shri Jaxay Shah, Chairperson of Quality Council of India (QCI) refers to the GQII, mentioning that India's national accreditation system has been ranked 5th in the world in the recent Global Quality Infrastructure Index (GQII) 2021https://pib.gov.in/PressReleasePage.aspx?PRID=1897809
22/12/23	Article on GQII published in IAF Outlook, https://iaf.news/2022/12/23/despite-the-coronavirus-pandemic-quality-infrastructure-continues-to-grow-worldwide/
22/12/15	Publication of the GQII 2021 Report: Tends, Comparison & Use of Data
22/11/26	Online Presentation of GQII at International Quality Congress in Guatemala, Guatemala City

ANNEX 3: RELEVANCE OF PRIVATE STANDARDS

The importance of privately owned standards and corresponding certification schemes has increased recently. Table 10 shows certification schemes recognized by the IAF. The certification bodies recognized via these schemes follow the ISO/IEC 17011 standard requirements and the specific requirements for the product, management system, personnel and validation/verification certifications.

Owner	Type	Level 3	Level 4
FAMIQS	Management systems	ISO/IEC 17021-1	FAMI-QS Certification Scheme
ICAO	Validation and Verification	ISO 14065	Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) certification scheme
FSSC	Management systems	ISO/IEC 17021-1	FSSC 22000 Schemes Parts3 and 4
IAQG	Management systems	ISO/IEC 17021-1	IA9100 Standard
			IAQG ICOP certification scheme transition to 9104-1
Global GAP	Product Certification	ISO/IEC 17065	GLOBALG.A.P. Produce Handling Assurance (PHA) GLOBALG.A.P. Integrated farm assurance IFA
BRCGS	Product Certification	ISO/IEC 17065	BRCGS Global Standard for Food Safety, Parts III &IV
			BRCGS Global Standard for Agents and Brokers, Parts III &IV
			BRCGS Global Standard for Packaging Materials, Parts III &IV
			BRCGS Global Standard for Storage and Distribution, Parts III &IV
			BRCGS Global Standard for Gluten Free Certification Program, Parts III &IV
			BRCGS Global Standard for Consumer Products Personal Care Household, Parts III &IV
IPC	Person Certification	ISO/IEC 17024	IPC Management System Auditors
IFS	Product Certification	ISO/IEC 17065	IFS Standard Food
			IFS Standard Broker
			IFS Standard Logistics
			IFS Standard PACsecure

Table 11: Private certification schemes recognized by IAF

In the data collection for the GQII 2023, we first asked the accreditation bodies about the number of accredited bodies for the oldest certification scheme for products, GlobalGAP Integrated Farm Assurance and the management systems FAMI-QS Certification Scheme.

Country	GQII Rank 2023	Global G.A.P. IFA CPCCs
ESP	7	18
USA	3	18
CHN	2	17
ITA	6	16
FRA	9	12
ARG	40	8
NLD	19	6
POL	12	6
DEU	1	5
VNM	52	4
ZAF	20	4
AUS	11	2
AUT	25	2
BRA	17	2
CZE	14	2
DNK	32	2
IND	10	2
MEX	15	2
CHE	16	1
KOR	8	1
URY	64	1

Table 12: Country distribution of accredited GlobalG.A.P. IFA certification bodies

The GlobalG.A.P. IFA was the first private certification scheme to sign a Memorandum of Understanding with the IAF. It is also relevant because it provides data for preparing product certification. Table 11 shows the number of accredited product certification bodies for GlobalG.A.P.

Of the 185 countries in the GQII, 21 countries have accredited certification bodies for Global G.A.P. IFA. Spain and the USA each have 18 accredited certifiers, followed by China (17), Italy (16) and France (12). Outside Europe, certification bodies in Argentina (8), Vietnam (4) and South Africa (4) are relatively well represented.

AB	Country	GQII2023	FAMI-QS
DAkkS	DEU	1	3
RvA	NLD	19	3
SAS	CHE	16	1
COFRAC	FRA	9	1
ACCREDIA	ITA	6	1
DSM (STANDARDS MALAYSIA)	MYS	33	1
JASANZ-NZL	NZL	42	1

Table 13: Country distribution of accredited FAMI-QS accredited certification bodies

Table 12 shows the data for the FAMI-QS certification bodies surveyed in seven countries. Here, Germany and the Netherlands lead with three accredited bodies for management systems each.

Data collection from private certification schemes was first attempted in 2023. We found that some of the accreditation scheme owners also publish very detailed data on the accredited bodies. A systematic analysis of this information could provide additional knowledge on disseminating and using QI services. So far, however, this information has yet to be considered for calculating the GQII ranking positions.

ANNEX 4: FREQUENTLY ASKED QUESTIONS

During the data collection and the presentation of the GQII, we repeatedly received questions, some of which are listed and answered here:

Question 1: What is the business model of the GQII, and how can it be ensured that the GQII exists in the long term and is regularly updated?
Answer: The GQII is primarily based on the commitment of Mesopartner and dedicated professionals who want to contribute to data transparency in the field of QI. At the same time, the various versions of the GQII have been financially supported by the German Ministry of Economic Development and Cooperation (BMZ) and PTB.

The future of the GQII depends mainly on the extent to which the institutions of QI and international development cooperation support it. At the same time, the effort involved in data collection could be significantly reduced if the international QI institutions and development cooperation provided their data in a disaggregated and machine-readable form.

Question 2: How does the GQII deal with the innovations in the field of validation and verification?
Answer: In previous GQII editions, we considered ISO 14065 for verifying validating bodies. The system remains valid until 2024 but is currently in a transition phase. Until 30 June 2024, validating verification bodies accredited to ISO 14065:2020 must also demonstrate compliance with the requirements 17029:2019.

However, from 30 June 2024, ISO 14065:2020 will become a subordinate standard to ISO 17029:2019, and ISO 14065 will be combined with ISO 14064-3:2019. ISO 14065 will then become a level 4 standard.

In the GQII 2023 report, we will include calculations of the coverage of ISO 17029 accreditations alone. However, if an AB currently has ISO 14065 accredited verifying validating bodies but does not yet have ISO 17029 accreditations, we will continue to assess it as equivalent this year.

Question 3: To which point in time does the GQII data refer?
Answer: The data used for the GQII are dynamic, regularly updated by the QI organisations, and published on websites. Even if, for example, the accreditation bodies report the number of accredited CABs to their regional and international organisations, these still need to be published in a form disaggregated by country or AB.

For the GQII, the data is collected over some time (usually from May to August of the current year). Since the indicators generally change little in a year, this type of counting is sufficiently accurate for the global ranking.

However, in the future, it would be desirable for the QI institutions to agree on a point in the year when the data will be collected and published.

Question 4: Does the GQII consider the accredited CAB's status?
Answer: For the GQII, we only record the valid accreditations at the time of the count. Frozen or revoked accreditations are not considered.

Question 5: What are the differences between certificates, sites and organisations in the context of accreditation and conformity assessment?

Answer: Accreditation certificates, sites, and organisations/bodies are related concepts in conformity assessment and accreditation. Let's break down the differences between these terms:

Unit	Explanation
Certificates	An accreditation certificate is a formal document that verifies and acknowledges that a particular entity, such as an individual, institution, program, or service, meets specific standards and criteria set by a recognised accrediting body. Accreditation is a process of evaluation and assessment by these accrediting bodies to ensure that the entity meets established quality and performance standards. Accreditation certificates provide tangible evidence of compliance with these standards and can enhance credibility, trust, and recognition within the industry or field.
Sites	In the context of accreditation, a site refers to a physical location or facility where certain activities, services, or programs are conducted. Accreditation might involve evaluating an organisation and a specific site where services are offered. For example, in the healthcare sector, a hospital might seek accreditation for specific departments or services like radiology or laboratory testing, and each of these sites would need to meet the relevant standards.
Organisations	An organisation is a structured entity encompassing individuals, resources, and operations working together to achieve specific goals. In the context of accreditation, an organisation usually refers to an entity such as a university, hospital, laboratory, certification body, or any other establishment that offers services, programs, or products. An organisation's accreditation involves assessing its operations, governance, and compliance with established standards to ensure its high quality and competence.

In collecting data for the GQII, we only collect the number of accredited organizations. We always speak of an organization when it has its own legal identity. We use the terms "organizations" and "bodies" as synonyms.
Accreditation refers to capabilities and processes defined in standards (for example, the ISO 17000 series) but never to the organization.

Question 6: Why does GQII ask ABs to enter their accreditation data in a form when the information is available on the ABs' website?

Answer: The requested information can be found on the ABs' websites. In GQII, we only collect information that is freely available.

At the same time, it could be more straightforward to map the data from the website to the categories of our form. This is especially true for the data on cross-border accreditation. We, therefore, ask all ABs to enter their data into the DataSheet to obtain up-to-date data and avoid mistakes.

Question 7: Does the GQII only cover accreditations of ABs from countries that are signatories of ILAC's MRAs or IAF's MLAs?

Answer: No. The GQII was developed to measure quality infrastructure development worldwide, focusing on developing and emerging countries. We record all accreditations that are based on ISO and IEC standards.

However, to reflect the different levels of recognition, we weigh the number of accredited CABs. The number of signatories of MRAs from ILAC or MLAs from IAF is fully considered. For ABs that have signed only one regional MRA/MLA, we weigh the number of accredited CABs by 0.5 and all others by 0.1. In this way, we want to recognise the developmental progress of countries just starting to build a national accreditation system.

Question 8: Following our submission of data, we were discussing the numbers, and it became apparent that we had differing views of what was required in the cross-border tab, i.e. Are you only looking for the number and location of CABs established overseas, or should this number also include UK CABs that have an office overseas which is contained within their accreditation. There was also a view that this should include countries where certificates are issued (but where there is no local CAB -i.e., they travel from another country). I don't believe it is the intention to include these.

Answer: On our motivation: As we rank globally as a national QI, we want to capture the emerging competencies in countries with a rudimentary quality infrastructure. These countries still need to have their own accreditation body; even if one exists, it only covers some demanded scopes. Here, foreign accreditation bodies are accrediting first testing laboratories and later certification bodies for products or management systems. These developments make the data on cross-border accreditation visible.

At the same time, the data on cross-border accreditation show different strategies of accreditation bodies in industrialised countries. We analysed the data and relationships in a study and organised a webinar, see https://gqii.org/cross-frontier-accreditation/ .

Regarding your question: In the tab "cross-border" tab, we only record the number of CABs accredited by UKAS and have their head office abroad. British CABs with offices abroad are not recorded as cross-border, as the services are provided via UK experts. I want to emphasise that we record organisations and not sites.

Question 9: What is the recommended date of the submitted data? If you do not have any specific date, our AB will send the latest data.

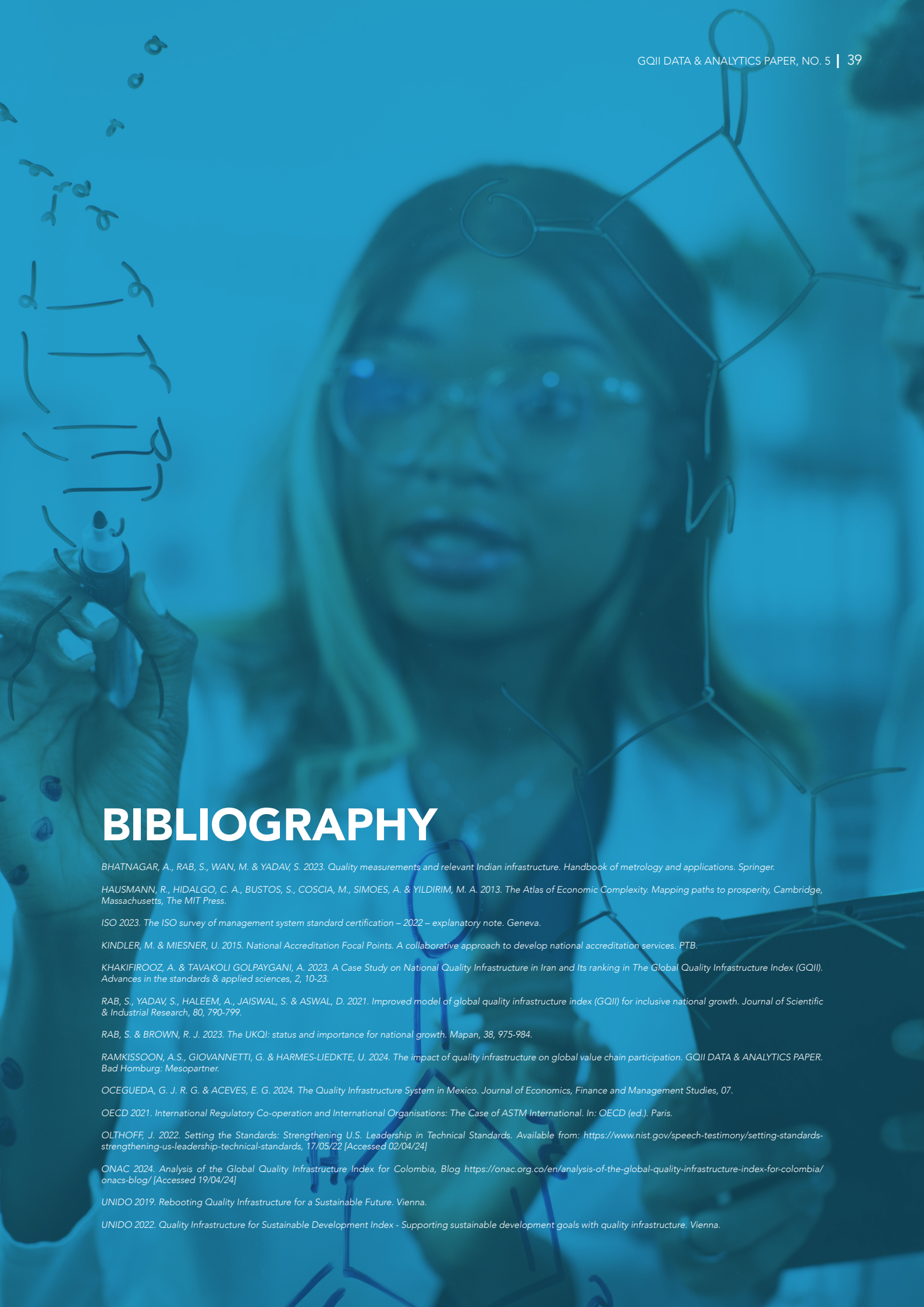
Answer: We collect the data in the middle of the year, from June to August. As the number of accredited CABs generally changes over shorter periods, we do not set a specific date. We also want to facilitate the reporting of ABs. In this respect, we request the ABs to share the current numbers of accredited CABs in the provided EXCEL file.

Question 10: How does the GQII handle the data provided by the accreditation bodies?

Answer: The GQII team only uses publicly available data. However, the accreditation bodies contribute by inserting their published data into the GQII EXCEL template. This ensures that the data is recorded correctly. It also reduces the effort to capture and publish the data at a central reference point. Our contribution is to compile data from different websites and publish them together. GQII requires that when users share our data with others, they do so under the Creative Commons licence, https://creativecommons.org/licenses/by-sa/4.0/, reference the data source when publishing and share the data under the same terms.'

Question 11: Why do you use the denomination Taiwan and not Taipei?

Answer: We follow the standard ISO 3166 - Codes for the representation of names of countries and their subdivisions when referring to each country or economy. According to the short name lowercase definition, we refer to "Taiwan (Province of China)"; see https://www.iso.org/obp/ui/#iso:code:3166:TW. We know this term is controversial and that APAC, IAF and ILAC use "Chinese Taipei". However, since we in GQII are guided by the ISO 3166 standard and refer to all QI institutions, we will continue to use the ISO 3166 term.



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