Strengthening Certification in Developing Economies

Technical Foundations, Emerging Trends and Recommendations for International Cooperation

Contents

Annexes

PTB's International Cooperation group

The Physikalisch-Technische Bundesanstalt (PTB) serves as Germany's national metrology institute. Within PTB, the International Cooperation group functions as an implementing organization of development cooperation. It is commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ) and the European Union.

This group aims to enhance economic, social, and ecological framework conditions to aid developing and emerging countries. It supports these countries in establishing and using a quality infrastructure that is both needs-based and internationally recognized. A functioning quality infrastructure is essential for everyday life, as it ensures fair and secure trade and serves as the cornerstone for a reliable health system, environmental protection and the expansion of renewable energies. PTB's International Cooperation group offers advice to governments and ministries, helps develop quality infrastructure institutions, and aids small and medium-sized enterprises.

Disclaimer

The views and opinions expressed in this study are those of the authors and do not necessarily reflect the official position of PTB.

Authors

Niels Ferdinand, Maria Llauradó, Stephanie Binks, Michael Hampel.

Here you can find this publication online:
https://www.ic.ptb.de/media/fileadmin/Publications/PTB_Study_Certification_Developing_Economies_EN.pdf

Executive Summary

Objectives of the study

Based on an explanation of the technical terms and the context relevant to supporting certification, the study defines key recommendations for how international cooperation organizations can support certification in emerging and developing economies. In this context, it describes existing approaches and examples, see Chapter 9.

Definition of certification

Certification is the provision of written assurance (a certificate) by an independent third party that a product, service, process, person, or system fulfils certain requirements. Through the certification process, it is confirmed that specific requirements included in standards are met.

Benefits of certification

The benefits of certification can be summarized as follows:

1. **Compliance and quality assurance:** Certification ensures products, services, and systems meet specific requirements, maintaining quality standards and regulatory compliance.
2. **International recognition and market access:** Market access is facilitated and international cooperation fostered by enhancing compliance with standard criteria.
3. **Risk management and insurance:** Certified management systems help reduce risks, leading to lower insurance premiums and demonstrating a commitment to safety standards.
4. **Consumer confidence and informed decision-making**: Product certification provides essential information to customers, enhancing brand reputation and credibility, as well as ensuring health and safety.
5. **Trade facilitation:** Certification ensures compliance with established requirements, overcoming obstacles related to non-tariff barriers and facilitating trade across borders.
6. **Environmental and social responsibility:** Sustainability certifications address environmental concerns, while certifications such as kosher and halal cater to specific consumer preferences and religious requirements.

7. **Trends and technological advancements:** The impact of digital transformation, new technologies, and industry-specific standards on the evolution of certification is highlighted, emphasizing improved speed, accuracy, and transparency.

Relevance of certification in developing economies

Certification is crucial for developing economies for several reasons:

- It aligns with international standards, facilitating trade and market access, thus promoting economic development.
- It provides credibility in meeting client requirements, addressing challenges like low sector development, lengthy supply chains, and weak public assurance systems.
- It ensures that commercial relations adhere to common criteria, promoting sustainable development in areas such as human rights, labour practices, environmental protection, and the reduction of corruption and bribery.

Classification of types of certification

Certification can be classified based on its legal character, subject, and content. The figure below summarizes certification types and their classification.

Types of certification		
Legal character	**Subject of certification**	**Content of certification**
Mandatory certification	Product certification	Quality / Resilience & IT security
Voluntary certitication	Management system certification	Safety / Environment
Mixed-type certificalion	Personnel certificalion	Social aspects / Sustainability
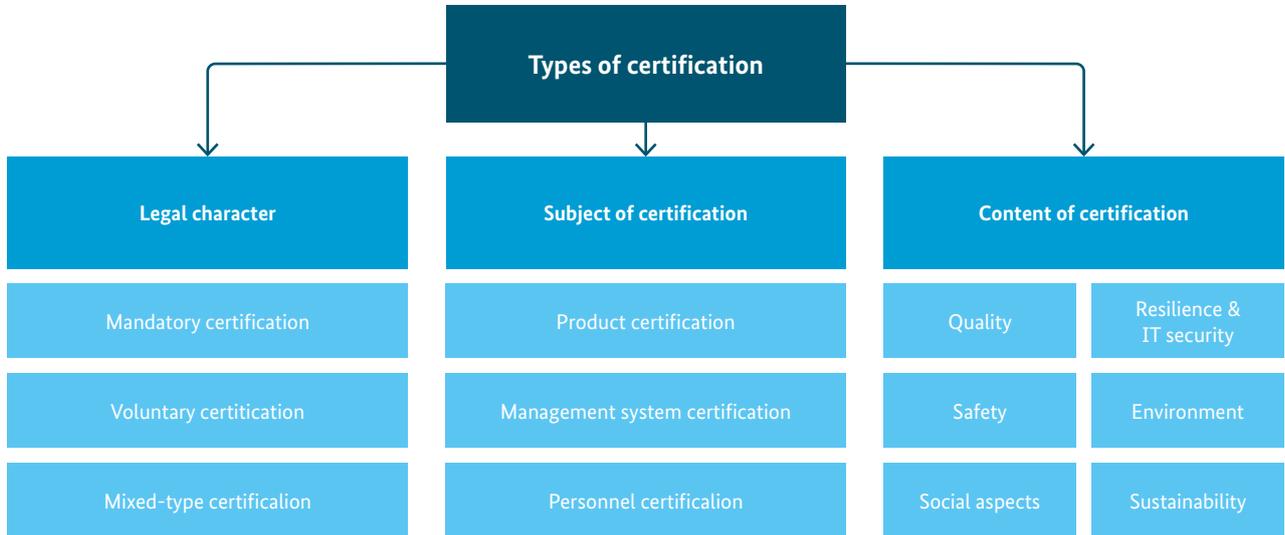
Certification as part of quality infrastructure

Certification is part of the quality infrastructure system, encompassing standardization, metrology, accreditation, conformity assessment, and market surveillance. It is interrelated to the other components and cannot be developed without the development of the other parts.

Trends in certification

Several trends[1] are steering the evolution of certification, as summarized in the table below:

Rise of digital transformation	■ New technologies, e. g. the internet of things (IoT), artificial intelligence (AI), blockchain ■ Digital platforms for data collection, analysis and reporting ■ Benefits: Improved speed, accuracy and transparency
Industry-specific standards	■ Focus on specialized services ■ Benefits: Customized solutions, greater alignment
Globalization and cross-border trade	■ Ensuring compliance with international standards and regulations ■ Benefits: Increased competitiveness and improved market access
Increased emphasis on cybersecurity	■ Assesses vulnerability of digital systems ■ Ensures data protection ■ Benefits: Increased security awareness and protection against risks
Quality assurance in the healthcare sector	■ Supports the demand for rigorous quality control measures ■ Benefits: Increased safety and efficacy of healthcare products as well as more certifications in the healthcare sector
Sustainability compliance in global value chains	■ Evaluation of environmental, social and ethical impact, alongside quality and safety ■ Increase in sustainability standards ■ Benefits: Assurance of environmentally friendly products and promotion of sustainability
Emergence of remote and virtual certification	■ Now easier due to technological advancements ■ Addresses challenges caused by travel restrictions ■ Benefits: Enhanced efficiency, cost savings and reduced emissions

1 Cohen (2024)

Approaches for the support of certification in international cooperation

Based on interviews with international experts, the study describes different approaches to fostering certification in emerging and developing economies as part of the international cooperation. Aspects to be considered when implementing the different options are described. The following figure gives an overview to the approaches identified:

Development of national certification bodies

Development of the quality infrastructure system

Support of system, product and personnel certification

Approaches to support certification

Development of standards

Development and implementation of certification schemes

Key Recommendations

This section summarizes the key recommendations of the study. Further specific aspects of different approaches to support certification via international cooperation can be found in Chapter 9.

Consider the requirements of the target market

The requirements of the target market of a product or service should be used as a starting point when determining how international cooperation can be used to fulfil quality, safety and sustainability criteria. Such criteria can be defined in standards or regulations, but can also include customer preferences or individual buyers' requirements. The fulfilment of such requirements along the entire value chain requires further support to improve the applying organizations' processes (for example, improved market surveillance measures carried out by authorities).[2] In this context, certification can contribute substantially to increased competitiveness but should not be seen as a stand-alone activity.

Support national quality infrastructure holistically[3]

The national quality infrastructure is an interrelated system in which each component and the regulatory framework are designed to work together seamlessly. The overall system creates the basis for the development of certification in a partner country. For the system to be coherent and effective, its elements must be developed in parallel. Additionally, the national quality infrastructure should be linked with the international framework through appropriate connections: aligning with the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) for standardization, the International Bureau of Weights and Measures (BIPM) and the International Organization of Legal Metrology (OIML) for metrology and legal metrol-

ogy, the Global Accreditation Cooperation (GLOBAC)[4] for accreditation, and various regional organizations.

Engage with stakeholders

Exchange and cooperation between quality infrastructure organizations as well as public and private stakeholders should be fostered. This support is essential for raising awareness and increasing demand for certification. Enhancing interaction among these players is vital because they typically operate in different areas and do not regularly communicate. Organized engagement processes among relevant stakeholders help create recognized standards, align related programs and strategies and lead to innovative approaches.

Consider the advantages of certification by national vs. international bodies in each specific case

The use of national certification bodies typically offers several advantages over international certification bodies operating from abroad. However, in some instances, certification by international bodies may be more suitable. Determining the most suitable approach requires an evaluation tailored to the specific context. The key considerations are summarized in the table below:

---

2 PTB has developed a method called *Calidena* to systematically analyse market requirements, quality issues and required activities for selected value chains *(https://www.calidena.ptb.de)*

3 The World Bank Group and PTB have developed a quality infrastructure diagnostic and reform toolkit. Its aim is to assist development partners and national governments in analysing the QI system and promote QI reforms and capacity building *(https://www.ptb.de/cms/en/ptb/fachabteilungen/abt9/gruppe-93/qi-toolkit.html)*

4 Established as a legal entity in December 2024, the Global Accreditation Cooperation will unify the work of the International Accreditation Forum (IAF) and the International Laboratory Accreditation Cooperation (ILAC). (ILAC, 2024)

Advantages of certification by national certification bodies	Cases in which international certification is to be preferred	Possible support by international cooperation
■ Lower costs ■ Consideration of national conditions ■ National income generation ■ Strengthening of national quality infrastructure	1. Lacking economic viability of national certification	■ Support the use of international certification services, at least in an interim phase ■ Monitor the market development to identify when demand might be sufficient to sustain new services by national certification bodies
	2. Lacking international recognition of national certification	■ Support the international recognition of national certification bodies ■ Support capacity building
	3. Lacking capabilities of national certification	

Table 1: Advantages of certification by national certification bodies vs international certification (Source: Own elaboration)

Prevent market distortion

The effects of the intervention on the certification market should be considered in the planning of support measures. Market distortions must be prevented by (for example) supporting only the certification of some organizations based on a specific standard, decreasing at the same time the demand for similar standards by other organizations that do not receive such support.

Harmonize standards

The increasing number of standards and regulations relevant for international trade leads to high burdens, especially for small producers from developing economies. This is the case for the regulations for imports into the European Union (EU), but also for producer-buyer relations based on private sustainability standards and codes of conduct. This is reflected in an increasing number of certification requirements based on such standards and regulations.

International cooperation should focus its support for new standardization initiatives on areas where no similar criteria or requirements exist. Wherever possible, existing standards should be adopted to the national standard framework or adapted if required due to specific contexts in developing economies. Additionally, initiatives to harmonize criteria defined in different standards or to recognize equivalency should be supported.

Involve existing organizations and initiatives

■ Many initiatives concerning criteria in global supply chains exist

■ Before supporting new organizations and initiatives, existing ones should be carefully evaluated and, if possible, supported and included in activities

Foster awareness and information sharing

It is particularly important to implement effective measures to raise awareness and to inform relevant stakeholders about the benefits of quality infrastructure in general and certification specifically. For example, studies demonstrating the benefits of investing in quality infrastructure services can contribute significantly to raising awareness among national stakeholders. Information and awareness raising activities on the importance of certification for buyers should not focus only on export markets. They are also relevant in developing economies, as the demand for certified products and services in their markets is often insufficient.

Consider recent trends in certification

The requirements of national and international markets evolve quicky. This is also reflected in national and international standards and the certification services based on such standards. The available technology also develops quickly and leads to new requirements and approaches for certification. The resulting certification trends, as described in Chapter 8, should be considered within the scope of international cooperation.

Set the right indicators

Projects supporting system, product and personnel certification often use output indicators focussing on the number of certifications issued. Such indicators are relatively easy to achieve in projects that finance or co-finance certification costs. However, they do not necessarily reflect relevant impacts related to long-lasting improvements in safety, quality, sustainability and increased competitiveness. In this context, it is recommended to avoid focussing too much on the numbers of certificates achieved and instead combine such approaches with indicators measuring the sustainable development of systems, products and personnel. For example, such indicators can cover increased sustainability of organizations (e.g. increased energy efficiency or decreased water use), improved competitiveness (e.g. increased sales in international markets), better products (e.g. higher fulfilment of client requirements measured in enquiries) or better knowledge of personnel (e.g. measured in enquiries).

Foster long term sustainability

International cooperation approaches to supporting certification in developing economies should be carefully evaluated and considered in the project planning. Rapid demand increases for certification driven by external support can be unsustainable if organizations or personnel lack viable long-term plans to cover certification costs. Approaches to supporting system, product and personnel certification should be embedded in measures supporting the quality infrastructure system holistically, while fostering durable capacity development and system-wide improvements.

1. Objectives, Methodology and Structure of this Study

This study has the following objectives:
- Define recommendations for how international cooperation organizations can support certification in emerging and developing economies
- Explain the technical terms and the context relevant to supporting certification
- Describe existing approaches and examples in this context

To provide this information, this document is structured as follows:
- Chapter 2 introduces certification and describes its benefits
- Chapter 3 explains why certification is important in developing economies
- Chapters 4 and 5 explain certification as part of the quality infrastructure system (QIS)
- Chapter 6 classifies different types of certifications
- Chapter 7 describes the organizations involved in certification
- Chapter 8 explains important certification trends
- Chapter 9 describes different approaches to supporting certification in developing economies

Chapters two to eight were developed based on desk research. A draft version was presented to selected international experts (see Annex A: List of experts reviewing the study and interviewed) and adapted to the comments received. The existing approaches were then discussed in semi-structured interviews with selected stakeholders from Africa, Central America, Southeast Asia and Europe, including representatives of certification bodies, other quality infrastructure organizations and coordinators of development cooperation projects involved in the promotion of certification in developing economies. The aspects discussed were complemented by document analysis. Altogether, these steps provided the information required to define the key recommendations at the start of the study.

© iStock
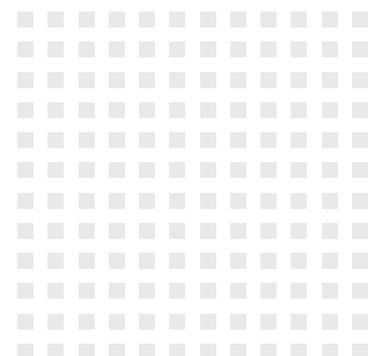
2. Certification

Certification is the provision of written assurance (a certificate) by an independent third party that a product, service, process, person, or system fulfils certain requirements. Through the certification process, it is confirmed that specific requirements included in standards are met. The independent character of the certification body (CB) distinguishes this process from a first party attestation (e.g. by a seller, producer, or supplier), known as a supplier declaration of conformity (SDoC) and a second party (e.g. a purchaser or user) attestation.

2.1. Certification bodies

The process described above is carried out by certification bodies. These organizations are mostly private entities. In some countries, public organizations also operate as certification bodies.

Certification bodies provide assessments of conformity with criteria defined in standards or specifications. In some cases, these assessments are based on reports from test laboratories.[5, 6] The results are stated in reports that include the findings from the assessment and, if applicable, any discrepancies with the requirements of the standard. Based on the assessments, and if the requirements are met, certification is granted.

2.2. Benefits of certification

The certification of products, systems, services and personnel provides a *seal of quality* that guarantees the specifications declared by the producer and the requirements of the consumer or stakeholders are met.

Certification based on international standards additionally provides international recognition of fulfilment with the defined criteria. Besides the given recognition, certification also demonstrates a commitment to fulfilling the standard's requirements, which include specific quality criteria.

These contributions are especially important in commercial relationships in which clients cannot assess by themselves if a product or service fulfils their requirements. The trust that may develop in direct supplier-client interactions is replaced with a credible assessment of conformity by recognized certification bodies. This credibility, in turn, facilitates trade based on commonly accepted criteria such as quality, safety and sustainability requirements. This benefits the organizations that receive the certification and users that make decisions based on certifications. Table 2 lists the benefits of certification.

2.3. Certification in international trade

Determining and examining whether products, systems and services comply with established requirements is essential in international trade. One obstacle to compliance is the non-acceptance of certifications (and test results), which results in exporters subjecting their products and processes to repeated and costly certification procedures. The World Trade Organization (WTO) has addressed this issue through three major agreements: The agreement on Technical Barriers to Trade (WTO/TBT), the agreement on the application of Sanitary and Phytosanitary Measures (WTO/SPS), and the agreement on Trade Facilitation (WTO/TFA), all of which seek to ensure that technical regulations and standards, as well as the procedures for determining compliance with them, do not obstruct international trade.

---

5 Physikalisch-Technische Bundesanstalt (PTB, 2007)

6 ISO/IEC (2020), ISO/IEC 17000:2020 (en)

Benefits in the areas of:		
Operational efficiency	**Market and customers**	**Compliance and strategic improvement**
■ Internal organization improvement ■ Process improvement ■ Productivity improvement ■ Product quality improvement ■ Personnel motivation ■ Enhancing innovation ■ Export improvement	■ Access to new markets ■ Market share improvement ■ Competitive advantage improvement ■ Corporate image improvement ■ Customer satisfaction	■ Anti-corruption and anti-bribery measure[7] ■ Approach for risk management in business ■ Better alignment of strategic, tactical, and operational policies and objectives ■ Better decision-making ■ Compliance of legislation ■ Problem solving improvement ■ Financial outcomes improvement ■ Facilitation of the access to governmental incentives

Table 2: Benefits of system and product certification[8]

The WTO agreements mentioned above include requirements for the international recognition of certification bodies and certificates issued based on their internationally recognized accreditation, as well as the use of international standards where possible (see further information in Chapter 5.1). Countries developing their national quality infrastructure and recognizing others in line with the WTO agreements foster the reduction of trade barriers.

This is very relevant for developing economies, who are at a greater disadvantage from technical barriers to trade (TBT). The inability to accept certifications across national borders is a significant trade obstacle.[9] The relevance of certification specifically in developing economies is the focus of the next chapter.
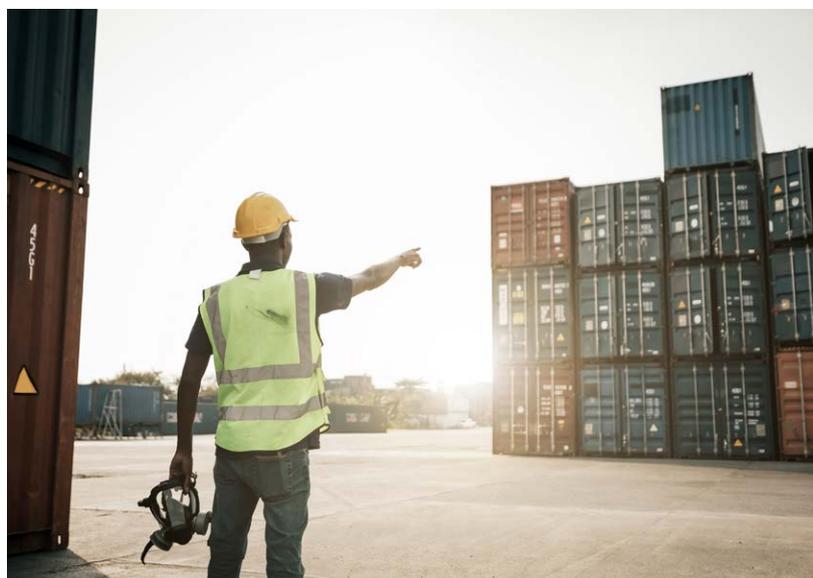
© iStock

---

7 By creating transparency of all processes through documentation and regular surveillance audits of third parties, the risks of bribery and fraud are greatly reduced. This transparency is created on three levels:
1. Companies through certification audits
2. Certifiers through assessments by the national accreditation bodies
3. National accreditation bodies through peer evaluations by ILAC, IAF or its regional members

8 This table summarizes the potential benefits of certification. They are extracted from Isharyadi and Kristiningrum's (2021) publication. The order in which they are listed is solely to provide an enumeration, i. e. it is not an indication of relevance. The benefits listed were found in some of the following publications as referenced in Isharyadi and Kristiningrum (2021): Hussain, T., Eskildsen, J.K., and Edgeman, R. (2018); Fonseca et al. (2017); Franceschini et al. (2011); Albulescu et al. (2016); Sampaio, P., Saraiva, P., and Rodrigues, A.G. (2009); Terziovski, M., and Guerrero, J. L. (2014); Islam, M.M., Karim, M.A., and Habes, E. (2015); Tarí, J.J., Molina-Azorín, J.F., and Heras, I. (2012); Kakouris, A.P., and Sfakianaki, E. (2018); Talapatra et al. (2019); Sá et al. (2020); and Siltori et al. (2020).

9 Standards Council of Canada (2023)
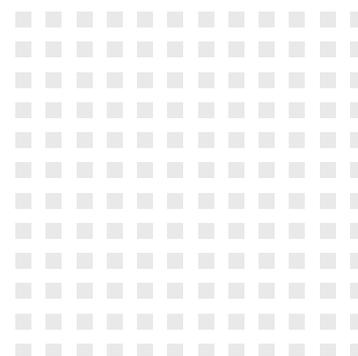
3. Relevance of Certification in Developing Economies

Certification is especially important in developing economies for the following reasons:

- Certification based on international standards facilitates international trade and the access of suppliers from developing economies to international markets. This, in turn, fosters **economic development.**
- **Trust in the fulfilment of client** requirements is hindered by low levels of sector development, long supply chains and gaps in the public assurance system (e.g. missing regulations, lacking resources for controlling/ inspection, corruption). **Credible assessment of conformity by recognized certification bodies** is therefore especially important for suppliers from developing economies.[10]
- Certification can ensure that commercial relations are based on common criteria to **prevent negative impacts and increase contributions to sustainable development,** for example with regard to human rights, labour practices, environmental aspects, and the reduction of corruption and bribery (see explanations in table 2: Benefits of system and product certification).

Over the past few decades, international cooperation organizations have taken different approaches to supporting certification as a driver for sustainable development. At the international level, the German Federal Ministry for Economic Cooperation and Development (BMZ) has a strategic focus on sustainability in global supply chains. Chapter 9 summarizes how international cooperation organizations can support certification.

---

10   Auriol and Schilizzi (2015)
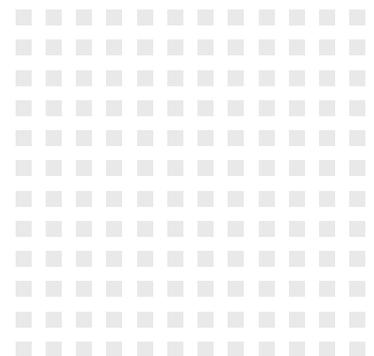
4. National Quality Infrastructure and How it is Linked to the International System

Quality infrastructure

In 2017, the leading institutions and promoters of quality infrastructure pertaining to the International Network on Quality Infrastructure (INetQI[11]), endorsed and developed a formal definition of quality infrastructure (QI):

> "The system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the quality, safety and environmental soundness of goods, services, and processes. The quality infrastructure is required for the effective operation of domestic markets, and its international recognition is essential to enable access to foreign markets. It is a critical element in promoting and sustaining economic development, as well as environmental and social wellbeing."[12]

National quality infrastructure

The national quality infrastructure encompasses standardization, metrology, accreditation, conformity assessment, and market surveillance[13]. On a national level, the following organizations are required as a minimum:[14]

■ A national metrology institute (NMI) responsible for the national measurement standards including international traceability and providing reliable, affordable calibration services.

■ A national standards body (NSB) to support the establishment of standards and promote their use to meet the requirements for export.

■ Access to the required accreditation services to guarantee the technical competence of laboratories, inspection bodies, and national quality certifications, i.e. ensuring the reliable performance of conformity assessment bodies (CABs). Such services can be provided either by a national accreditation body (NAB) and/or foreign accreditation bodies operating in the country.

The organizations mentioned above create the basis for the development of conformity assessment services by testing laboratories and certification and inspection bodies.

Figure 1 shows the components of the NQI, the relationship between the components, the services provided to the national value chain and links to the international system. Although not included in the figure, market surveillance is also part of the NQI as it ensures that products on the market comply with applicable regulations and requirements.

---

11 INetQI is an initiative aimed at bringing together all specialized organizations operating on a global scale and engaged in promoting and implementing quality infrastructure activities (metrology, accreditation, standardization, and conformity assessment) as a tool for sustainable economic development. (INetQI, 2024)

12 INetQI (2024)

13 Accreditation and market surveillance are both essential components of the national quality infrastructure. Accreditation underpins the competence and reliability of conformity assessment bodies, while market surveillance enforces compliance and protects public interests by monitoring products already on the market. Both functions must be performed by entities that are independent from each other, to avoid conflicts of interest, ensure impartiality, and maintain trust. Accreditation ensures technical competence without enforcement powers, while market surveillance exercises regulatory authority, including corrective actions and sanctions. Their separation strengthens the credibility and effectiveness of the quality infrastructure system.

14 Sanetra and Marbán (2007), Metrology Asia Pacific (2023)
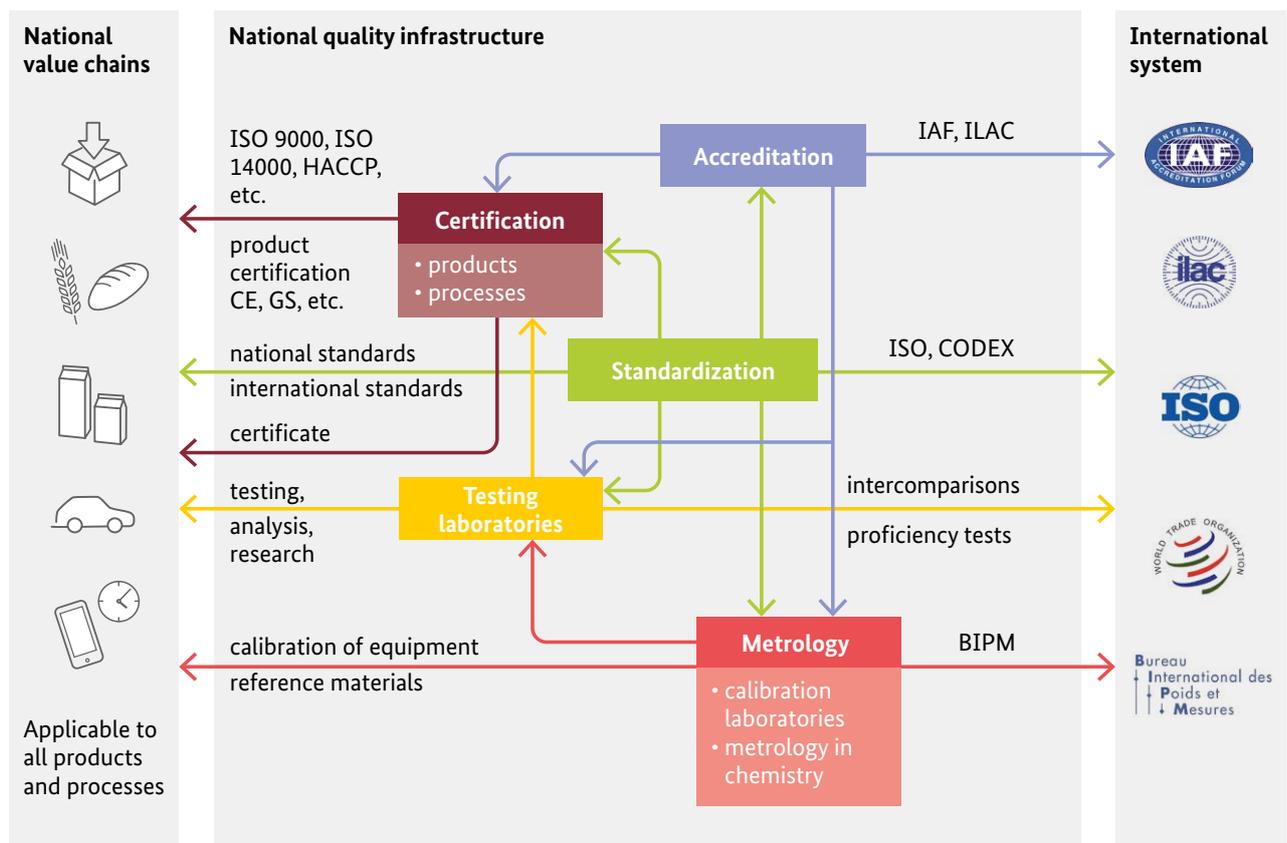
Figure 1: National quality infrastructure system and its relations to the international system (Source: Sanetra and Marbán, 2007)

As shown in Figure 1, the components are interrelated. The NQI must therefore be developed systematically and holistically; no component can be developed without the services of the others.

Benefits of the national quality infrastructure
The national quality infrastructure provides the foundation for ensuring safety and health, as well as the protection of the environment and consumers. As a result, it promotes social, economic, and ecological development.[15]
It is also crucial for the competitiveness of national companies in international markets, reducing TBT and supporting the integration of countries into the international system. [16, 17]

International system
As shown in Figure 1, the national quality infrastructure is related to the international system. The national organizations must be systematically linked to the international system in the form of the following institutions:

1. ISO and IEC for standardization
2. BIPM and OIML for metrology and legal metrology
3. Global Accreditation Cooperation for accreditation
4. The respective regional organizations

These relations between the national and international quality infrastructure ensure comparability, recognition of national services and traceability to the international system of units (SI).[18]

---

15 Frisch (2017)

16 Sanetra and Marbán (2007)

17 IEC, ISO, and United Nations Industrial Development Organisation
    (UNIDO, 2023)

18 Ferdinand et al. (2023)

5. Certification as Part of Quality Infrastructure

As explained in the previous chapter, certification is part of the quality infrastructure system and as such interrelated to its other components. Certification cannot be developed without the development of the other components. In this chapter, the components of quality infrastructure are briefly introduced to provide the background on their interactions with certification.

5.1. Standardization

Determining the technical specifications that products and services must meet, together with their test procedures and production processes, is the primary aim of standardization.[19] Standardization entails the development and provision of standards, as well as the dissemination of information about standards to interested parties. A standard is defined as follows:

> "Document approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods with which compliance is not mandatory."[20]

Voluntary nature
Standards provide a reference framework or a common technical language between suppliers and their customers. This, in turn, facilitates trade and technology transfer, and increases efficiency.[21] The use of standards in general is voluntary (compliance is up to the supplier or purchaser). However, standards may become mandatory if they are referenced in technical regulations.

Furthermore, their application may be required to access certain markets – for example, if international buyers request certification according to specific standards from their suppliers.

Public and private standards
As shown in Figure 2, standards can be categorized as being private or public.

Public standards are developed and promoted by organizations that are legally defined as standardization bodies by national and / or regional governments as well as multinational organizations. Examples of such standardization bodies include ISO at the international level, the European Standards Organizations (ESO) at the regional level and the German Institute for Standardization (DIN) at the national level. Private standards, however, are developed by non-governmental entities that are not legally defined as standardization bodies. These include individual firms, industry organizations, and non-governmental organizations (NGOs).

Today, private standards are increasingly important. They are mostly international, even if in some cases they were first developed on a national level (such as the Business Compliance Initiative, BCI).

Codes of conduct
Beside private standards, there are privately developed codes of conduct that can be certified. Hence, certification is not only relevant for standards, but also for privately developed codes of conduct. These codes are tailored to the specific values, principles, and operational requirements of private organizations and associations. The codes often include ethical guidelines, corporate social responsibility commitments, and industry-specific practices that are not covered by standards.

---

19 Ministry of Consumer Affairs (2023)

20 WTO (1994)

21 ISO (2005)

Public standards

International standards: ISO, IEC
Regional standards: EN, EAS, GOST
National standards: ANSI, AS, BS, DIN, IS, KS, SANS

Private standards

Consortia standards – food: GLOBALG.A.P, BRC
Retailers' private standards: Carrefour, Metro, Tesco, Unilever
Environmental integrity and social equity standards: Fairtrade, FSC, FLO
Consortia standards – high-technology sectors: GSM

Figure 2: Examples of public and private standards (Source: International Trade Center (ITC) and PTB, 2011)

National, regional, and international standards

Standards can be developed and applied on an international, regional, or national level. However, to prevent TBT, the WTO/TBT requires member countries to use existing international standards as the basis for technical regulations or conformity assessment procedures, provided these standards are effective and appropriate for achieving legitimate national objectives. These objectives include protecting the environment, preventing deceptive practices, and safeguarding human, animal, or plant life or health. Consequently, national standards should align with existing international standards where they are available and adequate to meet these objectives.[22]

Relation between standardization and certification

Certification confirms that a product, service, process, person, or system fulfils the requirements defined in standards. This means that certification cannot take place without the criteria defined in standards. In addition, the certification processes and the requirements for standardization bodies are defined in standards, namely ISO/IEC 17021-1: Certification of Management Systems, ISO/IEC 17024: Certification of Persons, and ISO/IEC 17065: Certification of Products, Processes and Services.

Certification can be based on national, regional, or international standards, defined by both public and private standardization bodies. To provide a certification service, the CB must have the specific standard in its certification scope and fulfil the requirements of the related ISO/IEC standard for the certification of (a) management systems, (b) personnel or (c) products, processes, and services.

---

22 ITC and PTB (2011)

5.2. Conformity assessment

Conformity assessment demonstrates whether a product, service, process, claim, system or person meets specific requirements. Such requirements can be stated in standards, regulations, or other normative documents.[23]

Conformity assessment can be divided into the following areas:

- Certification (see Chapter 2)
- Testing (see Chapter 5.2.2)
- Inspection (see Chapter 5.2.3)
- Validation and verification[24] (see Chapter 5.2.4)

The similarities and differences between the five conformity assessment areas mentioned are summarized in the table below. Testing, inspection and validation / verification and how they relate to certification are described in more detail in the following chapters.

	Certification	Testing	Inspection	Validation	Verification
Short definition	Provision of **written assurance** (a certificate) by an independent third party that a product, service, process, person or system meets certain requirements	Determination of **one or more characteristics of an object** of conformity assessment, according to a **procedure**	Examination of **an object and the determination of its conformity** with requirements	Confirmation of **plausibility for a specific intended use or application** by providing objective evidence that specified requirements have been met	Confirmation of **truthfulness by providing objective evidence** that specified requirements have been met
Relationship to the client being assessed	**Third** party assessment/ assurance	First-, second- or third-party assessment			
Link to the certification process		Can be used as a **stand-alone service or as a source of information for the certification process**			
Organizations offering the service	Certification bodies	Testing laboratories	(Individual) inspectors, inspection bodies, certification bodies	Validation, verification, or certification bodies	Validation, verification, or certification bodies
Assessment reference	Standards (most cases), technical regulations	Standards (most cases)	Standards, technical regulations, and specifications	Reference to standards or technical regulations possible, but not required	Reference to standards or technical regulations possible, but not required

Table 3: Overview of the areas of conformity assessment (Source: Own elaboration)

---

23 IEC (2023b)

24 Verification and validation are often not seen as separate components of conformity assessment, but part of certification. However, as they can be performed as stand-alone assessments, and since ISO/IEC 17029:2019 defines them as conformity assessment activities, they are treated separately in this document.

5.2.1. Testing

Testing is defined as the *determination of one or more characteristics of an object of conformity assessment, according to a procedure.*[25]

Typically, testing involves comparing one or more properties of an object or product against the requirements of a standard, and this process is usually conducted by a testing laboratory. Standards not only define the requirements for the tested product but also outline the testing procedures and the system requirements for the testing laboratory, as specified in ISO/IEC 17025:2017.[26]

Relationship between testing and certification
Testing is often a prerequisite of certification as it provides essential information to determine if an object or product meets the requirements of a standard. CBs use one or more test reports to evaluate if the product fulfils the required specifications and if a certificate can be issued. While product certification bodies are accredited to assess products and interpret test laboratory results, laboratories are accredited solely for conducting tests and measurements, not for certifying products.[27, 28]

Testing as part of the certification process is shown in Figure 3. The yellow text shows the process steps, blue the quality infrastructure organizations involved, and green the results.

5.2.2. Inspection

Inspection involves the examination (based on professional judgment by inspectors) of an object to determine its conformity with specified requirements.[29] Objects subject to inspection can include materials, products, installations, equipment, processes, workflows, and services. The requirements for these objects may pertain to factors such as quantity, quality, fitness for purpose, and safety. Inspections are conducted by inspection bodies on behalf of private clients, parent businesses, or government agencies.
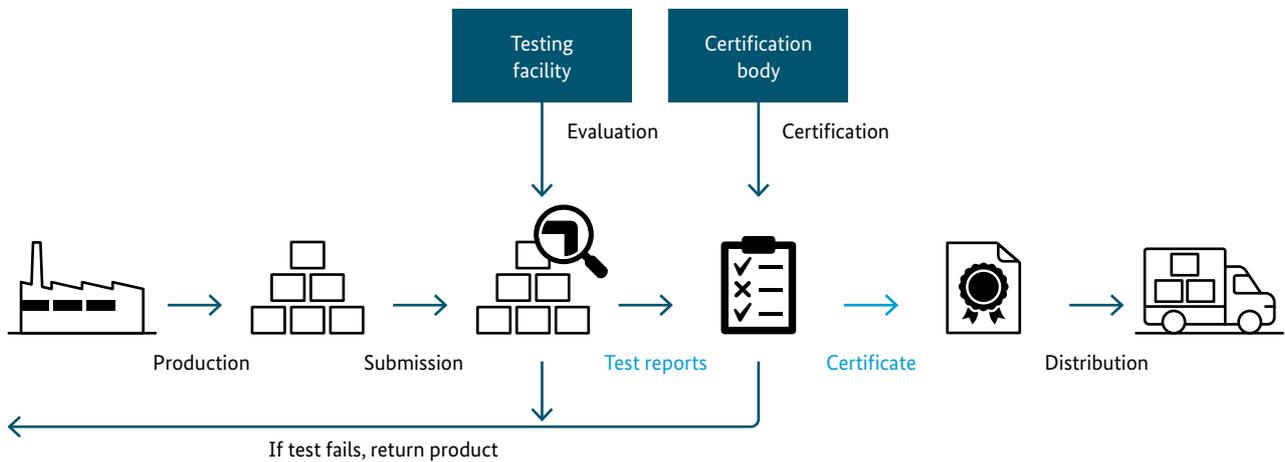

Figure 3: Third-party testing and the certification process (Source: Own elaboration)

---

25 ISO/IEC (2020), ISO/IEC 17000:2020(en) 5.2 Procedure: specified way to carry out an activity or a process.

26 IRENA (2015)

27 UNIDO (2017a)

28 TIC Council (2020)

---

29 ISO/IEC (2020), ISO/IEC 17000:2020(en)

Pre-shipment inspection

Pre-shipment inspection is a service in international trade that ensures goods meet specified requirements before they are shipped. This inspection, which is often required for export, is performed on the final product at the port before shipment. It can be part of private agreements or mandated by a country's export programs under WTO agreements, which typically require approval from the exporting country.

To facilitate this, a WTO member appoints a pre-shipment inspection entity to conduct the inspection and issue a pre-shipment inspection certificate (PSIC). Many countries opt to delegate this task to international inspection or certification bodies rather than perform it themselves.

Relationship between inspection and certification

Inspection involves examining an object to determine if it meets specified requirements, while certification provides a written statement confirming that these requirements have been met. Although inspection can be part of the certification process, it can also be conducted independently. Unlike certification, inspection does not provide long-term written assurance.[30, 31]

A key difference is that an inspection report is related only to the specific product, batch, or shipment inspected and has no implications for future products. In contrast, a certification report ensures that goods to be produced in the future will meet predefined criteria (based on an existing sample product).

Inspections do not always require third-party involvement, for example, government inspectors often conduct inspections based on national technical regulations. Although certification bodies frequently perform inspections, there are also entities that operate solely as inspection bodies.

5.2.3. Validation and verification

Verification is the *confirmation of truthfulness through the provision of objective evidence that specified requirements have been fulfilled.*[32] Only claims about things that have already happened or outcomes that have already been attained are subject to verification, i.e. it is a tool used for proving the truth (confirmation of a claim).

By contrast, **validation** is the *confirmation of plausibility for a specific intended use or application through the provision of objective evidence that specified requirements have been fulfilled.*[33] Only claims on a planned use in the future or an anticipated result are subject to validation. This procedure results in the confirmation of plausibility (confirmation of a claim).

ISO/IEC 17029:2019 outlines guidelines and requirements for bodies carrying out validation and verification as conformity assessment activities. Bodies conforming to the standard may offer verification or validation as a first-party, second-party, or third-party activity. Organizations can be validation bodies only, verification bodies only, or offer both services. As part of the conformity assessment process, validation and verification result in a declaration of conformity (DoC) that can either confirm the information claimed or can attest to the fact that the claim submitted could not be verified (confirmed to be true) or validated (confirmed to be plausible).[34]

Pre-export verification of conformity (PVoC)

In international trade, the PVoC is crucial as it ensures that all regulated products comply with a country's requirements before they are exported. This process verifies that products meet expected standards, qualify for international trade, protect consumers, reduce trade risks, and promote fair trade practices by confirming the safety and quality of imported and exported goods.[35]

30 FAO (2003)

31 German Accreditation Body (DAkkS, 2023c)

32 ISO/IEC (2020), ISO/IEC 17000:2020(en)

33 ISO/IEC (2020), ISO/IEC 17000:2020(en)

34 ISO/IEC (2019), ISO/IEC 17029:2019

35 Africa Certification (2023)

For exporters, the PVoC ensures that their products pass tests based on the importing country's approved specifications, technical regulations, and standards before shipping. Once products comply, they receive a certificate of conformity (CoC) from designated PVoC agents.[36] The CoC grants entry into the destination country's market, expedites customs processing, and minimizes the risk of losses due to non-compliant goods.[37]

Relationship between validation / verification and certification

Validation and verification are integral to certification processes, where they contribute crucial information for certification decisions. They can also be conducted independently as separate assessments.[38] Certification bodies typically offer both services, but there are also organizations that specialize solely in verification or validation. These organizations may not necessarily be third-party entities; often, verification and validation are carried out internally by the organization itself.

In testing laboratories, verification and validation are mandatory processes. These activities encompass various forms and are not limited to comparing results against standards, as is typically done in certification processes.[39]

5.3. Metrology

Metrology is the science of accurate and reliable measurements. It provides traceability between national applications and the international system and guarantees *that international technical guidelines are followed for the metrological performance and testing procedures of measuring instruments subject to legal controls*.[40] NMIs are in charge of creating and maintaining the national measurement standards.[41]

In this context, they are required to obtain, preserve, develop, and disseminate the most advanced calibration standards as well as the fundamental measuring units. Additionally, they provide the calibration of measuring instruments together with secondary metrology laboratories.

Relationship between metrology and certification

Traceability to the international system and calibrations are an essential part of quality management. For this reason, the use of metrology services is a requirement for the certification based on different standards such as ISO 9001:2015. Furthermore, such services are required for other components of conformity assessment, especially testing according to ISO/IEC 17025:2017 and ISO 17020:2012 (clause 6.2).

5.4. Accreditation

Accreditation is the independent, third-party evaluation of a conformity assessment organization (for example, a certification body, inspection body or laboratory) against recognized standards. It conveys formal demonstration of the body's impartiality and competence to carry out specific conformity assessment tasks (for example, certification, inspection, testing, and calibration).[42]

Accreditation bodies can seek international recognition within the framework of GLOBAC).[43] This system helps to ensure that accreditation bodies' work is consistent around the world and that international standards are maintained from one accreditation body to the next. As a result, a product that has been tested, inspected, or certified by an accreditation body under a mutual recognition agreement (MRA) with any of the organizations mentioned above can be accepted with confidence worldwide.

---

36 Kenya Bureau of Standards (2023)

37 SGS (2023)

38 IEC (2023b)

39 Interreg North-West Europe (2023)

40 Sanetra and Marbán (2007)

41 The measurement needs are defined by the production processes, customer requirements, and product quality elements, all of which are often outlined in standards. Sanetra and Marbán (2007).

---

42 Sanetra and Marbán (2007)

43 Both IAF and ILAC are expected to merge into a new unified international organization for accreditation named the Global Accreditation Cooperation (GLOBAC), which will cover all fields of accreditation, providing a more efficient and cohesive framework for global accreditation activities (Paris, 2023).

However, while conformity assessment results should be accepted in another nation due to the use of identical standards, there is no guarantee that every client or regulator in the world will accept a specific report or certificate.[44]

Relationship between accreditation and certification

Accreditation ensures the trustworthiness of certifications by validating the CB's impartiality and competence.[45] This accreditation is essential for gaining recognition of certifications, establishing credibility for products, services, and processes both domestically and internationally. This recognition is particularly significant when accreditation is granted by internationally recognized accreditation bodies.

Similarly, accreditation is crucial for verifying the competence of other quality infrastructure organizations involved in the certification process, including metrology and testing laboratories, medical/clinical laboratories (ISO 15189:2012), inspection bodies, verification/validation organizations, proficiency testing (PT) providers, and reference material (RM) producers, as discussed in previous chapters.

5.5. Technical regulation and market surveillance

Technical regulations are documents which define characteristics of products or processes, including the applicable administrative provisions, with which compliance is mandatory. They may also deal exclusively with terminology, symbols, packaging, marking or labelling requirements. Technical regulations are usually country-specific, but in some cases, they have regional or international nature. They frequently include references to technical specifications, standards or codes of conduct.[46]

Market surveillance is the activity carried out by authorities to ensure that products on the market conform with applicable laws and regulations and comply with the existing requirements.[47] Market surveillance is usually also based on inspections.

Relationship between technical regulation and certification

Regulations can specify which items require certification and the type of certification needed. This is important within the two approaches governments use to enforce technical regulations:

1. **Pre-market approval:** This mandates certification before products can enter the market, such as the CoC mentioned earlier.
2. **Market surveillance:** This method allows companies to self-certify that products meet requirements, which are then verified through random checks and consumer complaints.[48]

Market surveillance involves testing products to ensure compliance and imposing sanctions on suppliers for non-conformity. These processes shift responsibility for compliance to producers, reducing direct government involvement and emphasizing the importance of certification.[49]

To prevent conflicts of interest, requirements and processes for market surveillance must be kept strictly separate from the ones defined for accreditation.

---

44 UNIDO (2016)

45 Sanetra and Marbán (2007)

46 IEC, ISO, and UNIDO (2023)

47 European Commission (2024a)

48 Tippmann (2013)

49 Tippmann (2013)

6. Classification of Types of Certification

This chapter describes how certification can be classified based on the legal character of the certification, its subject, and its content. There are many certifications that do not cover only one of the types defined, but several of them. For example, certification based on the EU-organic production-regulation is a mixed-type product certification, that covers environmental and sustainability aspects.
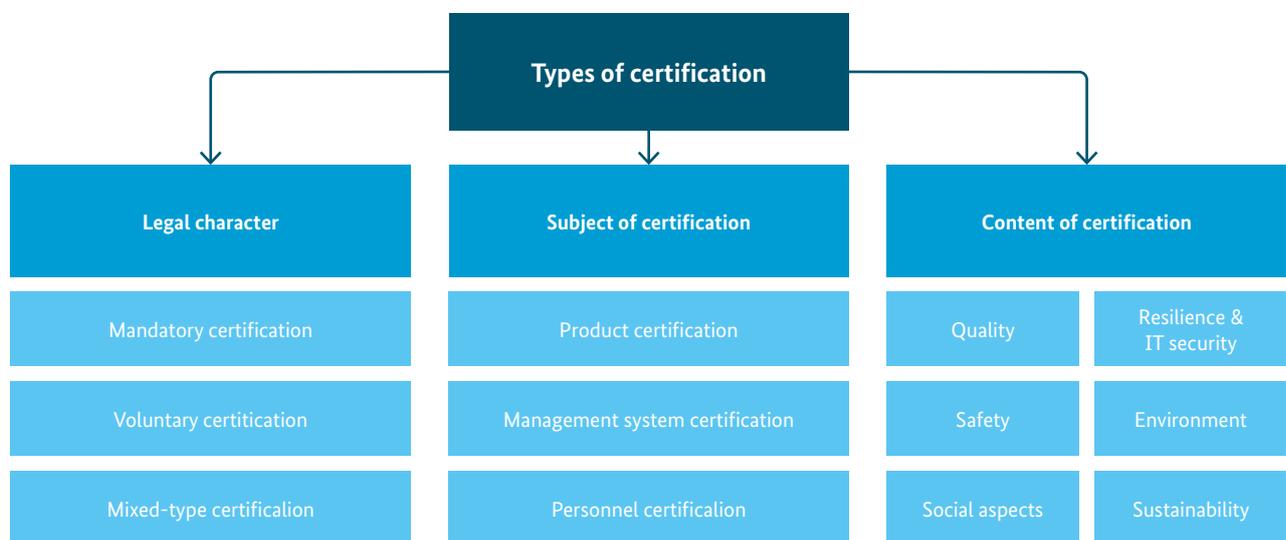
Figure 4: Overview, types of certification (Source: Own elaboration)

6.1. Legal character
6.1.1. Mandatory certification

In many cases, products and services are required by law to adhere to technical standards and measures based on WTO/SPS and WTO/TBT, making these requirements mandatory for market access. Exports must always meet the formal requirements set by the importing nation's government (mandatory requirements) as well as the importer's commercial needs (purchaser's requirements). However, most regulatory authorities are unable to inspect all products falling under the purview of techni-

cal regulations and SPS measures due to the high cost of conducting import inspections, factory surveillance, and challenges related to the testing and certification of a wide variety of products.[50]

Certificate of conformity
Mandatory certification is related to product conformity assessment and ensures that certain products meet the requirements of the technical regulations and the standards of the importing country. This process verifies product conformity through the issuance of a CoC, which is required for customs clearance. As mentioned above, a

---

50 ITC and PTB (2011)

CoC is issued after a PVoC is conducted. Before export, countries verify the conformity of all regulated products to enforce applicable standards.

Mandatory requirements versus buyers' commercial requirements

In this context, it is important to distinguish between mandatory requirements and buyers' commercial requirements. Mandatory requirements are established by governments and are legally binding. By contrast, commercial requirements, which are typically outlined in contractual agreements, are set by private sector entities such as companies that purchase items for additional processing or direct sale to customers. These specifications may be unique to a specific buyer or developed collaboratively for use within a particular industry sector (such as retail supermarkets).[51] Suppliers have the option of accepting or rejecting commercial requirements. However, non-compliance with these requirements can lead to a competitive disadvantage, effectively making them *mandatory* at a commercial level.[52]

> **Example**
>
> Voluntary sustainability standards (VSSes) are private standards (created and promoted by private companies or NGOs) that outline product requirements regarding environmental, social, and economic sustainability parameters. The specifications may include details about the characteristics or quality of products as well as production and processing techniques and transportation specifications.
>
> Labels and certifications are used to indicate that VSSes have been implemented successfully. The United Nations Conference on Trade and Development (UNCTAD) encourages developing economies to adopt and promote these standards as a means of gaining better access to more lucrative markets for their economy and positively contribute to the Sustainable Development Goals (SDGs).[53]

6.1.2. Voluntary certification

There are many voluntary standards covering general areas such as the environment, sustainability, social welfare, and human rights, as well as sector-specific domains such as textiles, fisheries, and animal husbandry.

Types of voluntary certification

There are two types of voluntary certifications:

1. Certifications integrated into national or international quality infrastructure, where private certification bodies issue certification after being accredited by the NAB. Examples include ISO 9001 and ISO 14001.
2. Certifications offered by private organizations, often NGOs, which conduct their own audits independently of the NAB.

6.1.3. Mixed types of certifications

Mixed types of certifications can be described as voluntary standards that have become mandatory for particular product groupings through company conventions and contracts. For example, the EU Organic Regulation 2018/848 is not legally required for all agricultural products, only those certified as organic.

---

51 ITC and PTB (2011)

52 ITC and PTB (2011)

53 UNCTAD (2024)

6.2. Subject of certification
6.2.1. Product certification

> Product certification is the mechanism by which a CB certifies that products, whether in batch or continuous production, have been inspected and tested to determine whether the products comply with specific requirements, typically contained in a standard.[54]

After the successful certification of a product, the manufacturer or producer is granted permission to include the product certification mark on the product. It can be crucial to have a product certification mark in particular markets to inform customers that a product is of high quality, particularly if the brand is still relatively unknown on the market.[55]

While pre-market approval and certification of products is a legal obligation for producers of some items, they may also choose to have their products assessed for technical compliance with voluntary standards.[56]

Benefits of product certification
The main benefits of product certification are:

1. Supplying information to help customers make more informed decisions
2. Enhancing brand reputation and credibility
3. Assisting suppliers to gain easier access to domestic and international markets
4. Helping manufacturers and suppliers comply with legal and regulatory requirements, thus reducing the risk of non-compliance penalties[57]

Technical requirements for product certification
The principles for the certification of goods, procedures, and services are outlined in ISO/IEC 17067. In addition, ISO 17065 includes standards for the competence and objectivity of certification bodies that provide their services in this field.

Table 3 lists examples of different levels of product certification as defined by ISO/IEC 17067. The appropriateness of each level depends on corresponding product risks, national quality infrastructure regulations and market acceptance. The schemes are identified by a universally understood scheme number.[58]

Scheme	Information
1a and 1b	Batch inspection
2	Surveillance testing in the market
3	Product testing at the factory
4	Type testing and production control
5	Type testing and quality assurance, including market surveillance

Table 4: Product certification schemes (Source: ISO/IEC (2013), ISO/IEC 17067:2013)

54 ITC and PTB (2011)

55 ITC and PTB (2011)

56 Likos and Yapici (2019)

57 IEC, ISO, and UNIDO (2023)

58 IEC, ISO, and UNIDO (2023)

Some certificates are only valid for a set amount of time (usually a year), after which the CB will evaluate them and issue new ones. Others have no expiration date; they remain valid as long as the manufacturer complies with the requirements and pays the annual fees.

Figure 5 outlines the steps of a product certification process.
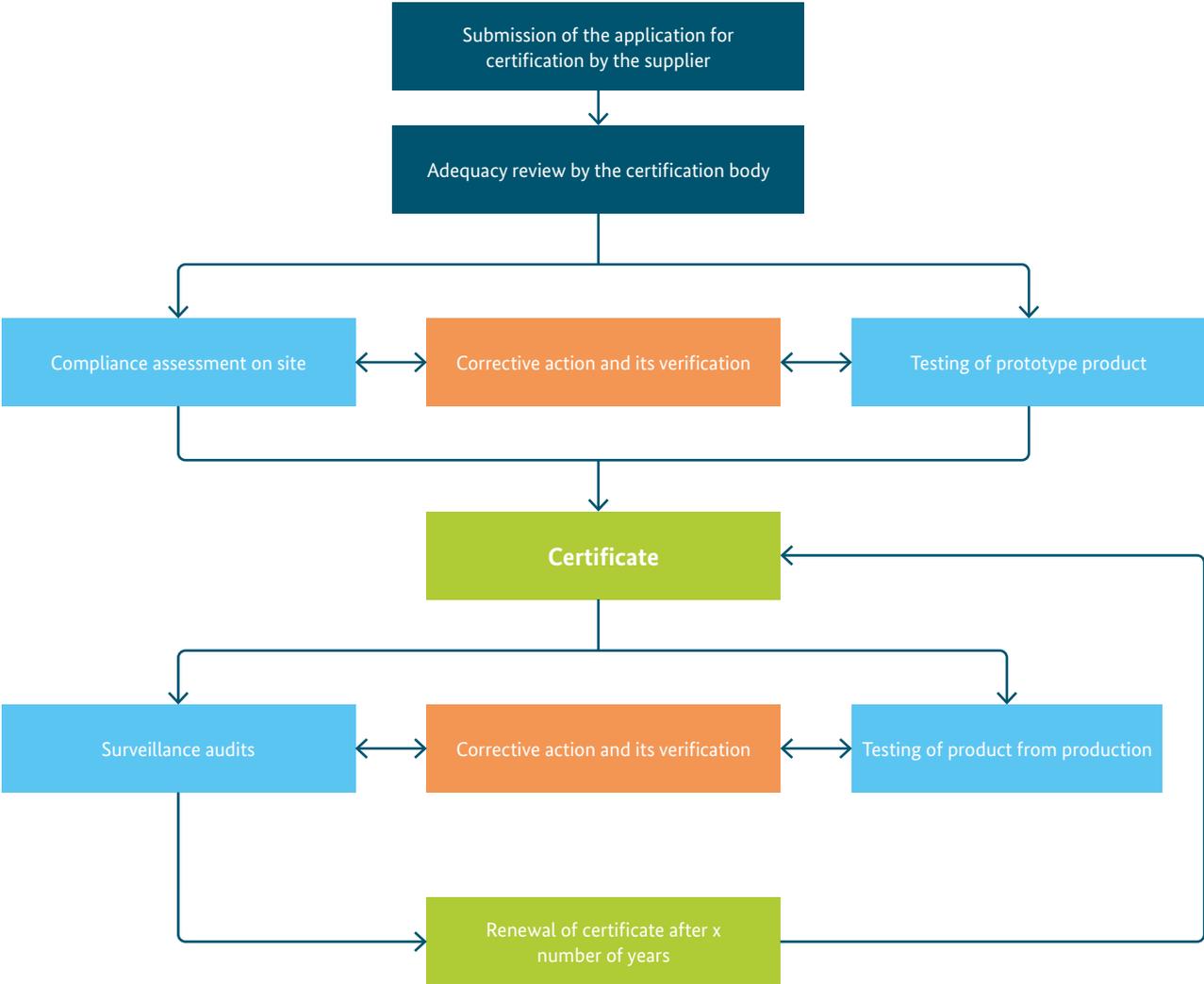

Figure 5: Product certification process (Source: ITC and PTB, 2011)

Many certification organizations provide product certification services in the public and private sectors, and at the national and international levels. In developing economies, usually only the NSB offers a product certification mark with market relevance, whereas in developed economies, private certification bodies are more common. Most product certifications are only recognized in the home market of the CB; however, some of them are effectively used in regional or even global markets.[59] Thus, the recommendation is for manufacturers to establish which certifications are accepted in the market they are trying to access.

6.2.2. Management system certification

A management system is understood to be a set of interrelated or interacting elements of an organization to establish policies and processes to achieve objectives.[60]

Leading standards and methodologies define a management system to be an iterative set of procedures meant to assist organizations in delivering products and services as well as other process outputs that satisfy relevant requirements. These requirements may be prompted by internal business goals, external customers, or legal and regulatory requirements. These models often place a strong emphasis on organizational process improvement, which is a requirement of all ISO standards relating to management systems.[61]

With the 1987 release of ISO 9001 (*Quality Management Systems – Requirements*), management system certification gained prominence. Today, management system certification is an important factor in a variety of areas including quality, risk management[62], energy, the environment, occupational safety, and IT security.[63]

The international standard ISO/IEC 17021 (*Conformity Assessment – Requirements for Bodies Providing Audit and Certification of Management Systems*) outlines the rules that certification bodies must follow when undertaking audits and certifications.[64]

Management system certification process
The process for management system certification involves two steps. The CB's stage 1 audit involves a document examination and serves as a focal point for the planning of the stage 2 audit. The stage 2 audit entails a thorough system audit, which is normally conducted on site, but can include remote audits. A certificate with a three-year validity period is granted after the stage 2 audit has been successfully performed and all non-conformities have been corrected and verified. Surveillance audits are performed throughout the three years of validity, typically once a year. The CB must re-evaluate the organization's performance after three years.[65] The certificate provided specifies the scope of certification as well as its duration of validity.[66]

Benefits of management system certification
Certification of management systems offers a variety of advantages:

1. Demonstrates that an organization has successfully implemented the system.
2. Informs clients and employees that the firm adheres to international standards.
3. Instils trust in the organization's capacity to regularly satisfy consumer expectations and fulfil other legal/market expectations (e.g. reducing occupational risks).
4. Provides marketing options for potential consumers. Enables access to regulated foreign markets where certification may be an entry requirement.[67]

In addition, implementing and maintaining certified management systems allows companies to manage and reduce risks effectively, which can lead to lower insurance premiums. Insurers assess risk based on factors such as the likelihood of incidents and the company's risk management capabilities. Certification demonstrates

---

59 ITC and PTB (2011)

60 ISO/IEC (2014)

61 Gantz (2014)

62 ISO 9001:2015 besides quality also includes explicit requirements for risk management

63 Kellermann (2019)

64 DAkks (2023a)

65 DAkks (2023a)

66 DQS (2023)

67 ISO (2024a)

that a company is proactively managing risks and adhering to high operational and safety standards, providing tangible evidence to insurers of the company's commitment to reducing risk.

Furthermore, using the services of an accredited certifier provides businesses with greater confidence in the professionalism and reliability of the service provider. Additionally, in many markets, certification by an accredited body is a mandatory requirement for entering and expanding into new markets.[68]

© iStock

6.2.3. Personnel certification

> Personnel certification is the acknowledgement of people who have specific knowledge, experience, or skills and shows that they can demonstrate such skills.

ISO/IEC 17024 is the relevant international standard for certification bodies to follow when certifying individuals.[69] Numerous advantages come with the existence of an international standard for personnel certification. For example, it establishes a baseline and uniform structure and set of conditions for the acknowledgment and comparison of competence domestically and between countries. This makes it easier to hire certified workers in different locations while also providing firms with a standard for hiring staff with specific competencies.[70]

The lack of specialized qualifications available through other sources such as formal degrees from educational or professional institutes frequently drives the need for such certification.[71] The primary aim of personnel certification is to ensure compliance with training standards (such as for technical experts). In contrast to other forms of certifications, one of the distinguishing features of personnel certification is that an examination must be undertaken using objective criteria to determine competence and scoring. ISO/IEC 17024 specifies additional

rules in this regard to ensure the impartiality of procedures and reduce a potential risk of a conflict of interest.[72]

Quality associations such as the European Organization for Quality (EOQ) and the American Society for Quality (ASQ) have recognized the demand for personnel certifications but also the need to create supporting frameworks for these qualifications (e.g. the European Competence Certification ECC or the European knowledge Recognition EKR created by EOQ).[73]

Finally, personnel certification enhances the skill set and competence of employees, promotes adherence to standards, and demonstrates a commitment to professional excellence. As a result, it contributes to a lower risk profile for the company, which can lead to reduced insurance costs.

6.3. Content of certification

Since the topics of the standards are very broad, the types of certifications are equally broad. This chapter gives some examples and describes the contents of some of the most well-known and widely used standards and certifications. The general advantages of certifications for organizations are explained in Chapter 2.2. In this chapter, the benefits for the respective certification topic or specific standard are summarized.

---

68 DAkks (2023a)

69 ITC and PTB (2011)

70 IEC, ISO, and UNIDO (2023)

71 IEC, ISO, and UNIDO (2023)

72 DAkkS (2023b)

73 EOQ (2024), ASQ (2024)

6.3.1. Quality

Quality issues have been at the forefront of certification, and corresponding certifications were the first to be developed.

ISO 9001
The ISO 9000 family is one of the most widely used and well-known standards for quality with ISO 9001 as a standard globally used for quality management systems (QMSs).

Example
ISO 9001:2015 details the requirements for the establishment, maintenance, and ongoing improvement of QMSs. With a focus on customer satisfaction and continuous improvement, ISO 9001 generally assists companies in controlling the quality of their products and services as well as their internal processes. The standard covers a variety of topics such as *context of the organization, leadership, planning, support, operation, performance evaluation, and improvement.*[74]

Certification
Certification must be performed by an accredited third-party certification body. This provides an extra degree of confidence in the company's quality management for its stakeholders.[75]

Benefits of an ISO 9001 certification
1. Increased customer trust and satisfaction through strong quality control mechanisms
2. Sound quality control processes, including efficient complaint management system.
3. Cost savings and productivity gains through process improvements
4. Culture of continuous improvement, through awareness training and internal audits

GLOBALG.A.P.
GLOBALG.A.P. is a set of internationally recognized standards covering a wide range of agricultural products. By adhering to these standards, producers can demonstrate their commitment to high-quality agricultural practices.

Example
Global Good Agricultural Practice (GLOBALG.A.P.) is a private organization that establishes voluntary standards for agricultural product certification globally. These standards address a number of topics related to agricultural production such as agricultural practices, social welfare, environmental sustainability, and food safety. The application of the GLOBALG.A.P. standards is strongly promoted by supermarket chains, mainly from industrialized countries.

Benefits of GLOBALG.A.P. certification
Overall, this form of certification offers farmers significant benefits in areas including market access, food safety, environmental sustainability, and regulatory compliance. Additional specific benefits can be summarized as follows:

1. Demonstration that the product is made using good agricultural and/or fish farming practices
2. Customer trust
3. Productivity boost and appeal to a competitive market
4. Implementation of processes for ongoing improvement
5. As more major retailers adopt the program, fewer second party inspections of farms will be conducted[76]

---

74 ISO (2015), ISO 9001:2015

75 ISO (2015), ISO 9001:2015

76 Bureau Veritas (2024)

Finally, in the realm of quality assurance, the rising demand for kosher and halal certifications should also be acknowledged.

Halal certification

Example

The Arabic word *halal* implies *permissible* or *legal* and is used to describe what is acceptable in accordance with Islamic religious law.

Halal certification is the means by which products intended for the halal market become legitimate. A product's certification is an indication of its quality and compliance with halal standards[77]. Each halal logo is distinct and visibly linked to its certification body, which must meet specific requirements to competently verify that products comply with Islamic dietary laws. Certification for halal products is granted by accredited bodies that specialize in this field, following the requirements defined in halal standards. Halal logos can be found on a variety of products, including food and pharmaceuticals, as well as non-food items like apparel, electronics, and cosmetics. With approximately 1.8 billion Muslims globally, making up about 24 % of the world's population, the Muslim demographic represents a significant market for consumer products.[78]

Kosher certification

Example

The word *kosher* refers to food prepared in accordance with Jewish dietary laws (kashrut) and means *fit* or *appropriate* in Hebrew. More than 14 million Jewish people choose to follow the kosher dietary requirements and search for kosher certification as an indicator of a product's quality level.[79]

Kosher certification is typically provided by specific kosher certification bodies that are knowledgeable in kashrut. The kosher certification bodies must meet specific requirements and standards rooted in religious texts and traditions. While not accredited by conventional accreditation organizations, the authority of these bodies stems from their religious expertise and community trust rather than formal accreditation. These bodies provide a seal of approval (hechsher) to products and services that comply with the standards of kashrut as stipulated in the Shulchan Arukh (the code of Jewish law). Each kosher certification body typically has its own unique logo and symbol. Usually, each body has a Rav HaMachshir (certifying rabbi) who determines the precise kashrut standards to be applied and ensures the correct application of these standards.[80]

---

77 Halal standard examples:
    Gulf Standards Organization (GSO)
    · GSO 2055-1:2015, Halal Food – Part 1: General Requirements
    GSO 2055-2:2021, Halal Products – Part 2: General Requirements for Halal Certification Bodies
    Standards and Metrology Institute for Islamic Countries (SMIIC)
    · SMIIC 1:2011, General guidelines on halal food

78 ISA (2022)

79 Caps Canada (2022)

80 Rabbi Dovid Cohen (2023)

Benefits of Halal and Kosher certification
Halal and Kosher certifications offer several benefits:

1. Meeting the religious dietary requirements of consumers by adhering to the dietary laws of Islam and Judaism, respectively.
2. Enhanced consumer trust by assuring compliance with specific criteria.
3. Increased market access and diversification of product offering for producers. These certifications can open markets that cater to Muslim and Jewish populations, ensuring a wider range of consumers.
4. Stringent quality standards provide improved quality and production processes.
5. Global recognition of certifications is beneficial for producers involved in the export market.[81, 82]

© iStock

6.3.2. Resilience and IT security

A resilient organization can successfully adopt planned steps to deal with urgent emergencies or unexpected events. To achieve this in times of economic and political instability, it is important for organizations to have systematic techniques to assess and manage risks, ensure safe value chains, promote safe workplaces, and safeguard information technology.[83]

ISO 22301
Natural catastrophes, health crises, supply chain challenges, and cybersecurity attacks can prevent companies from operating effectively. Consistent and strong business continuity planning and a well-defined action plan are needed to mitigate such threats.[84]

Example
The international standard for business continuity management systems (BCMSs, ISO 22301:2019) is the first international standard for developing and executing an effective business continuity plan. Its aim is to prepare, establish, and maintain controls and capabilities for managing an organization's overall capacity to function during potential interruptions, minimizing the impact on people, products, and the organization.[85]

ISO 27001
To safeguard companies' crucial information assets from online attacks and weaknesses (e.g., data theft, cybercrime, and leaks), companies should develop a cyber-resilient position – the capacity of an organization to function in the face of cyber threats. ISO/IEC 27001 was developed to provide support on these issues.[86]

81 ISA (2022)

82 Chaturvedi (2023)

83 PTB (2020)

84 Naden (2019)

85 Naden (2019)

86 ISO (2023)

Example

ISO/IEC 27001:2022 is considered the world's best-known standard for information security management systems (ISMSs). It requires companies to implement an extensive set of policies, procedures, and controls to manage information security risks and guarantee the availability, confidentiality, and integrity of information. A well-implemented information security management system is a tool for risk management, cyber-resilience, and operational excellence.[87]

Benefits of ISO 22301 and ISO 27001 certification[88, 89]

1. Business benefits:
   – Supporting strategic objectives
   – Generating a competitive advantage
   – Safeguarding and strengthening reputation and credibility
   – Contributing to organizational resilience

2. Financial benefits:
   – Lowering financial and legal risks
   – Achieving cost savings

3. Stakeholder benefits:
   – Protecting people, data, and intellectual property
   – Addressing stakeholders' expectations
   – Fostering trust in the organization's capacity for success

4. Internal process benefits:
   – Enhancing the ability to operate successfully despite interruptions
   – Exhibiting effective and efficient proactive risk control
   – Resolving operational uncertainties

6.3.3. Safety

Safety certifications focus on meeting requirements designed to reduce harm and assess risks. While legal regulations often exist to prevent negative impacts in various areas, such as national laws on occupational health and safety or medical product safety, these regulations can vary by region. Standards help organizations achieve and maintain a consistent level of safety across borders.

ISO 22000

Example

ISO 22000:2018 enables the implementation of a food safety management system (FSMS) for all types of organizations and producers within the food chain, which adds a layer of security to the global food supply chain, facilitating the cross-border movement of products and supplying consumers with safe food.[90] The standard unifies the requirements for methodically overseeing food supply chain safety and provides a distinctive approach to global best practices.

Certification

Companies can either self-declare their adherence to ISO 22000 or seek certification of their food safety management system.[91]

Benefits of ISO 22000 certification

1. Ensuring the ability to continuously offer food-related products and services that are safe and compliant with regulations
2. Improving risk management in food safety procedures
3. Enabling strong ties to the UN Codex Alimentarius, which develops government guidelines for food safety[92]

---

87 ISO/IEC (2022), ISO/IEC 27001:2022

88 ISO (2019), ISO 22301:2019(en)

89 ISO/IEC (2022), ISO/IEC 27001:2022

90 ISO and UNIDO (2021)

91 ITC and PTB (2011)

92 ISO (2018), ISO 22000:2018

ISO 45001

> **Example**
>
> ISO 45001:2018 establishes criteria for an *occupational health, and safety (OH&S) policy, objectives, planning, implementation, operation, auditing and review*. Key elements include *leadership commitment, worker participation, hazard identification and risk assessment, legal and regulatory compliance, emergency planning, incident investigation and continual improvement*.[93]
>
> **Benefits of ISO 45001 certification**
>
> 1. Creating a framework to systematically manage OH&S risks
> 2. Reducing workplace incidents and injuries
> 3. Demonstrating commitment to worker health and safety
> 4. Ensuring compliance with OH&S regulations
> 5. Increasing organizational resilience
> 6. Continuously improving OH&S performance[94]

6.3.4. Environment

In light of climate change, water scarcity and resource depletion, it has never been more imperative that organizations work towards lowering their environmental impact. Environmental standards and their respective certifications can enable organizations to manage and reduce their negative impacts systematically and efficiently.

ISO 14001

> **Example**
>
> ISO 14001:2015 provides organizations with a framework for creating and implementing an environmental management system (EMS) and continuously improving their environmental performance. It covers a wide range of topics, including waste management, resource use, environmental performance monitoring, and stakeholder involvement in environmental obligations.[95]

ISO 50001

> **Example**
>
> ISO 50001:2018 supports organizations across all industries and offers a method for enhancing energy efficiency through the creation of an energy management system (EnMS). It is suitable for organizations that are dedicated to minimizing their impact, preserving resources, and boosting profitability through effective energy management.[96]

Benefits of ISO 14001 and ISO 50001 certification
The benefits can be summarized as follows:

1. Enhancing environmental performance
2. Facilitating regulatory compliance
3. Improving environmental risk management
4. Creating cost savings
5. Enabling operational excellence
6. Creating stakeholder and customer trust[97]

---

93 ISO (2018), ISO 45001:2018

94 ISO (2018), ISO 45001:2018

95 ISO (2015), ISO 14001:2015

96 ISO (2024b), ISO 50001

97 ISO (2015), ISO 14001:2015

Leadership in Energy and Environmental Design (LEED) certification

Example

LEED certification is a widely accepted indicator of sustainability accomplishment, as it provides a foundation for safe, cost-effective, and highly efficient green buildings that promote social, political, and environmental goals. It covers all kinds of buildings and operational stages (e.g., new construction, interior fitouts, operations, maintenance). In response to the Paris Climate Agreement's 2030 and 2050 objectives, LEED v5 was developed. It encourages decarbonization, resilience, health, equitable results, and healthy ecosystems.[98]

Benefits of LEED certification

1. Contributing to an organization's overall energy efficiency and reduction goals
2. Lowering costs related to energy and water consumption
3. Demonstrating the organization's commitment to environmental consciousness to stakeholders

6.3.5. Sustainability

As sustainability has become more prominent, the number of sustainability certifications has increased. There is growing recognition that sustainability standards play a significant role in determining the extent to which organizations can meet their objectives and targets and improve their sustainability performance.[99]

Global organic textile standard (GOTS)

Example

GOTS is one of the most popular textile processing standards for organic fibres[100], and includes social and environmental requirements. It is supported by independent certification throughout the textile supply chain.[101]

GOTS certification

To include the GOTS label, products must comply with all requirements of the standard and be certified by a GOTS-approved certification body. Additionally, production facilities are required to be certified.[102]

Final products that have earned GOTS certification can include yarns, fibre products, clothing, home textiles, personal hygiene items, and food contact textiles.[103]

---

99   UNIDO (2017b)

100 Following the principles of organic agriculture (a farming method that promotes the health of ecosystems, soils, and people), organic fibres are natural fibres cultivated without using synthetic pesticides (such as insecticides), herbicides, or genetically modified organisms (GMOs)

101 GOTS (2024b)

102 GOTS (2024a)

103 GOTS (2024b)

---

98   U.S. Green Building Council (2024)

Benefits of a GOTS certification

1. Products with a GOTS label provide a trustworthy guarantee of the product's organic origin, including environmentally and socially responsible processing
2. It covers the complete organic supply chain
3. Verification is achieved by independent third-party certification
4. It is a risk management tool for buyers
5. It protects employees' health, safety, and rights
6. Cost-effectiveness is achieved through sustainability
7. Restriction in using hazardous substances in the processing of GOTS products, i. e., only low-impact GOTS-approved chemical inputs are allowed
8. GOTS products meet the established technical quality requirements[104]

B Corp Certification

Example

B Lab provides the B Corp certification for businesses, based on requirements for social and environmental performance, accountability, and transparency. B Lab's Standards Advisory Council and Board of Directors independently oversee their standards.[105]

The certification is based on the B impact assessment (BIA) framework, which assesses the company's practices and outputs in five areas: consumers, workers, the community, the environment and governance.[106]

Benefits of a B CORP certification

1. Building trust with consumers, communities, and suppliers
2. Attracting and engaging employees
3. Positioning the company as sustainably responsible and future-oriented

6.3.6. Social aspects

Social certifications are used as a tool for assuring good social practices. Usually, such certifications include requirements related to working conditions, labour rights, and other factors. In this context, social compliance means that companies guarantee the protection of their own workers and those within their value and supply chain.

SA 8000 standard [107]

Example

Developed in 1997 by Social Accountability International (SAI), the SA8000:2014 standard is considered as the leading social certification standard for organizations and factories wanting to measure their social performance. It is based on the following elements: child labour, forced or compulsory labour, health and safety, freedom of association and right to collective bargaining, discrimination, disciplinary practices, working hours, remuneration, and management system.

Certification and accreditation

Accreditation is vital to guarantee the impartiality, competence, and effectiveness of social audits. Hence, oversight of the SA8000 programme is provided by the Social Accountability Accreditation Services (SAAS) to guarantee quality and lower risk. As defined by SAI, stakeholders only consider a SA8000 certificate issued by audit companies that have been validated by SAAS as a true indicator of social performance.

Benefits of a SA8000 certification

1. Employee involvement
2. A culture of continual improvement
3. Enhancing working conditions and worker well-being
4. Increasing productivity
5. Improving stakeholder relationships
6. Enabling market access

---

104 GOTS (2024a)

105 B Lab Europe (2024)

106 B Lab Europe (2024)

107 SAI (2024)

GLOBALG.A.P. Risk Assessment on Social Practice (GRASP)

Example

Within GLOBALG.A.P., there is an additional module called GRASP that includes extra requirements related to social practices, such as worker welfare and labour conditions. Although GRASP offers significant benefits, it is not mandatory for GLOBALG.A.P. operators. While GLOBALG.A.P. certification is often required to sell produce to large retailers, GRASP certification is less frequently a condition of sale. This distinction highlights that the primary focus of the GLOBALG.A.P. framework is on food safety, with social responsibility being an important but supplementary aspect.

**GRASP benefits for producers**
1. On-farm realities assessment
2. Guidance on compliance
3. Workers' rights strengthening
4. Social risk management
5. Cost and time savings
6. Enhanced reputation

GRASP benefits for supply chain stakeholders
1. Comprehensive risk assessment
2. Enhanced transparency and mitigation
3. Global applicability
4. Reduced audit burden[108]

---

108 GLOBALG.A.P. (2024)
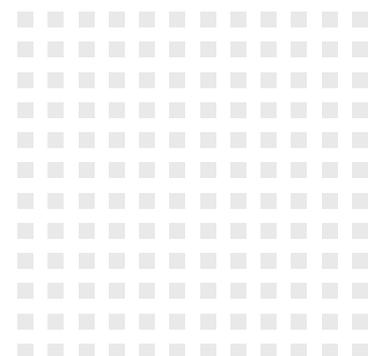
7. Organizations Involved in the Development of Certification

Different players must be considered regarding their support of quality infrastructure, and certification specifically. This chapter provides an overview of the organizations involved. Some of the bodies supporting certification and standardization are briefly mentioned in chapters 2.1 and 4.

7.1. National certification bodies

National certification bodies (NCBs) usually provide services only in one country, with a few providing services in several countries within the same continent. NCBs are authorized to run certification schemes within their country. Such schemes seek to promote trade and strengthen collaboration among recognized NCBs by aligning national standards with international standards.[109]

NCBs can be either publicly (state) or privately owned, see Table 4. Government bodies include, for example, national standards boards and/or bureaus, which are increasingly active in management certification. It is imperative that their competence should be proven by an internationally recognized accreditation, which is often not the case. As a rule, their services are significantly more affordable than those of international certification bodies. They do not usually play a role in the certification of voluntary product- and process-related standards. Private national certification bodies offer a vast range of certifications for management systems and products.

	Public certification bodies	Private certification bodies
Governance	Government-run or government-affiliated	Privately operated
Efficiency	Demand more time and resources. Bureaucracy results in delays in implementing changes.	Swift response to market demands. Operate with efficiency and resource optimization.
Area of work	Better suited to focus on public goods and legal standards, essential for meeting legal requirements and ensuring broader societal benefits	Better positioned to develop and implement industry-specific standards tailored to market needs
Objectives	Primary focus is on safeguarding public health, safety, and welfare. Support standards more related to regulations (e.g. food safety).	Objectives are often more commercially oriented, focusing on providing value to clients through efficient and flexible certification processes
Funding	Government-funded through budgets	Self-funded through service fees
Personnel challenges and training	Challenges in retaining trained personnel and losing institutional knowledge. Risk of knowledge obsolescence over time.	Less susceptible to losing trained personnel to higher-paying jobs. Efficient management of trained personnel and certification processes.
Other considerations	The involvement of public bodies in certification should be managed to avoid market distortions or conflicts of interest	

Table 5: Public vs private certification bodies (Source: Own elaboration)

---

109 Standards Council of Canada (2024)

7.2. International certification bodies

These organizations are national certification bodies that conduct most of their business activities internationally. Their headquarters are typically located in European countries, and they are accredited to ISO/IEC 17065 (for the certification of products, processes, and services) and/or ISO/IEC 17021 (for the certification of management systems). All international certification bodies known to the authors are private.

As the international requirements for competence in the certification of systems, personnel and products are remarkably high, developing economies often have few accredited national governmental or private certification bodies. As a result, companies and institutions in these countries frequently rely on international certification bodies, which typically command significantly higher costs.[110]

7.3. National standardization organizations

Standardization organizations develop standards on which certification is based. Both processes promote the quality and safety of products, services, and systems.

An NSB is the organization responsible for developing and disseminating national standards for use at the national level. The WTO Agreements mandate that NSBs consider harmonization with current international standards as this can facilitate trade between countries. To influence the development or revision of international standards, NSBs must be members of international standardization bodies. The WTO's requirements, the emergence of a multilateral trading system, the effects of globalization, and the growing significance of regional cooperation have expanded the role of NSBs. They now act not only as developers of purely national standards but also as partners in harmonizing standards regionally and internationally.[111]

7.4. Regional standardization organizations

Regional standardization organizations help NSBs accomplish their goals and play a crucial role in helping to harmonize standards on a regional level. There are also committees or bodies operating at the regional or sub-regional level to develop conformity assessment procedures and standards.[112]

7.5. International standardization organizations

ISO, IEC, and the International Telecommunication Union (ITU) are the largest international standards organizations. ISO and IEC are private, voluntary organizations, whereas the ITU is an intergovernmental organization with a treaty.

International Standards Organization

In order to contribute to ISO's work, an NSB must become a member of ISO. Currently, 169 NBSs make up the membership of the independent and non-governmental ISO. In cooperation with the ISO Central Secretariat, the members suggest new standards, take part in their creation, and offer assistance to the technical groups that create the actual standards. National representatives of standards committees are appointed by ISO members. Once their work is published as an ISO International Standard, ISO members may decide to translate and adopt it as a national standard.[113]

International Electrotechnical Commission

The IEC operates differently from ISO since its members are national committees (NCs). NSBs are occasionally among these national committees. More than 6,300 international standards and publications of a similar nature have been published by the IEC.[114] In the international IEC standardization and conformity assessment arena, the NCs supply the management know-how and dispatch professionals to represent national demands.[115]

---

110 These are globally active conformity assessment bodies that offer third-party assessments and are accredited for the respective field of activity. Examples include the General Society of Surveillance (SGS), intertek, Bureau Veritas, bsi, and TÜV.

111 ISO and UNIDO (2013)

112 ISO and UNIDO (2013)

113 ISO and UNIDO (2013)

114 ISO and UNIDO (2013)

115 EC (2023a)

International Telecommunication Union

The ITU is unique among international organizations because it was established to encourage collaboration between public and private sectors. The organization is composed of governments (member states) and the private sector (sector members). Study groups work together to create *ITU Recommendations* which have the status of international standards.[116]

Other international standards-producing organizations

In the context of the WTO/SPS agreement, relevant organizations include:

- The World Organization for Animal Health (WOAH)
- The International Plant Protection Convention (IPPC)
- The Codex Alimentarius Commission (CAC) (founded by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO))

Several other United Nations (UN) bodies, including the United Nations Economic Cooperation for Europe (UNECE), create standards that are applicable on a global scale.

Other standards-producing organizations which have created widely used or economically significant standards are:

- American Society for Testing and Materials (ASTM International)
- The European Committee for Standardization (CEN)
- The Institute of Electrical and Electronics Engineers (IEEE)[117]

7.6. Standards setting bodies without an official mandate

There are also organizations that set standards without an official mandate. As mentioned in Chapter 5.1, these are private entities, including companies, NGOs, and multi-stakeholder coalitions. These organizations create private standards, which are gaining in importance due

to increasing consumer demand for products that meet specific requirements in areas such as safety, environment, sustainability, and quality. Unlike national standards bodies, private organizations manage all aspects of the standards system without significant involvement from state actors.[118]

Additionally, these private bodies are not required to adhere to the good practices in standard development and conformity assessment as defined by ISO; compliance with such practices is voluntary. This often results in private standards being developed without engaging relevant stakeholders. For implementation of standards, third-party certification bodies typically verify compliance with these standards. However, there are instances where the standards-setting body itself performs the conformity assessment.[119]

7.7. National and supranational regulators

Regulators play a critical role in the implementation of regulatory regimes and regulations. Certification can be mandatory; in such cases, products and services are required by technical regulations to comply with these regulations. The following chapter summarizes the different types of regulators.

National regulators

National regulators work under the government (country-based). For some sectors (e.g. healthcare industry), countries require a national regulatory agency (NRA) in charge of making sure that products (e.g. pharmaceuticals and biological products) that are approved for public distribution have undergone the necessary testing and satisfy global requirements for quality, safety, and efficacy.[120]

Supranational regulator

On a regional scale, the presence of a supranational (e.g. European) regulator helps to guarantee that national regulators adequately implement rules and regulations and ensures a uniform approach to enforcement and compli-

---

116 ISO and UNIDO (2013)

117 ISO and UNIDO (2013)

118 Henson and Humphrey (2010)

119 Henson and Humphrey (2010)

120 WHO (2024)

ance. Cross-border markets will profit from a supranational regulator's harmonization of rules and regulations. However, the benefits of harmonization vary depending on how developed the relevant marketplaces are.[121]

EU product regulation

In some cases, the CE (European Conformity) mark is required for products to be sold in the EU. A product with the CE mark has been evaluated and found to meet EU safety, health, and environmental protection standards. This evaluation can be conducted either by the manufacturer or a notified body[122], depending on the applicable legislation and risk classification. Additionally, EU product regulations usually require the manufacturer to provide a signed EU declaration of conformity to confirm that the product complies with EU criteria.[123]

Product regulation outside the EU

Outside the EU, there are also examples of regulations on a regional scale, but to a more limited extent. For example, the Central American region has implemented regional technical regulations as part of the Central American harmonization process. The Central American Technical Regulations (RTCAs) cover a variety of topics, such as product registration, sanitary licenses, infant food, authorized additives, alcohol, packaging, and labelling. While all Central American countries[124] are subject to these RTCAs, each country may have different guidelines for implementation and interpretation.[125]

Another example is the Eurasian Economic Commission, which established the technical regulations of the Eurasian Economic Union (EEU), laying forth legally binding requirements for the topics mentioned in technical regulations. The technical regulations are adopted to guarantee the achievement of safety priorities.[126]

Finally, the role of the United States Food and Drug Administration (FDA) should be mentioned due to its relevance and responsibility in regulating a wide range of products to ensure their safety, efficacy and quality. The overall aim is to safeguard and promote public health. These products include food, drugs, medical devices, biologics, cosmetics and tobacco. The use of food products is regulated in accordance with the guidelines outlined in the Federal Food, Drug, and Cosmetic Act (FD&C Act), alongside the regulations issued under its jurisdiction. These regulations are published in the Code of Federal Regulations (CFR).[127]

7.8. Supporting entities

This chapter describes the organizations that support certification in other ways.

Export promotion agencies

Companies can find it difficult and time-consuming to enter overseas markets; therefore, export promotion agencies (EPAs) work as a bridge between companies and international markets. These agencies help regional companies to expand their consumer bases abroad.

They provide a variety of services to assist companies in overcoming export barriers, gaining access to valuable resources, and capitalizing on new possibilities. Companies are then better able to handle the obstacles of global trade and can maximize their export potential, which leads to further economic growth and development.[128]

EPAs might be based nationally or internationally. Overseas-based EPAs facilitate exports from a certain region to the host country. Although the agencies' support often extends to all sectors, exporting businesses benefit the most.

---

121 OECD (2003)

122 A notified body is an organization appointed by an EU country to evaluate the conformity of specific products prior to being placed on the market. (European Commission, 2025)

123 Your Europe (2024)

124 Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama

125 AESA and EY (2021)

126 EEU (2024)

127 FDA (2024)

128 ITC (2022)

The services offered by EPAs include:

1. Providing data on export markets
2. Image promotion of a country or region (through campaigns, events, and advocacy)
3. Consultancy services (such as staff training and technical support)
4. Marketing services (such as participation in trade fairs and missions)[129]

Quality councils

Quality councils exist in some countries to coordinate and foster the development of the national quality infrastructure, including certification. They typically include representatives of the different ministries involved, quality infrastructure institutions, sector organizations, academics and consumer associations.[130]

7.9. International cooperation organizations

In response to the challenges posed by globalization and sustainable development, international organizations work towards strengthening collaboration to advance the recognition, appreciation, and adoption of quality infrastructure, as well as offering direction and assistance for its efficient implementation and integration across national boundaries.[131] This section describes the work of some specific international cooperation organizations working in quality infrastructure and certification.

United Nations Industrial Development Organization (UNIDO)

For nearly 50 years, UNIDO has supported quality infrastructure development to enhance the industrial and economic performance of developing economies. Through targeted interventions, UNIDO focuses on strengthening national capabilities in standardization, metrology, conformity assessment, accreditation, and market surveillance.[132] Recently, in partnership with members of the INetQI, UNIDO created the quality infrastructure for sustainable development (QI4SD) index, an instrument

that assesses a country's quality infrastructure readiness to fulfil the SDGs. QI4SD has five dimensions (metrology, standardization, conformity assessment, accreditation, and policy), each of which has 36 indicators.[133]

World Bank Group

The World Bank Group (WBG) supports quality infrastructure through different methods. It provides loans, grants, and technical assistance for developing metrology labs and accreditation bodies, offers training and institutional strengthening, and aids in policy development. The WBG also funds specific quality infrastructure projects, conducts research, and organizes forums to share best practices. By collaborating with international organizations and fostering public-private partnerships, the WBG enhances global and local quality infrastructure efforts, promoting economic competitiveness and sustainable development. The WBG also demonstrates its commitment to quality infrastructure by being part of the INetQI.

German Corporation for International Cooperation

The German Corporation for International Cooperation (GIZ) assists partner countries in developing and enhancing quality infrastructure to improve access to quality infrastructure services. As part of their role in supporting quality infrastructure, several global GIZ projects include training and company support to promote certification in different sectors.

Establishing quality infrastructure in the least developed countries (LDCs) presents greater challenges compared to industrialized, emerging, and developing economies. These challenges include underprepared workforce, ineffective institutions, inadequate infrastructure such as buildings and transportation, and limited capacities for training and research.[134]

---

129 What Works Growth (2018)

130 Tackett (1991)

131 UNECE (2018)

132 UNIDO (2018)

133 UNIDO (2022)

134 Diekmann (2018)

Physikalisch-Technische Bundesanstalt (PTB)

PTB is the national metrology institute of Germany. In technical cooperation, PTB has supported its partner countries in the development and promotion of quality infrastructure, including certification, for 50 years. The international cooperation group of PTB is contracted by the BMZ and the EU as an implementation organization for development and cooperation. In addition to its development work, PTB is also active in research.

7.10. Certification associations

This chapter outlines certification associations and reasons for certification bodies to join them. While voluntary, membership demonstrates a commitment to staying informed about industry trends and an eagerness to participate in relevant conversations.

Advantages of certification associations include:
- Informing members about industry developments
- Supporting members by promoting accredited certification
- Advocating for members before accreditation and industry bodies
- Promoting members' interests in relevant forums
- Supporting continual improvement of certification schemes and regulatory frameworks

International Association of Accreditation and Certification Bodies (IAACB)

The IAACB is an association of accredited bodies dedicated to promoting collaboration, sharing knowledge, and fostering mutual growth. Its objective is to provide a strong foundation for accrediting and certification organizations and to support them in their development and success.[135]

Association of Accredited Certification Bodies (AACB)

The AACB is an association that represents accredited certification bodies in a variety of certification sectors. Its aim is to provide the best results for end users of third-party certification. The organization works to ensure that government, industry associations, and both public and private organizations understand, accept, and value the accredited certification of management products, systems, and personnel.[136]

European Federation of Associations of Certification Bodies (EFAC)

The EFAC was established due to concerns that European certification organizations lacked a focal point for advancing their individual and collective interests both domestically and internationally.[137]

7.11. Regional accreditation groups

There are several accreditation groups such as the EA (European co-operation for Accreditation), IAAC (Inter American Accreditation Cooperation), APAC (Asia Pacific Accreditation Cooperation), ARAC (Arab Accreditation Cooperation), AFRAC (African Accreditation Cooperation), and the Southern African Development Community Cooperation in Accreditation (SADCA). These groups are associations whose members include accreditation bodies. Worldwide, as of February 2025, these are six regional accreditation groups recognized by IAF and ILAC.[138]

The aim of these groups is to maintain, manage and expand (regional) MRAs that acknowledge the equivalence of their members' accreditations. Every organization goes through evaluation procedures to make sure they fulfil or surpass IAF requirements, and the IAF conducts evaluations every four years. Overall, they play a vital role in ensuring quality, recognition, and mobility within their respective regions.

---

135 IAACCB (2024)

136 AACB (2024)

137 EFAC (2024)

138 EA (2024)

8. Trends in Certification

This chapter discusses the certification market and current trends in certification.

8.1. The market for testing, inspection and certification

The testing, inspection and certification (TIC) market is expected to rise from $217.31 billion in 2022 to $328.23 billion in 2029. Due to the increased need for dependable and high-quality consumer goods, companies are expanding their TIC services globally. Throughout the forecast period, Europe is predicted to have the largest TIC market share. One driving factor related to the rising demand of TIC services, which entails positive market growth, is the increasing number of mandatory laws and regulations of governments, which target producers to ensure that the items meet quality and safety standards. Some countries demand certification as a means of assuring compliance. However, high costs are still associated with these services.[139, 140]

8.2. Current trends in certification

Several trends[141] are steering the evolution of certification, as shown in table 6. The trends are described more in detail in the following sub-chapters.

Rise of digital transformation	■ New technologies, e.g. the internet of things (IoT), artificial intelligence (AI), blockchain ■ Digital platforms for data collection, analysis and reporting ■ Benefits: Improved speed, accuracy and transparency
Industry-specific standards	■ Focus on specialized services ■ Benefits: Customized solutions, greater alignment
Globalization and cross-border trade	■ Ensuring compliance with international standards and regulations ■ Benefits: Increased competitiveness and improved market access
Increased emphasis on cybersecurity	■ Assesses vulnerability of digital systems ■ Ensures data protection ■ Benefits: Increased security awareness and protection against risks
Quality assurance in the healthcare sector	■ Supports the demand for rigorous quality control measures ■ Benefits: Increased safety and efficacy of healthcare products as well as more certifications in the healthcare sector
Sustainability compliance in global value chains	■ Evaluation of environmental, social and ethical impact, alongside quality and safety ■ Increase in sustainability standards ■ Benefits: Assurance of environmentally friendly products and promotion of sustainability
Emergence of remote and virtual certification	■ Now easier due to technological advancements ■ Addresses challenges caused by travel restrictions ■ Benefits: Enhanced efficiency, cost savings and reduced emissions

Table 6: Trends in certification (Source: Own elaboration)

---

139 Fortune Business Insights (2022)

140 The Fortune study only covers a portion of the certification bodies in its research. For example: 192 accredited certification bodies from GlobalGap were not recorded.

141 Cohen (2024)

8.2.1. Rise of digital transformation

Fast-changing development and integration of technology across industries has prompted the adaptation of certification processes to guarantee that individuals and organizations can thrive in a technology driven environment. Consequently, personnel certification has increased in areas such as cloud computing, data analytics, and artificial intelligence. For example, in data analytics, there are certifications such as SAS Certified Big Data Professional or SAS Certified Data Scientist, while in AI, certifications include NVIDIA Certified AI Developer.

8.2.2. Industry-specific standards

As industries become increasingly specialized, certification is designed to fulfil the specific needs and criteria of each sector.

8.2.3. Globalization and cross-border trade

The increasing globalization of markets results in certifications becoming internationally more recognized and sought after. Organizations and individuals are pursuing certifications that have international recognition, enabling them to compete effectively in cross-border trade and increase their market opportunities overseas.

8.2.4. Increased emphasis on cybersecurity

Digital threats such as cyber-attacks and data breaches have led to a heightened focus on cybersecurity certifications, such as CompTIA Security+, Certified Information Systems Security Professional (CISSP), and Certified Information Systems Auditor (CISA). These can validate individuals' expertise and ensure that organizations comply with measures to protect their digital assets and sensitive information.

8.2.5. Quality assurance in the healthcare sector

Quality assurance certifications are essential for ensuring patient safety and regulatory compliance, and for delivering high-quality care. These certifications cover areas such as patient safety protocols, healthcare management systems, medical device regulations, and healthcare compliance standards. An important example in this context is the *Joint Commission*, a standards-setting and accrediting body in the healthcare sector. It currently accredits roughly 4,000 community, academic, paediatric, long term acute, psychiatric, rehabilitation and specialty hospitals.[142]

8.2.6. Certification of sustainability standards in global value chains

Sustainability certification has surged in popularity due to increased demand for sustainable products and practices. Despite varying national sustainability standards, certified products are gaining market share worldwide, with developed economies often imposing stricter requirements. In developing economies, the adoption of sustainability standards is more prevalent for the industries that are present in the export sector.[143]

Certification schemes now also cover entire supply chains, from raw materials to end-of-life management. Several factors are important in the evolution of sustainability standards, including technology, traceability and transparency, finance, future proofreading standards, and due diligence.[144]

---

142 The Joint Commission (2025)

143 ITC (2021)

144 ITC (2021)

8.2.7. Remote and virtual certification

In the last decade, technological advancements have led to an increase in remote working. In the context of certification, remote auditing is becoming increasingly prevalent among companies. The most recent version of ISO 19011:2018 – *Guidelines for auditing management systems* – incorporates additional requirements for performing remote audits to facilitate the transition to e-auditing.[145,146] Nonetheless, remote audits cannot replace in-person audits completely[147]. An OECD survey found that most stakeholders believe that on-site audits are more successful than remote audits overall, especially when it comes to regulatory systems or the actual physical auditing of premises.[148]

© iStock

---

145 A remote audit is the same as a traditional audit except that it is conducted remotely using electronic methods to receive audit evidence and objectively analyse it in order to identify the conformance to standards (Gallo, 2023)

146 Gallo (2023)

147 The authors of ISO 19011 propose including *remote* as one of the many *appropriately balanced* techniques in audit planning, viewing it as an audit method, rather than a standalone type of audit

148 OECD (2023)

9. Approaches for the Support of Certification in International Cooperation

This chapter describes approaches to foster certification in emerging and developing economies as part of international cooperation. Aspects to be considered when implementing the different options are described. Unless otherwise stated, the content was developed based on semi-structured interviews with experts and the experience gathered in international cooperation projects by the authors (for more information on the methodology, see Chapter 1).

Figure 6 summarizes the approaches for the support of certification.

9.1. Development of the quality infrastructure system

As described in the previous chapters, a national quality infrastructure system according to international norms is essential for the development of certification, as the quality infrastructure components are interrelated and mutually supportive. For this reason, the status of the quality infrastructure system should always be considered when supporting certification as part of international cooperation projects.

Figure 6: Approaches to support certification (Source: Own elaboration)

9.1.1. Description of the approach

A national or regional quality infrastructure system can be supported by international cooperation in many ways. The following intervention areas are especially relevant to create the basis for the development of certification:

Improvement of the national framework conditions
Consultancy and facilitation are two ways in which international cooperation can play a crucial role in strengthening the national framework conditions related to certification in the following areas:

- Definition of structures according to international standards and good practices as well as the role of certification and its interaction with other quality infrastructure components in national **quality laws**
- Inclusion of certification in **national quality policies**
- Development of national **certification strategies, including implementation**
- Representation of certification and coordination with the other components in **national quality committees**
- **Awareness raising and information** on market requirements, the importance of certification and its interaction with other quality infrastructure components. This is especially important for small and medium-sized enterprises in developing economies, but also for quality infrastructure organizations and relevant stakeholders.

Development of quality infrastructure organizations and their services
Supporting the development and offerings of quality infrastructure organizations can enhance national certification bodies' access to necessary services.

For example, certification according to the GOTS standard on organic textiles requires the following services from other quality infrastructure organizations, which are often not available in developing economies:

- Adoption of the GOTS standard and standards on organic agriculture into the national **standards system**
- Specific **testing services**, including testing on genetically modified organisms, as a basis for the certification decision

- **Metrological** services for the testing laboratories involved – for example, for the calibration of testing equipment
- **Accreditation** of conformity assessment services, incorporating organic certification (specifically, certification based on the GOTS standard) into the accreditation scope
- **Market surveillance mechanisms** to monitor compliance with certification requirements – for example, to prevent falsely declared organic cotton

9.1.2. Example project

Title: Strengthening Quality Infrastructure in Cambodia
Implementing Organization: PTB
Commissioned by: BMZ

This project aims to strengthen the quality infrastructure system in Cambodia, supporting sustainable development and integration into global markets. Quality infrastructure encompasses metrology, standardization, conformity assessment, and accreditation, with each component mutually reinforcing the others. The project targets the agricultural sector which serves as a key example of these interdependencies within the system.[149]

The project comprises three interconnected components, all aimed at enhancing quality infrastructure in Cambodia. All three components contribute to the overall aim by approaching distinct layers of the system:

1. The first component focuses on increasing collaboration among Cambodian quality infrastructure organizations
2. The second component entails broadening and improving the spectrum of services provided by these organizations, including capacity building activities such as training for testing and calibration laboratories
3. The third component seeks to link the services offered by quality infrastructure institutions with the needs and expectations of the demand side[150]

---

149 PTB (2024)

150 PTB (2024)

9.1.3. Aspects to be considered

Key aspects to consider when supporting the development of the quality infrastructure system as part of international cooperation for certification include:

Enhance the quality infrastructure system holistically

The national quality infrastructure is an interrelated system where each component and the technical regulatory framework are designed to work together seamlessly. For the system to be coherent and effective, its elements must be developed in parallel. Additionally, the national quality infrastructure should be linked with the international QI framework through appropriate connections: aligning with ISO and IEC for standardization, BIPM and OIML for metrology and legal metrology, IAF and ILAC for accreditation, and various regional organizations.

Develop a comprehensive policy framework

Policy and regulatory frameworks are a crucial part of the quality infrastructure system, affecting both the provision of and demand for quality infrastructure services. Therefore, the creation of specific quality services must be supported by robust policies and regulations. Public policies and programs should set objectives and criteria related to quality of goods and services and reference quality infrastructure services. It is important to include quality criteria and relevant standards in public tenders, contracts, and government programs.

Technical regulations should avoid including detailed quality criteria. Mandatory requirements that extend beyond protecting health, safety, or the environment are not consistent with international best practices or WTO/TBT agreements. Experience indicates that such mandatory requirements are often not enforced, whereas incorporating quality criteria into tenders, contracts, and government programs encourages industry actors to actively demonstrate compliance with these standards.

Promote exchange and cooperation

Encouraging collaboration and communication between quality infrastructure organizations and public and private stakeholders is crucial. This support is vital for raising awareness and promoting effective quality assurance practices. Enhancing interaction among these players is important because they often work in separate areas and do not frequently communicate. Structured engagement processes among relevant stakeholders help align related programmes and strategies, foster innovative approaches, and build long-term productive relationships, thereby improving quality within key sectors.

Foster awareness and information sharing

It is particularly important to implement effective measures to raise awareness and to inform relevant stakeholders about the benefits of quality infrastructure in general and certification specifically. For example, studies demonstrating the benefits of investing in quality infrastructure services can contribute significantly to raising awareness among national stakeholders.

Define specific priorities depending on the national context

The development of quality infrastructure services should be aligned with the concrete needs of the country. These depend on the development status of the quality infrastructure system itself, as well as on national development priorities. Current and potential users of quality infrastructure services should be consulted regularly, with consideration given to both the financial viability and the potential impact of services to be developed. It is also advisable to evaluate whether services, including certification, are already available in neighbouring countries and can therefore be easily accessed in the region. If so, there may be no need to develop these services nationally.

9.2. Development of national certification bodies

In today's dynamic markets, certification bodies face significant challenges in keeping pace with rapidly changing customer requirements, standards and regulations. International cooperation can assist national certification bodies in developing economies to stay current with market demands, ensuring that national clients have direct access to necessary certification services. Without such support, international certification bodies that operate across national borders, often with greater personnel and financial resources, are better positioned to continually update and refine their services than smaller national

competitors.[151] This disparity is particularly evident in accessing the European Union market, which features ever evolving and stringent codes of conduct, standards, and regulations. In this context, international cooperation is crucial in supporting capacity development and ensuring the competitiveness of national certification bodies in developing economies.[152]

9.2.1. Description of the approach

The following options to support the development of national certification bodies by international cooperation were identified:

Strategic and technical advisory
International cooperation can support the organizational development and the improvement and expansion of the services of national certification bodies by providing strategic and technical advice. In the context of changing requirements and certification trends (see above), such advice by national and international experts is especially relevant in the following areas:

- **Strategic positioning**, considering market trends and requirements
- **Organizational development**, including management systems and certification processes
- **Improvement and expansion of services**, including new certification scopes as well as digital processes and online methods

Capacity development
Based on or in parallel to the advisory support described above, international cooperation can enhance the capacities of staff at national certification bodies. This is important on all levels:

- **Management staff** must have current information regarding new certification requirements and emerging trends
- **Administrative staff** need knowledge on updated processes, e.g. digital process management

- **Auditors** (often external to national certification bodies) require up-to-date knowledge on requirements defined in codes of conduct, standards and regulations. They must also be informed about changes in the auditing techniques, e.g. applying digital auditing methods.

Financing
International cooperation may also contribute to financing the development of national certification bodies via the following measures:

- **Grants and donations:** Direct financial support to cover, for example, operational costs, specific projects, and capacity-building initiatives
- **Loans:** Low-interest loans

Financing or co-financing by international cooperation or national public entities should only be considered as an interim solution to cover costs in specific development phases of certification bodies – for example, during the early market introduction. Only self-financing models guarantee the required independence and are economically sustainable in the long term.

9.2.2. Example project

Title: Knowledge Centres for Organic Agriculture in Africa: Support of a private certification body in Kenya
Implementing Organization: GIZ
Commissioned by: BMZ

GIZ has supported the creation of a private national certification body in Kenya by assisting in the entire development of the organization up to accreditation, in collaboration with local partners.[153] Prior to this, mainly European certifiers offered certification services in East Africa. High costs for their services, such as travel expenses and daily fees ranging from EUR 400 to 800, resulted in the exclusion of small-scale manufacturers from certification and from having access to foreign markets.[154] In this context, the objective of this project was to

---

151 Interview 2 and 6

152 Interview 2 and 6

153 Interview 1

154 Standards and smallholders' integration into global food chains – recommendations and case studies (2007)

build a regional certification body for organic products in Africa that can provide internationally recognized certification services to small-scale producers at a local competitive price. Its activities included becoming engaged in certification activities worldwide, testing products and suppliers' quality systems, conducting surveillance, and examining product samples to ensure compliance with national and international standards, specifications, and technical regulations.[155] The result was the set-up of Africert in Kenya, which today is well established and recognized both nationally and in the region.

9.2.3. Aspects to be considered

Aspects to be considered when fostering the development of national certification bodies as part of international cooperation projects can be summarized as follows:[156]

Ensure a viable business model

The support of national certification bodies by international cooperation should be based on a viable business model defined in a comprehensive business plan.

The business plan should define a reasonable path to achieve financial sustainability. As part of this study, five certification bodies operating in developing economies across Africa and Latin America with different price levels were analysed. These cases provide insights into the cost and income structure of certification bodies in developing economies. The related information is summarized in Table 5.

Operational costs

The five cases evaluated show that the annual operational costs of national certification bodies range from USD 100,000 to USD 1 million. This broad range reflects significant differences in the price levels of the economies considered, the geographical focus of the certification bodies analyzed, and the scope of services offered. However, several interview partners confirmed their operational costs were within the medium-low to medium range, as indicated in the table below.

This means that certification bodies in these economies must generate a minimum annual revenue of USD 200,000 to USD 300,000 to cover their operational costs.[157]

Price level of the economy the certification body is operating in	Geographical focus and spectrum of services of the certification body	Operational costs of the certification body
Very low	National operation, narrow spectrum of certification services	USD 100,000
Medium-low		USD 200,000
Medium		USD 300,000
High	National operation, medium spectrum of certification services	USD 500,000
High	Regional operation, broad spectrum of certification services, high investments in the development of new services	USD 1,000,000

Table 7: Operational costs of certification bodies for selected cases by cost level, geographical focus and spectrum of certification services (Source: Own elaboration)

---

155 Munyi and Nyagah (2007)

156 Interview 1 and 3

157 Information based on interviews 1, 2, 3 and 6 and additional enquires among staff of certification bodies in partner countries

The certification body listed in the table above with USD 500,000 in operational costs offers a broader spectrum of certification services than those with lower costs. The certification body with the highest costs (USD 1,000,000) has an even wider range of services and operates at a regional level.

In this context, it should be considered that expanding the services of certification bodies requires investment: each new or updated standard added to the service portfolio demands financial and personnel resources (e.g. updating processes and training staff). In addition to these internal costs, external expenses such as laboratory analysis, external auditors, and accreditation could pose a significant financial burden to certification bodies. The breakdown of these costs is described in more detail in the next section.

Cost distribution
The interview partners consulted during this study confirmed the following cost distribution of a typical certification offered by a national certification body based on international standards:

- The largest share of costs is attributed to **decision-making, laboratory, and accreditation costs**. Decision-making refers to the certification body's evaluation to determine whether certification should be granted or maintained. To guarantee impartiality, this process is conducted by personnel that is different from those who carried out the audit. It includes reviewing audit reports, assessing corrective actions taken by the organization, and ensuring that all requirements of a standard are met.[158] Laboratory analysis also contributes to this cost category. Accreditation fees, which are often among the highest fixed expenses, are particularly significant when accreditation is provided by bodies based in developed economies that charge higher rates. This cost is further compounded when international travel is required as part of the accreditation process.
- Approximately one-quarter of the costs are related to **Administrative expenses** such as phone, electricity, internet, and accounting
- **Auditor fees** account for another quarter of the costs. In most cases, auditors are external to the certification bodies
- Around 13 % of the costs are related to auditors' **travel expenses**
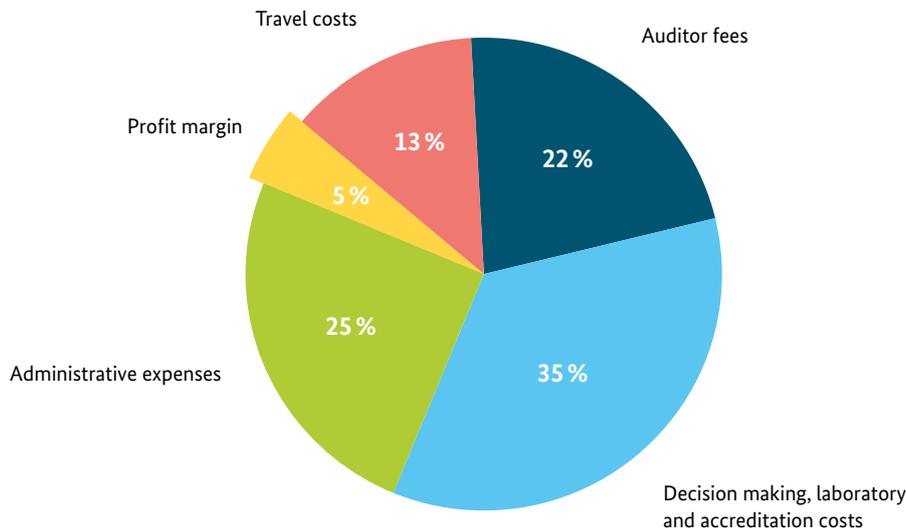
Figure 7: Cost distribution of a certification conducted by a national certification body in developing economies [159]

---

159 Information based on interviews 1, 2, 3 and 6 and additional enquires among staff of certification bodies in partner countries. The international standards ISO 9000, GLOBALG.A.P and Fairtrade were used as examples for the enquiries about the typical certification costs.

158 ISO/IEC 17065:2012 – *Conformity assessment – Requirements for bodies certifying products, processes, and services* applies

■ It is important to note that the profit margins of national certification bodies in developing economies are typically low (around 5 % in the cases analysed during the interviews). This means that national certification bodies must conduct a high volume of certifications to remain profitable.

Certification prices and minimum revenue of national certification bodies

In the cases analysed as part of this study, we found that yearly certification fees for small and medium-sized enterprises conducted by a national certification body based on international standards such as ISO 9001, GLOBALG.A.P, and Fairtrade, typically range from USD 2,000 to USD 5,000 in developing economies. Prices depend on several factors, including the national price structure, the size of the enterprise, the certification scope, and the location of auditors.

This price range was observed in economies with medium-low (USD 2,000) to medium (USD 5,000) cost levels, where certification was conducted by national certification bodies operating within their home country (see Table 5). This price range was confirmed by the few publications on certification prices that could be found as part of this study.[160, 161]

Considering the operational costs described in the previous section, the following number of certifications **is required annually** to ensure financial viability:

■ **60 certifications** of small or medium-sized enterprises for a national certification body operating in an economy with a medium cost level
■ **100 certifications** of small and medium-sized enterprises for a national certification body operating in an economy with a medium-to-low cost level

The market must **support** at least this **minimum** number of certifications **to sustain** a viable business model.

In the cases analysed, certification body clients are typically certified under one up to three different certification schemes, with two being the average. As a result:

■ In case A (60 certifications per year), a certification body needs approximately 30 active clients
■ In case B (100 certifications per year), around 50 active clients are required

Most certification bodies operate in a competitive market, allowing them to set prices based on their costs and clients' willingness to pay. However, small and medium-sized enterprises in developing economies typically operate on very limited budgets. As a result, the ability to raise certification fees to improve economic viability is highly constrained. Given these limitations, national certification bodies typically focus on increasing the number of certifications rather than raising prices.

Advantages of certification by national vs. international bodies in specific cases

The following table summarizes the advantages of certification by national certification bodies as well as cases in which international certification is to be preferred. The table is further explained in the following section.

---

160 Information based on interviews 2, 3 and 6 and additional enquires among staff of certification bodies in partner countries. As part of this study, the publicly available information found on prices for certification in developing and emerging economies was highly limited. The pricing is normally specified in project offers defined for the concrete certification request.

161 Tech Quality Pedia (2024)

Advantages of certification by national bodies	Cases in which international certification is to be preferred	Possible support by international cooperation
a) Lower costs	1. Lacking economic viability of national certification	■ Support the use of international certification services, at least in an interim phase ■ Monitor the market development to identify when demand might be sufficient to sustain new services by national certification bodies
b) Consideration of national conditions	2. Lacking international recognition of national certification	■ Support the international recognition of national certification bodies ■ Support capacity building
c) National income generation	3. Lacking capabilities of national certification	
d) Strengthening of national quality infrastructure		

Table 8: Advantages of certification by national certification bodies vs international certification (Source: Own elaboration)

a) **Lower costs:** The costs in the cases analysed were found to be approximately 50 % lower when certification was conducted by a national certification body operating within its home country compared to an international certification body with a subsidiary in the same country. This price difference is because certification bodies with headquarters outside developing economies normally have higher price levels. Additionally, international travel costs must be added in cases where the international certification body does not have an office in the country where the service is demanded.[162] This means that organizations in developing economies may receive certification services from national certification bodies with similar benefits at significantly lower prices. Lower certification prices are especially important for small and medium-sized enterprises such as cooperatives in developing economies.

b) **Consideration of national conditions:** National certification bodies are normally better informed about specific national conditions relevant to the certification process than international competitors operating from abroad. Examples of such conditions include specific legal requirements as well as the cultural and socio-economic context. Such conditions can be highly relevant, for example, when auditors assess possible non-compliance with social standards such as SA 8000 during worker interviews.

c) **National income generation:** For national certification bodies, income and related taxes are generated nationally, with the related economic effects. In contrast, international certification bodies operating from abroad generate their income in other countries, often outside developing economies.

d) **Strengthening of national quality infrastructure:** National certification bodies are normally well connected to other quality infrastructure institutions such as national testing laboratories and national standardization bodies. They frequently use the services of these national quality infrastructure institutions and often participate actively in standardization processes (via representation in national technical committees), contributing to the general development of the national quality infrastructure system.

However, in specific cases certification by international certification bodies may be preferable compared to national certification:

---

162 Information based on interviews 2, 3 and 6 and additional enquires among staff of certification bodies in partner countries. As part of this study, no publicly available information on prices for certification in developing and emerging economies could be found. The pricing is normally specified in project offers defined for specific certification requests.

1. **Lacking economic viability of national certification:** Some certifications required by international clients are very specific, with only a limited number of certification processes demanded. Additionally, in newly developing sectors, certification demand is very low – for example, for manufacturing photovoltaic components based on international standards in countries where the manufacturing sector is still in its early stages. In such cases, it is often not economically viable to develop a dedicated national certification service, as each additional service requires investment and operational expenditures, such as accreditation costs, initial and ongoing training of personnel, and the development and implementation of procedures.

2. **Lacking international recognition of national certification:** Clients in international markets normally require certification by internationally recognized certification bodies. This technically means that related certification services must be accredited by an accreditation body that is internationally recognized in the relevant scope. However, beyond this formal recognition, international markets often place greater trust in international certification bodies than in national competitors located in developing and emerging economies.

3. **Lacking capacities of national certification:** Certification services require specific knowledge and experience, both within certification bodies themselves and among their external auditors. If the required competencies are (still) not sufficiently developed nationally, international certification services may be necessary.

In the first case, international cooperation can facilitate the use of international certification bodies in developing and emerging economies to achieve the intended benefits of certification. At least during an interim phase, developing national certification body services may not yet be economically viable. It is important to monitor market development – for instance, as the target sector matures, growing demand may eventually justify the establishment of new services by national certification bodies.

In the second and third cases, international cooperation can support national certification bodies in gaining international recognition and strengthening their capacities. Activities may include providing advisory services and training to help them meet the requirements of an internationally recognized accreditation, as well as improving client relations – for example, by facilitating participation in international congresses and trade fairs.

Prevent market distortions

To prevent possible market distortions, existing certification bodies operating in the partner countries of international cooperation should be considered. Currently, in most developing economies, several certification bodies are active. Therefore, support activities should be carefully defined, such as offering equal support to a group of bodies.

The consideration of existing certification services is particularly important when supporting public certification bodies, see Table 4. As they are normally publicly (co-) financed and operating in regulated areas, they have competitive advantages over private certification bodies. Considering this, individual public entities should not be supported in areas in which private certification bodies are already active, but rather in regulated areas.

Promote national certification services

National certification bodies have a competitive disadvantage in global markets, as clients tend to trust their services less than international certification bodies. Their compliance with international standards and accreditation by internationally recognized accreditation bodies are often not sufficient to gain market access. For this reason, national certification bodies' support in gaining access to clients and markets (e.g. via the participation in trade fairs, organization of site visits etc.) is an important activity for international cooperation.[163]

---

163 It takes considerable effort to convince buyers to trust the services offered by national certification bodies. For instance, in one of the organizations interviewed, it took a decade to gain access to the EU market due to a lack of confidence (Interview 2).

Foster international recognition

Certification should be internationally recognized and based on internationally harmonized standards to ensure compatibility and competitiveness in international markets. For this reason, it is important to support the accreditation by internationally recognized accreditation bodies and the implementation of certification schemes based on international standards.[164]

Plan support activities considering the market dynamics

The demand for certification services evolves quickly. To ensure support activities remain relevant, international cooperation should carefully evaluate market dynamics. For example, they should focus on training for standards that are in high demand for certifications and unlikely to change in the near future. This approach helps prevent support efforts from becoming outdated by the time they are completed.

9.3. Support system, product and personnel certification

International cooperation may support the certification of systems, products and personnel in developing economies, enhancing compliance with standard criteria (for example, sustainability standards) and thus improving the fulfilment of the requirements of target markets. At the same time, related measures can increase the demand for certification services, as clients are better prepared to successfully pass the certification process.

9.3.1. Description of the approach

International cooperation can support system, product and personnel certification in the following ways:

Capacity building and consultancy on certification requirements

Organizations may be supported by capacity building and consultancy activities to apply the requirements of standards in their systems and products. This approach is often applied to support small and medium-sized enter-

prises, given that they often lack the required resources to fulfil the requirements of international markets.

(Co-)financing of certification costs

The costs of certification can be a high burden, especially for small and medium-sized enterprises and for cases in which the services of international certification bodies are required. In this context, international cooperation may cover the certification costs in full or in part. (Co-)financing should only take place in selected cases as initial support and based on agreements that specify when the company will be fully responsible for covering the certification costs. See further explanation in Chapter 9.3.3.

(Co-)financing of infrastructure investments

Another approach is to (co-)finance infrastructure improvement costs. For instance, small and medium-sized enterprises (SMEs) may need upgraded food-processing equipment to meet the requirements of the HACCP (Hazard Analysis and Critical Control Points) standard. By providing financial support for these upgrades, international cooperation can help SMEs enhance their compliance capabilities, ensuring they meet stringent safety and quality standards.

9.3.2. Example project

Title: Alliance for Product Quality in Africa
Implementing Organization: PTB and GIZ
Commissioned by: BMZ

The Alliance for Product Quality is a collaborative partnership involving companies, business associations, and the German Corporation for International Cooperation (GIZ). The goal of this project is to improve product quality in Africa, allowing African companies to be part of global value and supply chains and enhance their competitiveness in the international market.[165]

The project involves several interventions related to certification, e.g.:

---

164 Interview 5

165 GIZ and PTB (2024)

1. **Ethiopia:** The project entails supporting a lab to offer international tests to increase product certifications. The support is provided through:
   – Training laboratory staff in the use of new test methods
   – Purchasing new equipment
   – Assistance in the accreditation procedure and ensuring that the tests provided are internationally accepted[166]

2. **Ghana:** The project assists agricultural businesses in meeting international quality requirements and obtaining the necessary certifications. Assistance is provided through:
   – Training and consultation to help businesses establish quality management systems and internal inspection mechanisms
   – Support by technical specialists for GLOBALG.A.P., HACCP, FSSC 22000, and organic certification, which are internationally in high demand[167]

3. **Rwanda:** The project targets coffee and tea manufacturers to enhance their product quality and obtain certificates required for international export. Support is provided through:
   – Training on quality requirements and cultivation methods
   – Initial financing for certification[168]

9.3.3. Aspects to be considered

Aspects to be considered when supporting certification of systems, products or personnel as part of international cooperation projects can be summarized as follows:

Ensure sustainability[169]
When financing or co-financing certification costs, it is crucial to ensure that the certified organizations, product or personnel can cover the costs for re-certification. The reasons why external financing is required for certification should be analysed. Organizations asking for

financing or co-financing of certification costs may not see sufficient benefits of the certification compared to its costs or may not have viable business plans to cover such essential business development activities.

Financing or co-financing of certification costs often leads to a rapid increase in demand for certification, which is not supported by an intrinsic motivation of organizations or personnel. This means that certification bodies will have more demand during the implementation of support measures by international cooperation. However, this demand is often unsustainable, as demand decreases after the end of such activities (one interview partner referred to the related effect for national certification bodies as a *straw fire*).

Considering this, the sustainability of financing or co-financing certification costs should carefully be evaluated for certified organizations and personnel and for certification bodies. Given the results of the interviews conducted as part of this study, it is recommended to limit financing of certification costs to the lowest percentage possible and to focus related measures to very specific cases – for example, the introduction of new standards or the creation of first certification in a specific market. In all cases, the support activities should be communicated together with a plan for the phase-out.

Set the right indicators
Projects supporting system, product and personnel certification often use output indicators focussing on the number of certifications issued. Such indicators are relatively easy to achieve in projects that finance or co-finance certification costs. However, they do not necessarily reflect relevant impacts related to durable improvements of safety, quality and sustainability and increased competitiveness. In this context, it is recommended to prevent focussing too much on the numbers of certificates achieved and at least combine such approaches with indicators measuring the sustainable development of systems, products and personnel. For example, such indicators can cover an increased sustainability performance of organizations (e.g. increased energy efficiency or decreased water use), improved competitiveness (e.g. increased sales in international markets), better products (e.g. higher fulfilment of client requirements measured in enquiries) or better knowledge of personnel (e.g. measured in enquiries).

---

166 Alliance for product quality in Africa (2024a)

167 Alliance for product quality in Africa (2024b)

168 Alliance for product quality in Africa (2024c)

169 Interviews 1 and 4

Support certification holistically [170]

It is important to support the certification of systems, products and personnel holistically by improving certification services and increasing the benefits of certification. As stated in the other sub-chapters of this section, this includes incorporating the most relevant standards into the national standards system and supporting national certification bodies to improve access to the required services. Furthermore, measures to increase the benefits of certification for the applying organizations or personnel are important. Such measures may include supporting the recognition of certification by authorities (for example, an environmental ministry for certifications based on environmental standards) and of private customers (for example, business to business customers requiring reliable environmental performance data for their sustainability reports).

Prevent market distortion

The effects of intervention on the certification market should be considered in the planning of support measures. Market distortions must be prevented; for example, supporting only the certification of some organizations based on a specific standard decreases demand for a similar standard by other organizations that do not receive such support.

Consider market requirements [171]

Certification should only be seen as one part of efforts by an organization or a person to fulfil clients' requirements. For example, a textile product may fulfil the requirements for organic certification while not fulfilling the requirements of international buyers. Considering the experience discussed in the interviews, it is recommendable to focus on the overall requirements of the target market or clients. The fulfilment of such requirements normally requires further support activities – for example, for process improvements in applying organizations and for improvements in external conditions (for example, improved market surveillance measures by the authorities). In this context, PTB has developed a method called *Calidena* to systematically analyse market requirements, quality issues and required activities for selected value chains.[172]

---

170 Interview 1 and 3

171 Interview 4

172 https://www.calidena.ptb.de

9.4. Development of standards

Supporting standard development through international cooperation creates the basis for the certification of systems, products and personnel. Additionally, related activities can foster the harmonization of standards, strengthen environmental and social aspects, facilitate international trade and promote standardization according to international good practices.

9.4.1. Description of the approach

International cooperation can support the development of standards in the following ways:

Support of international standardization

The most relevant development processes of globally recognized standards are managed by officially mandated international standardization bodies such as ISO and IEC. To ensure that the perspectives and requirements of developing economies are considered, it is crucial to strengthen their active participation in the relevant technical committees of international standardization bodies. International cooperation can support the representation of developing economies by:

- **Advisory, information and awareness raising on relevant standardization processes and technical committees** for developing economies, depending on their current and future standardization demand
- **Supporting the digitalization** of developing economies to enhance their ability to engage in standardization processes, which increasingly rely on digital tools and communication
- **Capacity building** of the representatives of developing economies to ensure that they can participate actively and are well informed
- **(Co-)financing of the participation** of representatives of developing economies – for example, by covering travel costs for the participation in international meetings.
- **(Co-)financing standardization processes** managed by international standardization bodies – for example, in areas that are of special interest for the international cooperation such as labour practices or CO_2 emissions in global supply chains

Support of national standardization

National standardization fosters the application of standards by providing information and raising awareness, thereby increasing the demand for certification. Furthermore, national standardization is essential to ensure that the specific socio-economic demand and requirements are well reflected in standardization processes – both nationally and internationally.

International cooperation can support national standardization by:

- **Advisory, information and awareness raising** on relevant areas for standardization and existing standards. For example, the development of national action plans for standardization can be supported
- **Organizational development of national standardization organizations**
- **Strengthening of national standardization processes**, e.g. by advising on the application of good standardization practices or technical consultancy and capacity building of technical committees
- **(Co-)financing the participation** of representatives in national standardization processes, for example by covering travel costs
- **(Co-)financing national standardization processes** in areas that are specific for developing economies and not covered in international standards

Support of standardization by organizations without an official mandate

International cooperation can also support standardization by organizations without an official mandate. This support may cover the same areas as described above for international standardization bodies such as ISO and IEC. In practice, it is focussed on the organizational development and support of standardization processes in most cases, as newly established organizations are supported to create standards in areas of special interest for international cooperation.

9.4.2. Example project

Title: Common Code for the Coffee Community (4C)
Implementing Organization: GIZ
Commissioned by: BMZ

The aim of the project is to improve the economic, social, and environmental conditions of coffee production and processing to promote a sustainable coffee industry. The 4C Code was developed through consultation with coffee stakeholders worldwide and was first implemented in 2006. It sets standards that coffee farmers and other supply chain members must comply with to sell 4C-certified coffee. Buyers such as Nestlé have committed to purchasing increasing amounts of 4C-compliant coffee.

The 4C Association originally managed this code before transitioning in 2016 into the Global Coffee Platform (GCP) and the Coffee Assurance Services (CAS). The latter was acquired by MEO Carbon Solutions in 2018 and renamed 4C Services, which continues to ensure compliance with the 4C Certification System.[173]

9.4.3. Aspects to be considered

Aspects to be considered when fostering the standard development as part of international cooperation support of certification can be summarized as follows:

Ensure good standardization practice

International cooperation should ensure that, in all supported standardization activities, good standardization practice is observed. Such practice is defined in relevant ISO and ISEAL standards, among other places.[174]

---

173 4C (2024)

174 See e.g. ISO/IEC Guide 59:2019 – Code of Good Practice for Standardization and ISEAL Code of Good Practice for Setting Social and Environmental Standards

Ensure an effective representation of developing economies

Most standardization processes today are still driven by representatives of developed economies. To ensure that standards and related certification schemes fulfil the requirements and consider the context of developing economies, it is especially important to foster their equal representation vis-à-vis the relevant stakeholders. This includes representatives from the private sector and small and medium-sized enterprises, which are often underrepresented both in national and international standardization processes. To achieve effective representation, capacity building of technical committee members from developing countries is required in many areas.[175]

Consider possible adverse effects

Standards creating the basis for certification in international trade with developing economies may create adverse effects – for example, by defining criteria that are too demanding for small and medium-sized enterprises. Such potential adverse effects should be analysed within the framework of international cooperation and considered in the planning of support activities – for example, consultancy and training programs.[176]

Contribute to harmonization

The increasing number of standards and regulations relevant for international trade leads to high burdens, especially for small producers from developing economies. This is true for regulations for imports into the European Union, but also for producer-buyer relations based on private sustainability standards and codes of conduct.

International cooperation should focus its support of new standardization initiatives on areas where no similar criteria or requirements exist. Wherever possible, existing standards should be adopted to the national standards framework or adapted if required due to a specific context in developing economies. Additionally, initiatives to harmonize criteria defined in different standards or to recognize equivalency should be supported.[177]

Define criteria applicable in developing economies

Standards and regulations relevant for international trade evolve continuously and criteria to be fulfilled tend to be more demanding with each new version. To lower market entrance barriers, international cooperation may support the development of guidelines and standards specific for developing economies, defining applied criteria that may be more easily fulfilled but at the same time compatible with more demanding international standards.[178]

9.5. Development and implementation of certification schemes

International cooperation can also support the development and implementation of certification schemes, creating the basis for certification according to newly defined criteria or for the broader application of existing standards.

9.5.1. Description of the approach

Measures to support the development and implementation of certification schemes in developing economies can include the following:

Technical assistance
- **Standards development:** Assist in adapting international standards to the local context, or adapting existing standards to the national standards system
- **Quality infrastructure support:** Help develop necessary quality infrastructure, such as testing laboratories according to international standards
- **Accreditation guidance:** Provide guidance on achieving national and international accreditation for the certification scheme

---

175 Interview 3

176 Interview 2

177 Interview 6

178 Interview 2

Financial support
- **Funding:** Provide grants, loans, and subsidies to cover the initial setup costs and ongoing operations of the certification scheme
- **Capacity building:** Support training programs and workshops to develop local expertise

Training and capacity building
- **Skill development:** Organize training for auditors, inspectors, and certification bodies
- **Technical workshops:** Conduct workshops to enhance technical know-how and best practices

Policy and regulatory support
- **Policy framework:** Collaborate with local governments to create supportive policies and regulatory environments

Stakeholder engagement
- **Stakeholder outreach:** Engage local communities and stakeholders to ensure the scheme meets their needs and gains support
- **Public-private partnerships (PPPs):** Facilitate partnerships between government, private sector, and civil society

Monitoring and evaluation
- **Impact assessment:** Assist in developing metrics and methods to assess the impact of the certification scheme
- **Continuous improvement:** Support ongoing monitoring and feedback mechanisms to improve the scheme

Marketing and promotion
- **Brand development:** Help create a strong brand for the certification scheme
- **Market access:** Promote certification internationally to open new markets for certified entities

9.5.2. **Example project**

Title: Strengthening Quality Infrastructure for Solar Photovoltaics in Tunisia
Implementing Organization: PTB
Commissioned by: BMZ

In Tunisia, PTB supported the development of a guideline for solar photovoltaic (PV) installers as part of a project aimed at advancing quality infrastructure for renewable energy. ANME (National Agency for Energy Management) was supported to develop an installation guide for PV systems connected to the low-voltage grid. The guide gives a general introduction to PV systems and covers the procedures for installation, testing, commissioning and maintenance, and describes common faults and security issues and how to avoid them. To facilitate the use of the guide, training for installers was organized jointly with ANME.

The guide has proven successful and is backed by the Tunisian government. The training and content of the guide provides the basis for installer certification for the market segment of small and medium-sized PV systems connected to the low-voltage grid. The guide was shared with GIZ and the relevant stakeholders in Morocco and used there as a basis for a certification label for installers.[179]

---

179 Taqa pro (2024)

9.5.3. Aspects to be considered

Ensuring long term commitment

By developing and implementing certification schemes, structural and organizational changes are supported that create the basis for certification according to the specific requirements of developing economies. Such changes take time; international cooperation should ensure a long-term commitment to support a successful implementation.

Supporting the development and implementation holistically

As described above (see *Description of the approach*), the development and implementation of certification bodies requires a holistic approach covering not only the adaptation or adoption of standards, but also technical assistance of conformity assessment bodies, the development of governance structures, and marketing activities, among other things. International cooperation should ensure that this broad range of activities can be covered by the supporting project or seek cooperation with other implementing agencies to support the implementation effectively.

Ensure national adaptation[180]

It should be ensured that certification schemes are applicable in the context of the partner country, fulfil the specific requirements of the target market, use viable governance structures and are supported by relevant stakeholders. For this reason, the schemes should always be developed together with the relevant national organizations and be based on a broad stakeholder engagement.

---

180 Interview 2

About the Authors

The authors

Niels Ferdinand is the founder and director of Ferdinand Consultants. Since 1999, he has worked as an international consultant for PTB, supporting projects on the development of quality infrastructure, including different approaches to support certification. Throughout his career he has gathered experience working in Asia, Africa, Europe, and Latin America on projects with governmental institutions, SMEs, international development cooperation organizations, multinational corporations, and academic institutions.

Maria Llauradó works as a junior consultant at Ferdinand Consultants. Since 2022, she has gathered experience collaborating with stakeholders from Asia, Africa and Europe. She is involved in projects focussed on international cooperation, climate change, renewable energy, quality infrastructure, and sustainability reporting. She has contributed to PTB projects related to photovoltaics, green hydrogen, and quality in the supply chain.

Michael Hampel is a consultant at Ferdinand Consultants. He focusses on corporate responsibility, sustainability reporting, strategies and the facilitation of stakeholder engagement processes. Additionally, he is involved in international projects on quality infrastructure. Since joining Ferdinand Consultants, he has contributed to PTB projects in quality assurance, quality infrastructure, renewable energy, and climate change.

Stephanie Binks works as a consultant at Ferdinand Consultants. She focusses on helping the clients in the areas of sustainability reporting, sustainability strategies, quality infrastructure and sustainable development projects. Since joining the consultancy, she has been involved in numerous PTB projects related to quality infrastructure, especially in Asia and Africa.

Ferdinand Consultants

Ferdinand Consultants is an international sustainability consultancy that was established to foster sustainable impact. Its team combines sustainability expertise and industry knowledge with on-the-ground experience gained from working in the field in numerous sectors and countries around the world. For over two decades, it has been offering advice to national governments, international organizations, development agencies and NGOs with a focus on improving quality infrastructure services in developing economies.

Bibliography

All internet sources were accessed between July 2023 and June 2024.

4C (2024). 4C works towards sustainable coffee supply chains and improved livelihoods of farmers. [Online] Retrieved from: *https://www.4c-services.org/*

AACB (2024). Description of the AACB. [Online] Retrieved from: *https://aacb.com.au/*

AESA and EY (2021). Regulations applicable to labelling, packaging and specific requirements for packaged foods and beverages in the 6 Central American countries. [Online] Retrieved from: *https://trade.ec.europa.eu/access-to-markets/en/country-assets/Central_America_Labelling_and_packaging_of_packaged_foods_and_beverages.pdf*

Africa Certification (2023). Pre-export verification of conformity / PVoC. [Online] Retrieved from: *https://www.africa-certification.com/en/pre-export-verification-of-conformity/pre-export-verification-of-conformity-pvoc/?doing_wp_cron=1649616954.2769510746002197265625*

Albulescu, C.T., Drăghici, A., Fistiş, G.M., and Truşculescu, A. (2016). Does ISO 9001 quality certification influence labor productivity in EU-27. [Online] Retrieved from: *https://www.researchgate.net/publication/304106046_Does_ISO_9001_Quality_Certification_Influence_Labor_Productivity_in_EU-27*

Alliance for product quality in Africa (2024a). Better quality assurance services in the textile sector in Ethiopia. [Online] Retrieved from: *https://www.allianceforproductquality.de/en/projekte/bessere-qualitaetsdienstleistungen-textilsektor-aethiopien/*

Alliance for product quality in Africa (2024b). Certification of fruit exporters in Ghana. [Online] Retrieved from: *https://www.allianceforproductquality.de/en/projekte/zertifizierung-von-fruchtexporteuren-in-ghana/*

Alliance for product quality in Africa (2024c). Quality made in Rwanda: Tea and coffee producers tap into lucrative niche markets. [Online] Retrieved from: *https://www.allianceforproductquality.de/en/projekte/qualitaet-made-in-ruanda/*

ASQ (2024). Global. [Online] Retrieved from: *https://asq.org/global/world-map*

Auriol, E. and Schilizzi, S. G.M. (2015). Quality signalling through certification in developing countries. [Online] Retrieved from: *https://issuu.com/objectif-developpement/docs/02-papiers-recherche*

B Lab Europe (2024). What does the B Corp certification mean? [Online] Retrieved from: *https://bcorporation.eu/what-is-a-b-corp/what-does-b-corp-certification-mean/*

Bureau Veritas (2024). Global gap certification. [Online] Retrieved from: *https://www.bureauveritas.dk/en/needs/global-gap-certification*

Caps Canada (2022). Halal and Kosher certifications: Their importance for your product development. [Online] Retrieved from: *https://blog.capscanada.com/halal-and-kosher-certifications-their-importance-for-your-product-development*

Chaturvedi, R. (2023). A comprehensive guide to Kosher certification. [Online] Retrieved from: *https://www.siscertifications.com/guide-to-kosher-certification/*

Cohen, A. (2024). Paving the path to quality assurance: unveiling the top trends in the testing, inspection, and certification (TIC) Market. [Online] Retrieved from: *https://www.verifiedmarketreports.com/blog/top-7-trends-in-the-testing-inspection-and-certification-tic-market/*

DAkkS (2023a). Certification bodies for management systems. [Online] Retrieved from: *https://www.dakks.de/en/certification-bodies-for-management-systems.html*

DakkS (2023b). Certification bodies for persons. [Online] Retrieved from: *https://www.dakks.de/en/certification-bodies-for-persons.htm*l

DAkkS (2023c). Inspection bodies. [Online] Retrieved from: *https://www.dakks.de/en/inspection-bodies.html*

Diekmann, U. (2018). Qualitätsinfrastruktur in least developed countries. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/Studies/PTB_Studie_QI_in_LDCs_DE.pdf*

DQS (2023). What is certification? [Online] Retrieved from: *https://www.dqsglobal.com/en-hk/about/certification/what-is-certification*

EA (2024). IAF/ILAC recognition. [Online] Retrieved from: *https://european-accreditation.org/mutual-recognition/iaf-ilac-recognition/*

EEU (2024). Technical regulation and standardization. [Online] Retrieved from: *https://eec.eaeunion.org/en/comission/department/deptexreg/tr/default.php*

EFAC (2024). EFAC. [Online] Retrieved from: *https://www.eqa.ie/our-accreditations-and-approvals/efac/*

EOQ (2024). European Quality: Building a brighter, better tomorrow. [Online] Retrieved from: *https://www.eoq.org/home/*

European Commission (2024a). Product safety and market surveillance. [Online] Retrieved from: *https://commission.europa.eu/business-economy-euro/product-safety-and-requirements/product-safety/product-safety-and-market-surveillance_en*

European Commission (2025). Notified bodies. [Online] Retrieved from: *https://single-market-economy.ec.europa.eu/single-market/goods/building-blocks/notified-bodies_en*

FAO (2003). Environmental and social standards, certification and labelling for cash crops. [Online] Retrieved from: *https://www.fao.org/3/y5136e/y5136e00.htm#Contents*

FDA (2024). Product regulation. [Online] Retrieved from: *https://www.fda.gov/animal-veterinary/animal-food-feeds/ product-regulation*

Ferdinand, N., Telfser, K., Heider, C., and Balbín, N. (2023). Quality Infrastructure for Photovoltaic Systems. Assuring safety, quality and sustainability in emerging and developing economies. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/ publikationen/Studies/PTB_Study_QI_for_PV_EN.pdf*

Fonseca, L., Domingues, J.P., Baylina, P., and Calderón, M. (2017). Management system certification benefits: where do we stand? [Online] Retrieved from: *https://www.jiem.org/index.php/jiem/article/view/2350*

Fortune Business Insights (2022). Testing, inspection and certification (TIC) market size, share, covid 19 impact analysis, by service type, by sourcing type, by industry, and regional forecast, 2022-2029. [Online] Retrieved from: *https://www.fortunebusinessinsights.com/testing-inspection-certification-tic-market-104939*

Franceschini, F., Galetto, M., Maisano, D., and Mastrogiacomo, L. (2011). A proposal of a new paradigm for national quality certification systems. [Online] Retrieved from: *https://www.researchgate.net/publication/230841998_A_ proposal_of_a_new_paradigm_for_national_quality_certification_systems*

Frisch, B. (2017). Quality infrastructure for sustainable development – QuISP. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/docs/ PTB_Compact_QuISP_f_EN.pdf*

Gallo, I. (2023). What are benefits and barriers when performing remote audits? [Online] Retrieved from: *https://advisera.com/articles/what-are-benefits-and-barriers-when-performing-remote-audits/*

Gantz, S.D. (2014). Auditing in context (Quality management and quality assurance). In: The Basics of IT Audit. [Online] Retrieved from: *https://www.sciencedirect.com/science/article/abs/pii/B978012417159600002X*

GIZ and PTB (2024). Alliance for product quality in Africa. [Online] Retrieved from: *https://www.ptb.de/cms/ fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/projektprofile/PTB_Projekt_ Alliance_for_Product_Quality_EN.pdf*

GLOBALG.A.P. (2024). Why choose the GLOBALG.A.P. Risk Assessment on Social Practice? [Online] Retrieved from: *https://www.globalgap.org/what-we-offer/solutions/grasp/*

GOTS (2024a). Certification. [Online] Retrieved from: *https://global-standard.org/certification-and-labelling/ certification#benefits*

GOTS (2024b). The standard. [Online] Retrieved from: *https://global-standard.org/the-standard*

Henson, S., Humphrey, J. (2010). Understanding the complexities of private standards in global agri-food chains as they impact developing countries. [Online] Retrieved from: *https://www.ids.ac.uk/download.php?file=files/dmfile/ HensonHumphreyLeuvenOct08.pdf*

Hussain, T., Eskildsen, J.K., and Edgeman, R. (2018). The intellectual structure of research in ISO 9000 standard series (1987–2015): A Bibliometric analysis. [Online] Retrieved from: *https://www.tandfonline.com/doi/abs/10.1080/14783363.2018.1469977*

IAACB (2024). What we do. [Online] *Retrieved from: https://iaacb.org/what-we-do/*

IEC (2023a). National committees. [Online] Retrieved from: *https://www.iec.ch/national-committees*

IEC (2023b). What is conformity assessment. [Online] Retrieved from: *https://www.iec.ch/conformity-assessment/what-conformity-assessment*

IEC, ISO, and UNIDO (2023). Building trust – The conformity assessment toolbox. [Online] Retrieved from: *https://www.iso.org/publication/PUB100230.html*

ILAC (2024). Global Accreditation Cooperation Incorporated is Registered in New Zealand. [Online] Retrieved from: *https://ilac.org/latest_ilac_news/global-accreditation-cooperation-incorporated-is-registered-in-new-zealand/*

INetQI (2024). [Online] Retrieved from: *https://www.inetqi.net/*

Interreg North-West Europe (2023). The difference between verification, validation, regulatory compliance and certification. [Online] Retrieved from: *https://vb.nweurope.eu/media/9617/guide-to-verification_validation_certification.pdf*

IRENA (2015). Quality infrastructure for renewable energy technologies. [Online] Retrieved from: *https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_QI_1_PM_Guide_2015.pdf?rev=e3f303f33053400b97d094dc0c324541*

ISA (2022). How Halal certification benefits businesses and consumers. [Online] Retrieved from: *https://www.isahalal.com/news-events/blog/how-halal-certification-benefits-businesses-and-consumers*

Isharyadi, F. and Kristiningrum, E. (2021). Profile of system and product certification as quality infrastructure in Indonesia. [Online] Retrieved from: *https://doi.org/10.1515/eng-2021-0054*

ISO (2005). ISO strategies. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/102_National_QI/PTB_Q5_National_QI_EN.pdf*

ISO (2015). ISO 9000:2015. Quality management systems – Fundamentals and vocabulary. [Online] Retrieved from: *https://www.iso.org/standard/45481.html*

ISO (2015). ISO 9001:2015. Quality management systems. Requirements. [Online] Retrieved from: *https://www.iso.org/standard/62085.html*

ISO (2015). ISO 14001:2015 Environmental management systems – Requirements with guidance for use. [Online] Retrieved from: *https://www.iso.org/standard/60857.html*

ISO (2016). ISO 37001:2016 – Anti-bribery management systems. A practical guide. [Online] Retrieved from: *https://www.iso.org/publication/PUB100457.html*

ISO (2016). ISO 17034:2016 General requirements for the competence of reference material producers. [Online] Retrieved from: *https://www.iso.org/obp/ui/en/#iso:std:iso:17034:ed-1:v1:en*

ISO (2018). Food safety management – ISO 22000:2018. [Online] Retrieved from: *https://www.iso.org/publication/ PUB100430.html*

ISO (2018). ISO 45001:2018. Occupational health and safety management systems – Requirements with guidance for use. [Online] Retrieved from: *https://www.iso.org/standard/63787.html*

ISO (2018). ISO 31000:2018 – Risk management– A practical guide. [Online] Retrieved from: *https://www.iso.org/ publication/PUB100464.html*

ISO (2019). ISO 22301:2019(en) Security and resilience – Business continuity management systems – Requirements. [Online] Retrieved from: *https://www.iso.org/obp/ui/#iso:std:iso:22301:ed-2:v1:en*

ISO (2022). ISO 15189:2022. Clinical laboratory - Requirements for quality and competence. [Online] Retrieved from: *https://www.iso.org/obp/ui/es/#iso:std:iso:15189:ed-4:v1:en*

ISO (2023). How tech giants are building cyber resilience. [Online] Retrieved from: *https://www.iso.org/contents/news/2023/02/how-to-build-cyber-resilience.html*

ISO (2024a). Introduction to conformity assessment and ISO/CASCO. [Online] Retrieved from: *https://www.unescap. org/sites/default/files/3%20-%20Introduction%20to%20Conformity%20Assessment%20and%20ISO%20CASCO.pdf*

ISO (2024b). ISO 50001 – Energy management. [Online] Retrieved from: *https://www.iso.org/iso-50001-energy-management.html*

ISO (2025). Popular standards. [Online] Retrieved from: *https://www.iso.org/popular-standards.html*

ISO/IEC (2013). ISO 17067:2013 Conformity assessment – Fundamentals of product certification and guidelines for product certification schemes. [Online] Retrieved from: *https://www.iso.org/obp/ui#iso:std:iso-iec:17067:ed-1:v1:en*

ISO/IEC (2013). ISO/IEC 17067 Conformity Assessment – Fundamentals of Product Certification and Guidelines for Product Certification Schemes. [Online] Retrieved from: *https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17067:ed-1:v1:en*

ISO/IEC (2014). ISO Supplement, Annex SL, Appendix 2, cl. 3.04. [Online] Retrieved from (p. 23): *https://www.unescap.org/sites/default/files/3%20-%20Introduction%20to%20Conformity%20Assessment%20and%20 ISO%20CASCO.pdf*

ISO/IEC (2017). ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. [Online] Retrieved from: *https://www.iso.org/publication/PUB100424.html*

ISO/IEC (2019). ISO/IEC 17029:2019. Conformity assessment – General principles and requirements for validation and verification bodies. [Online] Retrieved from: *https://www.iso.org/standard/29352.html*

ISO/IEC (2020). ISO/IEC 17000:2020(en). Conformity assessment – Vocabulary and general principles. [Online] Retrieved from: *https://www.iso.org/obp/ui/en/#iso:std:iso-iec:17000:ed-2:v2:en:term:6.5*

ISO/IEC (2022). ISO/IEC 27001:2022. Information security, cybersecurity and privacy protection – Information security management systems – Requirements. [Online] Retrieved from: *https://www.iso.org/standard/27001*

ISO/IEC (2023). ISO/IEC 17043:2023. Conformity assessment – General requirements for the competence of proficiency testing providers. [Online] Retrieved from: *https://www.iso.org/standard/80864.html*

ISO/TC 176/SC 2 (2015). The process approach in ISO 9001:2015. [Online] Retrieved from: *https://www.iso.org/committee/53896.html?t=kEIf8Ra_jTmCDLWo7ku57UZUvu942m754FkDGe8wsE5qAT-fBKpIHM9ANkCXo5Me&view=documents#section-isodocuments-top*

ISO and UNIDO (2013). Fast forward. National standards bodies in developing countries. [Online] Retrieved from: *https://www.iso.org/publication/PUB100038.html*

ISO and UNIDO (2021). ISO 22000:2018 – Food safety management systems. A practical guide. [Online] Retrieved from: *https://www.iso.org/publication/PUB100454.html*

Islam, M.M., Karim, M.A., and Habes, E.M. (2015). Relationship between quality certification and financial & non-financial performance of organizations. [Online] Retrieved from: *https://ideas.repec.org/a/jda/journl/vol.49year2015issue6pp119-132.html*

ITC (2022). Understanding the role of government export promotion agencies. [Online] Retrieved from: *https://thetradecouncil.com/understanding-the-role-of-government-export-promotion-agencies/*

ITC (2021). Sustainability standards - A new deal to build forward better. [Online] Retrieved from: *https://intracen.org/file/t4sdpublication20211217webpagespdf*

ITC and PTB (2011). Export quality management. A guide for small and medium-sized exporters. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/209_Guide_EQM/ITC_PTB_Export_Quality_Management_EN.pdf*

Kakouris, A.P., and Sfakianaki, E. (2018). Impacts of ISO 9000 on Greek SMEs business performance. [Online] Retrieved from: *https://www.researchgate.net/publication/328391336_Impacts_of_ISO_9000_on_Greek_SMEs_business_performance*

Kellermann, M. (2011). Thoughts on a national quality policy. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/304_Discussion_4_National_QI/PTB_Q5_Discussion4_National_QI_EN.pdf*

Kellermann, M. (2019). Comprehensive Diagnostic Tool. Annex to the QI Toolkit. [Online] Retrieved from: *https://documents1.worldbank.org/curated/en/676051553265192554/pdf/Comprehensive-Diagnostic-Tool-Annex-to-the-QI-Toolkit.pdf*

Kenya Bureau of Standards (2023). PVoC responsibilities. [Online] Retrieved from: *https://www.kebs.org/index.php?option=com_content&view=article&id=201:responsibilities-under-the-pvoc-program&catid=59&Itemid=346#*

Likos, E. and Yapici, F. (2019). Product certification on furniture industry. In: Söğütlü C, Döngel N, Çinar H, İmirzi Ö, Yilmaz K, Öztürk Y, Akkuş B, editors. The XXIXTH International Conference Research for Furniture Industry. [Online] Retrieved from: *https://www.degruyter.com/document/doi/10.1515/eng-2021-0054/html#j_eng-2021-0054_ref_001*

Metrology Asia Pacific (2023). Setting up a national quality infrastructure. [Online] Retrieved from: *https://metrologyasiapacific.com/about-metrology/what-is-the-quality-infrastructure/setting-up-a-national-quality-infrastructure/*

Ministry of Consumer Affairs (2023). Product standards, technical specifications and certification. [Online] Retrieved from: *https://administracion.gob.es/pag_Home/en/Tu-espacio-europeo/derechos-obligaciones/empresas/productos/normas-especificaciones/info-general.html*

Munyi, P, and Nyagah, R. (2007). From Science to Market: Transferring Standards Certification Know-How from ICIPE to Africert Ltd. [Online] Retrieved from: *https://www.ipmall.info/sites/default/files/hosted_resources/IP_handbook/ch17/ipHandbook-Ch%2017%2020%20Munyi-Nyagah%20ICIPE%20and%20Africert%20Ltd.pdf*

Naden, C. (2019). Building resilience: ISO standard for business continuity just updated. [Online] Retrieved from: *https://www.iso.org/news/ref2446.html*

OECD (2023). Costs, benefits and effectiveness of remote audits for international food safety. [Online] Retrieved from: *https://www.oecd.org/publications/costs-benefits-and-effectiveness-of-remote-audits-for-international-food-safety-fef97106-en.htm*

OECD (2003). Supra-national regulators. [Online] Retrieved from: *https://www.oecd.org/finance/financial-markets/18469190.pdf*

Paris, C. (2023). IAF and ILAC to Merge as "GLOBAC". [Online] Retrieved from: *https://www.oxebridge.com/emma/iaf-and-ilac-to-merge-as-globac/*

PTB (2024). Strengthening quality infrastructure. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/projektprofile/PTB_project_Cambodia_95274_EN.pdf*

PTB (2020). Business resilience standards. helping businesses address covid-19 related economic challenges. [Online] Retrieved from: *https://see.ptb.de/fileadmin/documents/see/SEE_QI_Visibility/Visibility_material/ToT-Booklet-Komplett_Cover.pdf*

PTB (2007). The roadmap to an accreditation system. 30 milestones for developing countries. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/007_Accreditation/PTB_Q5_Accreditation_EN.pdf*

Rabbi Dovid Cohen (2023). Logos. [Online] Retrieved from: *https://consumer.crckosher.org/publications/logos/*

Sá, J.C., Vaz, S., Carvalho, O., Lima, V., Morgado, L., Fonseca, L., Doiro, M., and Santos, G. (2020). A model of integration ISO 9001 with Lean six sigma and main benefits achieved. [Online] Retrieved from: *https://www.tandfonline.com/doi/abs/10.1080/14783363.2020.1829969*

SAI (2024). SA8000® standard. [Online] Retrieved from: *https://sa-intl.org/es/programs/sa8000/*

Sampaio, P., Saraiva, P., and Rodrigues, A.G. (2009). ISO 9001 certification research: questions, answers and approaches. [Online] Retrieved from: *https://www.researchgate.net/publication/228682800_ISO_9001_certification_research_Questions_answers_and_approaches*

Sanetra, C., Marbán, R.M. (2007). The answer to the global quality challenge: a national quality infrastructure. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/102_National_QI/PTB_Q5_National_QI_EN.pdf*

SGS (2023). Uganda – Pre-export verification of conformity. [Online] Retrieved from: *https://www.sgs.com/en/services/uganda-product-conformity-assessment-pca*

Siltori, P.F., Simon Rampasso, I., Martins, V.W., Anholon, R., Silva, D., and Souza Pinto, J. (2020). Analysis of ISO 9001 certification benefits in Brazilian companies. [Online] Retrieved from: *https://www.tandfonline.com/doi/abs/10.1080/14783363.2020.1756246*

Standards and smallholders' integration into global food chains – recommendations and case studies (2007). [Online] Retrieved from: *https://nscpolteksby.ac.id/ebook/files/Ebook/Hospitality/Food%20Quality%20and%20Safety%20Standards%20(2007)/6.%20Chapter%205%20-%20Standards%20and%20smallholders%20integration%20into%20global%20food%20chains%20recommendations%20and%20case%20studies.pdf*

Standards Council of Canada (2023). The benefits of accreditation for developing countries. [Online] Retrieved from: *http://www.jtc1sc34.org/en/c/document_library/get_file2965.pdf?uuid=d285e04c-84a2-4d77-aacf-07aad43eb289&groupId=10174*

Standards Council of Canada (2024). National certification body. [Online] Retrieved from: *https://www.scc.ca/en/agl-ncb*

Tackett, S. (1991). The quality council: a catalyst for improvement. [Online] Retrieved from: *https://pubmed.ncbi.nlm.nih.gov/10112985/*

Talapatra, S., Santos, G., Uddin, K., and Carvalho, F. (2019). Main benefits of integrated management systems through literature review. [Online] Retrieved from: *https://www.researchgate.net/publication/337497309_Main_benefits_of_integrated_management_systems_through_literature_review*

Taqa pro (2024). Organisation. [Online] Retrieved from: *https://taqapro.ma/organisation/*

Tarí, J.J., Molina-Azorín, J.F., and Heras, I. (2012). Benefits of the ISO 9001 and ISO 14001 standards: A literature review. [Online] Retrieved from: *https://www.jiem.org/index.php/jiem/article/view/488/0*

Tech Quality Pedia (2024). ISO 9001 Certification Fees | ISO 9001 Certification Body. [Online] Retrieved from: *https://techqualitypedia.com/iso-9001-certification-fees/*

Terziovski, M., and Guerrero, J.L. (2014). ISO 9000 quality system certification and its impact on product and process innovation performance. [Online] Retrieved from: *https://blogs.curtin.edu.au/cbs-staff/wp-content/uploads/sites/37/2014/10/ISO-9000-Innovation-Published-ARticle-20141.pdf*

The Joint Commission (2025). Accreditation Options & Certification. [Online] Retrieved from: https://www.jointcommission.org/what-we-offer/accreditation/health-care-settings/hospital/learn/accreditation-options-certifications/

Thomas, D. (2023). Certification and verification: What's the difference? [Online] Retrieved from: *https://iov42.com/certification-and-verification-whats-the-difference/*

TIC Council (2020). Value of the testing, inspection and certification Sector. [Online] Retrieved from: *https://www.tic-council.org/application/files/1216/2211/4719/Value_of_the_Testing_Inspection_and_Certification_Sector_-_2020-12-23_Final_report.pdf*

Tippmann, C. (2013). The national quality infrastructure. [Online] Retrieved from: *https://emi.qcc.gov.ae/-/media/Project/QCC/EMI/Documents/TheNationalQualityInfrastructure.pdf*

Tran, E. (1999). Verification/validation/certification. [Online] Retrieved from: *https://users.ece.cmu.edu/~koopman/des_s99/verification/*

UNCTAD (2024). Voluntary Sustainability Standards. [Online] Retrieved from: *https://unctad.org/topic/trade-analysis/voluntary-sustainability-standards*

UNECE (2018). 12 international organizations renew their commitment to promote quality infrastructure through a global network. [Online] Retrieved from: *https://unece.org/trade/press/12-international-organizations-renew-their-commitment-promote-quality-infrastructure*

UNIDO (2022). Quality infrastructure for sustainable development index - supporting sustainable development goals with quality infrastructure. [Online] Retrieved from: *https://hub.unido.org/sites/default/files/publications/Quality%20Infrastructure%20for%20Sustainable%20Development%20Index_REPORT_online.pdf*

UNIDO (2018). Quality infrastructure – UNIDO's unique approach. [Online] Retrieved from: *https://hub.unido.org/sites/default/files/publications/UNIDO_QI_CASE_FINAL_ONLINE.pdf*

UNIDO (2017a). Setting up accreditation bodies in developing countries. [Online] Retrieved from: *https://www.unido.org/sites/default/files/2017-07/Accreditation_Bodies_final_0.pdf*

UNIDO (2017b). Quality Infrastructure of the Americas. [Online] Retrieved from: *https://qica.site/wp-content/uploads/2022/04/NQI_Americas_Report_EN.pdf*

UNIDO (2016). Setting up accreditation bodies in developing countries. [Online] Retrieved from: *https://www.tralac.org/images/docs/10794/setting-up-accreditation-bodies-in-developing-economies-a-guide-to-opening-the-door-for-global-trade-unido-october-2016.pdf*

U.S. Green Building Council (2024). [Online] Retrieved from: *https://www.usgbc.org/leed*

What Works Growth (2018). Toolkit business advice – Export promotion agencies. *https://whatworksgrowth.org/wp-content/uploads/18-01-15_Updated_-_Export_Promotion_Agencies.pdf*

WHO (2024). National regulatory agencies. [Online] Retrieved from: *https://www.who.int/southeastasia/activities/national-regulatory-agencies*

WTO (1994). TBT Agreement. [Online] Retrieved from: *https://www.ptb.de/cms/fileadmin/internet/fachabteilungen/abteilung_9/9.3_internationale_zusammenarbeit/publikationen/102_National_QI/PTB_Q5_National_QI_EN.pdf*

Your Europe (2024). CE marking. [Online] Retrieved from: *https://europa.eu/youreurope/business/product-requirements/labels-markings/ce-marking/index_en.htm*

Annex A: List of Experts Reviewing the Study and Interviewed

List of experts for quality infrastructure and certification who reviewed the study

Name
Anna Kalkuhl
Tobias Diergardt
Martin Kaiser
Manfred Kindler
Jutta Krawinkel
Michael Peet
Lani Limpin
Taurino Reyes
Ulf Seiler

List of experts interviewed

Name	Organization	Date
Ruth Nyagah	SPS Consultant	24.04.2024
Taurino Reyes	CERTIMEX	25.04.2024
Michael Peet	BSI	26.04.2024
Christian Dohse	GIZ	02.05.2024
Ulf Seiler	PTB	13.05.2024
Lani Limpin	OCCP	14.05.2024

Annex B: Glossary

Accreditation	Formal recognition that an organization is competent to perform specific tasks. For example, testing and calibration laboratories and certification or inspection bodies are accredited for specific services.
Compliance	Conforming to a rule, such as a specification, written down in standards or technical regulations.
Conformity	Compliance of a product, service, process, system, individual or body with the requirements specified.
Conformity assessment	Any activity whose objective is to determine, directly or indirectly, whether the requirements specified for a product, process, system, individual or body are met. Conformity assessment includes activities such as sampling, testing, inspection or certification as well as the accreditation of conformity assessment bodies.
Inspection	Assessment of the design of a product, the product, a process or facilities and determination of its conformity with specific requirements or, based on professional judgement, with general requirements. Inspection of a process may include inspection of people, facilities, technology and methodology.
Metrology	The science of measurement. A distinction is made between scientific, legal and industrial metrology.
National quality system	Group of organizations responsible for the quality infrastructure of a country. This usually includes metrology, standards and accreditation bodies.
Nonconformity	Deviation from a specification, a standard or technical regulation. Nonconformities are known as a defect and classified as critical, major or minor.
Proficiency testing	Use of interlaboratory comparisons to determine the individual performance of laboratories in carrying out specific tests or measurements.
Quality	Degree to which a group of inherent characteristics meets requirements. It is demonstrated by customer satisfaction.
Quality assurance	Measures that "focus on providing confidence that quality requirements will be fulfilled" (ISO 9000). Quality assurance is part of quality management and includes the use of quality infrastructure services.
Quality infrastructure	The system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the safety, quality and environmental soundness of goods, services and processes.

Standards	Voluntary agreements made by stakeholders on a product, a service or a process. Formal international standards are developed using the core WTO TBT principles of transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and addressing the concerns of developing economies.
	Private standards are elaborated by private or non-governmental organizations *(standards setters)*. Standards are prepared by all interested parties. The consensus-based process is facilitated by a national, regional or international standards body. Compliance with standards is voluntary; they can, however, be referenced in legislation and private contracts.
Technical barriers to trade	Bi- and multilateral agreements attempt to facilitate trade and eliminate technical barriers to it. Exceptions are only tolerated when they involve the legitimate interests of states.
Technical committee	Representatives of interested stakeholder groups (e.g. business sector, academia and consumers) that develop standards. This committee is guided by the national standards body, which has an advisory and facilitating role.
Technical regulations	Acts issued by the competent authority which establish the characteristics of a product or service or related products and includes applicable administrative dispositions, the observance of which is mandatory or imperative.
Testing	Determination of one or more characteristics of an object evaluated for conformity according to a procedure.
Testing and analysis laboratory	Laboratory that performs tests and analysis to generate objective data on the quality of a product or a process.
Third party	Individual or organization recognized as independent from the interested parties. The interested parties are usually the supplier (first party) or the customer (second party).
Traceability	Ability to trace or leave records of movements and processes gone through by a specific product, mainly those intended for human consumption. The concept is also applicable to the logistics management of warehouses, inventories and production processes of any product, etc.
	In metrology, a traceability chain is an unbroken chain of comparisons, each with their stated uncertainties. This ensures that a measurement result or the value of a standard is related to references at the higher levels, ending at the primary physical standard. In chemistry and biology, traceability is often obtained by using certified reference materials (CRM).
Value chain	Complete range of activities carried out by companies taking the product from its creation to its end use and beyond. This process includes materials, production and distribution and it usually involves several companies and supporting institutions.

Annex C: List of Important Standards

The following list summarizes standards and standard series that are especially relevant in the context of this study. They are presented in the order in which they appear throughout the study.

Name	Description
ISO/IEC 17021-1:2015 – Conformity assessment – Requirements for bodies providing audit and certification of management systems – Part 1: Requirements	Contains principles and requirements for the competence, consistency and impartiality of bodies providing audit and certification of all types of management systems.
ISO/IEC 17024:2012 – Conformity assessment – General requirements for bodies operating certification of persons	Contains principles and requirements for a body certifying persons against specific requirements, and includes the development and maintenance of a certification scheme for persons.
ISO/IEC 17065:2012 – Conformity assessment – Requirements for bodies certifying products, processes and services	Contains requirements for the competence, consistent operation and impartiality of product, process and service certification bodies.
ISO/IEC 17025:2017 – General requirements for the competence of testing and calibration laboratories	It sets out requirements for the competence, impartiality, and consistent operation of laboratories, ensuring the accuracy and reliability of their testing and calibration results.
ISO/IEC 17029:2019 – Conformity assessment – General principles and requirements for validation and verification bodies	Contains general principles and requirements for the competence, consistent operation and impartiality of bodies performing validation/verification as conformity assessment activities.
ISO/IEC 17000:2020(en) – Conformity assessment – Vocabulary and general principles	Specifies general terms and definitions relating to conformity assessment (including the accreditation of conformity assessment bodies).
ISO/IEC 17020:2012 – Conformity assessment – Requirements for the operation of various types of bodies performing inspection	Specifies requirements for the competence of bodies performing inspection and for the impartiality and consistency of their inspection activities.
ISO 15189:2022 – ISO 15189 – Medical laboratories – Requirements for quality and competence	Specifies requirements for quality and competence in medical laboratories.
ISO 9000 series – Quality management	Helps organizations improve the quality of their products and services and consistently meet their customers' expectations.
ISO 14000 series – Environmental management	Improves the company's environmental performance.
ISO/IEC 17067:2013 – Conformity assessment – Fundamentals of product certification and guidelines for product certification schemes	Describes the fundamentals of product certification and provides guidelines for understanding, developing, operating or maintaining certification schemes for products, processes and services.
ISO/IEC 17024:2012 – Conformity assessment – General requirements for bodies operating certification of persons	Contains principles and requirements for a body certifying persons against specific requirements, and includes the development and maintenance of a certification scheme for persons.
GLOBALG.A.P.	Standards for safe and responsible production processes in agriculture, aquaculture, and floriculture.

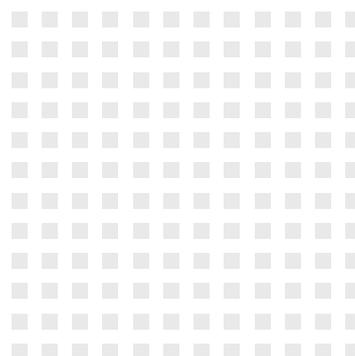|	
GSO 2055-1:2015 – متجر المواصفات – Ministry of Commerce and Industry – Sultanate of Oman	"Contains general requirements for Halal food."
GSO 2055-2:2021 – Standards Store – GCC Standardization Organization	"Contains the requirements that halal certification bodies shall meet."
SMIIC	"Contains the basic requirements and general requirements that shall be followed at any stage of food chain."
ISO 22301:2019 – Business continuity management systems	"Provides a framework for organizations to plan, establish, implement, operate, monitor, review, maintain, and continually improve a documented management system."
ISO/IEC 27000 family – Information security management	"IT security, cybersecurity and privacy protection are vital for companies and organizations today. This family of standards keeps them safe."
ISO 22000 – Food safety management	"Inspires confidence in the company's food products."
ISO 45000 series – Occupational health and safety	"Reduces workplace risks and make sure that everyone gets home safely."
ISO 50001 – Energy management	"Helps organizations manage their energy performance."
Global organic textile standard (GOTS)	"Defines requirements for organic textiles."
SA8000® Standard – SAI	"SA8000 measures social performance in eight areas important to social accountability in workplaces, anchored by a management system element. "
GLOBALG.A.P. Risk Assessment on Social Practice (GRASP)	"Aims to support the evaluation of workers' health, safety, and welfare at farm level."
ISO 19011:2018 – Guidelines for auditing management systems	"Contains guidelines for auditing management systems."
ISEAL standards	"ISEAL is the global membership association for credible sustainability standards."
ISO/IEC Guide 59:2019(en), ISO and IEC recommended practices for standardization by national bodies	"Provides recommended standardization practices that are intended to support the application of the following: – the WTO TBT Committee decision on principles for the development of international standards, guides and recommendations (G/TBT/9, 13 November 2000); – the WTO TBT Agreement's Code of Good Practice for the Preparation, Adoption and Application of Standards (Annex 3 of the 1995 WTO TBT Agreement)."

Abbreviations and Acronyms

AACB	Association of Accredited Certification Bodies
AI	Artificial intelligence
ASQ	American Society for Quality
ASTM International	American Society for Testing and Materials
BCI	Business Compliance Initiative
BCMS	Business continuity management system
BIA	B impact assessment
BIPM	International Bureau of Weights and Measures
	Bureau international des poids et mesures
BMZ	Federal Ministry for Economic Cooperation and Development
	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung
CAB	Conformity assessment body
CAC	Codex Alimentarius Commission
CAS	Coffee Assurance Services
CB	Certification body
CE	European Conformity
	Conformité Européenne
CEN	European Committee for Standardization
CFR	Code of Federal Regulations
CISA	Certified Information Systems Auditor
CISSP	Certified Information Systems Security Professional
CoC	Certificate of conformity
CRM	Certified reference materials
DAkkS	German Accreditation Body
	Deutsche Akkreditierungsstelle
DIN	German Institute for Standardization
	Deutsches Institut für Normung
DoC	Declaration of conformity
EFAC	European Federation of Associations of Certification Bodies
EMS	Environmental management system
EOQ	European Organization for Quality
ESO	European Standards Organization
EU	European Union
EnMS	Energy management system
EPA	Export promotion agency
FAO	Food and Agriculture Organization of the United Nations
FDA	Food and Drug Administration
FD&C Act	Federal Food, Drug, and Cosmetic Act
FSMS	Food safety management system
GCP	Global Coffee Platform
GIZ	German Corporation for International Cooperation
	Deutsche Gesellschaft für Internationale Zusammenarbeit

GLOBAC	Global Accreditation Cooperation
GLOBALG.A.P.	Global Good Agricultural Practices
GMO	Genetically modified organism
GRASP	GLOBALG.A.P. Risk Assessment on Social Practice
GSO	Gulf Standards Organization
IAACB	International Association of Accreditation and Certification Bodies
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ILAC	International Laboratory Accreditation Cooperation
INetQI	International Network on Quality Infrastructure
IoT	Internet of Things
IPPC	International Plant Protection Convention
SI	International system of units
ISMS	Information security management systems
ISO	International Standardization Organization
ITC	International Trade Centre
ITU	International Telecommunication Union
LDC	Least developed country
LEED	Leadership in Energy and Environmental Design
MRA	Mutual recognition agreement
NAB	National accreditation body
NC	National committee
NCB	National certification body
NGO	Non-governmental organization
NMI	National metrology institute
NQI	National quality infrastructure
NRA	National regulatory agency
NSB	National standards body
OH&S	Occupational health and safety
OIML	International Organization of Legal Metrology
	Organisation Internationale de Métrologie Légale
PSIC	Pre-shipment inspection certificate
PT	Proficiency testing
PVoC	Pre-export verification of conformity
QI	Quality infrastructure
QIS	Quality infrastructure system
QI4SD	Quality infrastructure for sustainable development
QMS	Quality management system
PPP	Public-Private Partnership
RM	Reference material
RTCA	Central American Technical Regulations
	Reglamento Técnico Centroamericano
SAAS	Social Accountability Accreditation Services
SAI	Social Accountability International
SDG	Sustainable Development Goal
SDoC	Supplier declaration of conformity

SGS	General Society of Surveillance
	Société Générale de Surveillance
SMIIC	Standards and Metrology Institute for Islamic Countries
TBT	Technical barriers to trade
TIC	Testing, inspection and certification
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
VSS	Voluntary sustainability standards
WBG	World Bank Group
WHO	World Health Organization
WOAH	World Organization for Animal Health
WTO	World Trade Organization
WTO/SPS	Agreement on the Application of Sanitary and Phytosanitary Measures
WTO/TBT	Agreement on Technical Barriers to Trade
WTO/TFA	Trade Facilitation Agreement

List of Tables

List of Figures

Imprint

Contact

Physikalisch-Technische Bundesanstalt
International Cooperation
Dr. Marion Stoldt
Phone +49 531 592-9300
marion.stoldt@ptb.de
www.ptb.de/q.3/en

Here you can find this
publication online: