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QUALITY INFRASTRUCTURE IN AUSTRALIA

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TIPS report for the Department of Trade, Industry and Competition. This country study is for a project on the alignment of the quality infrastructure/technical infrastructure in South Africa. The project includes four country case studies: Australia, Brazil, Kenya and South Korea. The case studies are available on the TIPS website.

CONTENTS

ABBREVIATIONS

AANZFTA	ASEAN-Australia-New Zealand Free Trade Area
ACCC	Australian Competition & Consumer Commission
ACI-FTA	Australia-Chile Free Trade Agreement
A-HKFTA	Australia-Hong Kong Free Trade Agreement
ANZCERTA	The Australia - New Zealand Closer Economic Relations Trade Agreement
AOQ	Australian Organisation for Quality Ltd
APAC	Asia Pacific Accreditation Cooperation
APMP	Asia Pacific Metrology Programme
APEC	Asia-Pacific Economic Cooperation
APLAC	Asia Pacific Laboratory Accreditation Cooperation
ASEAN	Association of Southeast Asian Nations
ATIA	Australian Technical Infrastructure Alliance
AUSFTA	Australia-United States Free Trade Agreement
BIPM	International Bureau of Weights and Measures
CAB	Conformity Assessment Body
CE	Conformité Européenne (French for European Conformity)
ChAFTA	China-Australia Free Trade Agreement
CIPM	International Committee of Weights and Measures
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
dtic (the)	Department of Trade, Industry and Competition (South Africa)
EESS	Electrical Equipment Safety System
EMC	Electromagnetic Radiation
EMS	Environmental Management System
FSMS	Food Safety Management System
GDP	Gross Domestic Product
IA-CEPA	Indonesia-Australia Comprehensive Economic Partnership Agreement
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
INetQI	International Network on Quality Infrastructure
ISMS	Information Security Management System
ISO	International Organization for Standardisation
JAEPA	Japan-Australia Economic Partnership Agreement
JAS-ANZ	Joint Accreditation System of Australia and New Zealand
KAFTA	Korea-Australia Free Trade Agreement
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
MAFTA	Malaysia-Australia Free Trade Agreement

MDMS	Medical Device Management System
MoU	Memorandum of Understanding
MRA	Mutual Recognitional Agreement
NATA	National Association of Testing Authorities
NMI	National Measurement Institute
NQI	National Quality Infrastructure
NZ	New Zealand
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health and Safety Management System
OIML	International Organization of Legal Metrology
QI	Quality Infrastructure
QMS	Quality Management System
RCM	Regulatory Compliance Mark
PAC	Pacific Accreditation Cooperation
PATFA	Peru-Australia Free Trade Agreement
SA	Standards Australia
SAFTA	Singapore-Australia Free Trade Agreement
SCSC	Sub-Committee on Standards and Conformance
SDGs	Sustainable Development Goals
SDO	Standards Development Organisation
SISO	Support for Industry Service Organisations
SQAM	Standards, Quality Assurance and Metrology
TAFTA	Thailand-Australia Free Trade Agreement
TBT	Technical Barriers to Trade (WTO Agreement)
TC	Technical Committee
TI	Technical Infrastructure
TIPS	Trade & Industrial Policy Strategies (South Africa)
WTO	World Trade Organization

1 INTRODUCTION

1.1 Motivation and terminology

The Department of Trade, Industry and Competition (the dtic) has commissioned Trade & Industrial Policy Strategies (TIPS) to conduct a study on the alignment of the technical infrastructure (TI) in South Africa. Part of this study are case studies on the quality infrastructure (QI) in other countries (Australia, Brazil, Kenya and South Korea).

For South Africa, Australia has long been a reference in the design of its national quality infrastructure. The QI in Australia is highly developed and exemplary in many areas. The English language connects both countries and their location in the southern hemisphere also speaks in favour of comparing South Africa with Australia. After all, Australian experts played an essential role in the Standards, quality, Assurance and Metrology (SQAM review (Nedlac, 2001), which laid the foundation for the current TI in South Africa. Over the past two decades, both the Australian and South African QI systems have evolved significantly. An updated comparison, therefore, provides new ideas.

The term quality infrastructure is used in this study. This follows the international definition as it has been used by the International Network on Quality Infrastructure (INetQI) co-operating professional organisations since:

"*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 important to enable access to foreign markets. It is a critical element in promoting and sustaining economic development, as well as environmental and social wellbeing."*[1]

The understanding of a system of metrology, standardisation, accreditation, conformity assessment and market surveillance (in regulated areas), as an "infrastructure" probably has its origins even in Australia. However, up to now – as in South Africa – the term "technical infrastructure or "Standards and Conformance Infrastructure" has been used there. In recent publications, however, the term "quality" infrastructure has been used (Australian Government, n.d.-a).

1.2. Base of information

The main source of information on the Australian quality infrastructure are publications of the Department of Industry, Science, Energy and Resources[2] and the various QI bodies. The report *Australian's standard and conformance infrastructure: An Essential Foundation* by the department gives a comprehensive overview. (Australian Government, 2016) Detailed information is available on the websites of the QI bodies – Standards Australia (SA), National Measurement Institute (NMI), National Association of Testing Authorities (NATA), and the Joint Accreditation system of Australia and New Zealand (JAS-ANZ). However, independent studies of the Australian quality infrastructure are lacking. The study by the University of Technology Sydney on the *Economic Value of NATA Accreditation to Australia* (Agarwal et al., 2017) was also contracted by NATA.

To verify the findings and assessments in the case study, several resource people in Australia were consulted.[3]

[1] Quality infrastructure definition adopted in June 2017. Available at: https://www.bipm.org/utils/common/pdf/QI-definition.pdf. (Accessed 28.9.2020.

[2] The Department of Industry, Science, Energy and Resources replaced the Department of Industry, Innovation and Science on 1 February 2020.

[3] We would like to thank especially Pamela Tarif, Senior International Engagement Manager at Standards Australia and Ulrich Diekmann, Consultant in International Development Cooperation, for their valuable comments. The statements and possible errors in this study remain the sole responsibility of the author.

2 CONTEXT

Australia, with an area of 7 617 930 km², is the sixth-largest country in the world with a population of only 25.4 million (2019). Australia is entirely in the southern hemisphere, between the Indian and Pacific Oceans, south of maritime Southeast Asia and north of Antarctica.

“The country’s first inhabitants, the Aboriginal people, are believed to have migrated from Asia tens of thousands of years before the arrival of British settlers in 1788. They now make up less than 3% of Australia’s 23 million people. Years of mass immigration after the Second World War heralded a profound demographic shift that made modern Australia one of the most multicultural countries in the world. But migration is still a politically sensitive issue.” (BBC, 2018).

In the 20th century, Australia developed into a prosperous industrial nation. The land and its natural resources were used for the rapid development of its agricultural and processing industries. The Australian economy is characterised by continuous growth, low unemployment, contained inflation, low public debt, and a strong and stable financial system. Today the services sector is the most crucial sector of the Australian economy, accounting for 70% of gross domestic product (GDP) and 75% of jobs (nationsonline.org, n.d.).

The Australian manufacturing sector has, however, seen a significant decline against its peak of close to 30% of GDP in the late 1960s. By 1991 the manufacturing sector employed 16% of the Australian workforce and contributed close to 15% of GDP. In 2018 its contribution to GDP had declined to 5.7% of GDP with 300 000 less workers employed in manufacturing than in the 1990s. Furthermore, there is a notable decline in nominal sales revenue and a decline in sales output over the decade from 2008 to 2019, which goes beyond the collapse in growth during the 2009 financial crisis, and except for a few years continued to decline until 2018 (AI Group, 2019).

Despite this decline in manufacturing, Australia has had three decades of positive economic growth with the mining sector making a significant contribution. Australia has demonstrated a remarkable ability to sustain a steady rise in material living standards and to absorb economic shocks, and provides a number of social protections for its citizens.

In shaping its foreign and economic policy, Australia initially looked to Europe and the United States but has developed closer ties with Asia over the past 20 years. Australia became a member of the OECD in 1971 (Carroll, 2014) and was one of the founding members of the World Trade Organization (WTO) in 1995. As a small country with an open economy, Australia stands for free trade and is particularly active in the economic integration of the Asia-Pacific region.

In international comparisons of prosperity, education, health and quality of life, Australia is one of the most liveable countries in the world. However, the country has made little progress in reducing its ecological footprint. Alarming environmental problems are linked to climate change and are manifested, for example, in large-scale forest fires and the dramatic damage in the Great Barrier Reef (Great Barrier Reef Foundation, n.d).

3 QI FRAMEWORK AND ORGANISATIONS

3.1 Overview

The quality infrastructure plays a crucial role in economic growth and the development of a small, open economy like Australia. The Australian QI-system is characterised by close cooperation between private and public institutions. The Commonwealth Department of Industry, Science, Energy and Resources has a co-ordinating and supporting role. NIMA is a department of the Department of Industry, Science, Energy and Resources. The other core institutions Standards Australia, NATA, and JAS-ANZ are independent. Their integration into the National Quality System is regulated by individual Memorandum of Understanding (MoU) with the Australian Government. All institutions of the Australian Quality Infrastructure have to generate most of their resources themselves.

3.2 Key QI organisations

3.2.1 Standards Australia

SA is the national standards body (see Standards Australia, n.d-a). It is a not-for-profit, non-governmental organisation that co-ordinates standardisation activities in the country. Its origins date back to 1922 when engineers founded the Committee of the Australian Commonwealth Engineering Standards Association. Since then, its legal form and business areas have changed continuously.

Standards Australia co-ordinates the development of Australian standards and the production of related documents such as manuals, guides, technical specifications and technical reports. Standards Australia also accredits standards development organisations (SDOs). Depending on the circumstances of their sector or industry, organisations can develop their standards and certification systems. There are five accredited SDOs for the timber industry, telecommunications, fishery, pharmacists and railway safety.

Standards Australia is a limited liability company. More than 70 industry, government and consumer organisations are members of the Standards Australia Council. The council's role is to elect the Board of Directors and Chairman of the Standards Development and Accreditation Committee and to appoint new members of the organisation. SA also administers the Australian Design Award.

In 2003, Standards Australia separated from its commercial activities. SAI Global Limited purchased this and listed it on the stock exchange. Through a co-operation agreement, SAI Global was involved in the marketing of Australian standards. In 2020, the commercial distribution of Australian standards returned to Standards Australia. Standards Australia is now innovating to increase access to standards and broadening its reach and relevance for customers, such as though its webstore (Standards Australia Webstore, n.d.) .

Standards Australia supports the growth of industries by developing and building market confidence in new and established technical areas. Standards Australia plays a pivotal role in blockchain standardisation (Standards Australia, n.d.-b).

Standards Australia also promotes the smart city agenda by organising forums and round tables. In this context, the lack of cross-sectoral standardisation and clear metrics for smart cities was noted. Consequently, Standards Australia participated in the Sustainable Development Goals (SDG) Task Force of the International Organization for Standardization (ISO) Technical Steering Committee. Many of the Sustainable Development goals (SDGs) are directly related to the goals of smart cities, from waste management and sanitation to urban infrastructure, including transport (Standards Australia, n.d.-c).

3.2.2 National Measurement Institute

Since 2004, NMI has been the central institution of the Australian metrology industry. Its origins date back to 1926 when the government founded the National Measurement Laboratory. The NMI has integrated the competences of the National Measurement Laboratory of the Commonwealth Scientific and Industrial Research Organisation, the National Standards Commission, and the Australian Government Analytical Laboratories.

Formally, the NMI is a division of the Department of Industry, Science, Energy and Resources and is accountable to the Australian Parliament. The National Measurement Act 1960 defines the functions of its head, the "Chief Metrologist".

The NMI is responsible for establishing and maintaining Australia's measurement units and measurement standards and for co-ordinating Australia's national measurement system. It implements, develops, maintains and disseminates Australia's top measurement standards for physical, chemical and biological measurements, conducts research into new measurement techniques and is responsible for Australia's legal metrology. It also regulates the use of measuring instruments such as petrol tankers and supermarket scales in Australia's domestic trade.

The NMI also supports the other elements of the standards and compliance infrastructure by contributing measurement expertise to relevant activities. For example, NMI experts work with NATA on accreditation of laboratories and proficiency testing. NMI experts are also members of the Australian delegations to the international standardisation committees of the ISO, the International Electrotechnical Commission (IEC) and the International Telecommunication Union on behalf of Standards Australia.

The NMI has staff working throughout Australia, including research and analytical laboratories in Sydney, Melbourne and Perth, and trade measurement centres in all capitals except Canberra.

The NMI conducts scientific research to keep Australia's measurement standards in step with the ever-increasing technological demand for accurate measurements. The NMI also develops reference materials for regulatory authorities and industry.

The NMI provides calibration, laboratory and consultancy services to Australian industry, commerce, defence and trade and provides measurement standards to support environmental, health and safety. It also includes type certifications for measuring instruments. These include all types of weighing equipment and dispensers for petrol, liquefied petroleum gas (LPG) and compressed natural gas.

In contrast to other National Measurement Institutes in the world, the NMI also offers testing laboratory services. These include chemical and microbiological testing for food and agricultural products, pharmaceutical analysis services, environmental testing services, forensic drug analysis and analysis for doping control in sport. The NMI is self-financed through revenues from services.

The NMI monitors key performance indicators such as revenue, costs and lead times. The NMI is also active in developing measurement skills in the industry, government, and the community by providing training courses, joint research projects, and supervising undergraduate and PhD students.

The NMI strategy is based on a sectoral approach. The NMI works with industry, academia, researchers, government and international partners to address some of Australia's most pressing social and economic challenges.

The NMI focuses its strategy in the following key sectors (Australian Government, n.d.-b):

- Environment: The NMI supports the management of pollutants, including research on new pollutants of concern and greenhouse gases.
- Food: The NMI is developing measurements in new areas such as food origin and fraud, and improved methods to accurately measure key nutrients such as vitamin D and amino acids.
- Health: the NMI produces DNA reference materials to increase the effectiveness of personalised healthcare, particularly in the field of genetic testing for cancer patients.
- Energy: The NMI supports energy security, including the development of methods for electrical measurements and the production of internationally comparable reference gases for the natural gas and liquefied natural gas (LNG) industry.

Its specialised measurement capabilities also support applications in advanced manufacturing, defence and security and many other areas of relevance to Australia.

3.2.3 National Association of Testing Authorities

NATA is a membership-based, not-for-profit organisation. Its origins of accreditation go back to the period after the Second World War. NATA was founded In 1947 was founded to ensure that the manufacture of ammunition in Australia met high standards. NATA is therefore often referred to as the oldest National Accreditation Body, although this role was not formalised until 1988 through a MoU with the Australian government (NATA, 2017).

NATA focuses on the accreditation of test and calibration laboratories to ISO/IEC 17025, clinical laboratories to ISO 15189 and inspection bodies to ISO/IEC 17020. NATA also accredits providers of proficiency tests to ISO/IEC 17043 and producers of certified reference materials to ISO 17034. NATA does not carry out accreditations in the field of certification bodies for products or management systems.

Complementary to the accreditation service, NATA provides training for staff of conformity assessment bodies, as well as companies and public organisations. A particular target group are assessors who are trained in the Technical Assessor Development Program. The majority of technical assessors work in NATA accredited facilities or are well recognised in their professional field, including academia (NATA, n.d.).

NATA seeks to highlight the economic contribution of its accreditation services.

A study commissioned by the University of Technology Sydney comes to the following conclusion:

"…. accreditation provides indirect but real benefits for the community and consumers of intermediate and final goods and services. This research report highlights the measurable and intangible attributes of NATA accreditation as a contributor to the Australian economy. Whilst the estimated measurable economic worth represents a value of between AUD 315m and AUD $421m,[4] to place a value on the intangible attributes of accreditation is impossible as the services NATA provides are intrinsically woven within the fabric of the Australian business, economy, and society." (Agarwal et al., 2017)

3.2.4 Joint Accreditation System of Australia and New Zealand

JAS-ANZ is a binational, independent, third-party accreditation body. In 1991, the Australian and New Zealand governments established JAS-ANZ by contract to strengthen trade relations between the two countries and with other countries. Its secretariat is in Canberra, Australia, and Wellington, New Zealand, is the administrative arm of the Governing Board.

The agreement commits JAS-ANZ to establish a common accreditation system aimed at building confidence through trade support and trade promotion, linkages, and international acceptance. Accreditation is intended to strengthen trust between trading partners and to promote economic exchange. JAS-ANZ focuses on the accreditation of certification bodies for product and management standards. This enhances the status and authority of certification bodies both nationally and internationally and strengthens the international competitiveness of Australian and New Zealand industry.

JAS-ANZ's services are also gaining importance beyond international trade. One example is the health reform plan in Australia, where health ministers have developed standards for clinical safety and quality in hospitals and healthcare facilities (Australian Government, 2016).

The JAS-ANZ Accelerate Training Academy exists to equip conformity assessment professionals with the latest knowledge, skills and understanding – giving them the ability to interpret and apply standards and other requirements. The courses are focusing on understanding essential accreditation standards and documents. The training aims to provide knowledge and skills to elevate accreditation and certification from pure compliance to an invaluable business advantage (JAS-ANZ, n.d.-a).

3.2.5 Australian Technical Infrastructure Alliance

The four key quality infrastructure organisations formed ATIA in 2010. This is a lean co-ordination body of the Australian Quality Infrastructure. In ATIA, Australia Standards, NMI, NATA and JAS-ANZ contribute their resources, knowledge and ideas and represent common interests.

ATIA also acts as a focal point for external stakeholders. The collaboration promotes synergy within the quality infrastructure. Its combined authority and experience means it can provide comprehensive advice, products and services to all sectors that depend on standards and compliance infrastructure.

[4] Converted at about US$230 million to US$300 million. Retrieved 28.9.2020.

4 KEY COMPONENTS AND DISTRIBUTION OF COMPETENCES

4.1 Metrology

4.1.1 Measurement legislation

Legislation for Australia's measurement system includes the:

- National Measurement Act 1960.
- National Measurement Regulations 1999.
- National Measurement Guidelines 2016.
- National Trade Measurement Regulations 2009.

Current Australian measurement legislation supports the use of metrology and measurement instruments for both commercial and non-commercial purposes, including those used by regulators.

4.1.2 Review of measurements Acts

Overview

In 2018, the Australian Government initiated a review process of the Australian measurement Acts. Through this process, the government aims to modernise, streamline and simplify the national measurement framework (Australian Government, n.d.-c).

The starting point is the results of an independent review of legal metrology in 2015, which confirmed that the national metrology system works well, but that the legislation is too prescriptive, complicated and difficult for the public to understand.

In the terms of reference for the review (Australian Government, n.d.-d), the Department of Industry, Innovation and Science outlined that the new measurement law should follow a principle-based, proportionate, flexible and risk-based approach and minimise the regulatory burden on the economy. Unjustified regulatory barriers to the market entry of new technologies and other technical barriers to competition should be avoided. Appropriate third parties should also be involved in supporting or implementing the framework. Overall, confidence in the Australian metering legislation should be strengthened by adopting proven national and international regulatory approaches.

As part of the review process, the department has published six discussion papers, which together address the issues of traceability, measurement tools, measurement-based transactions, third-party agreements and compliance agreements (Australian Government, n.d.-c). Each of these discussion papers describes the current legal situation and practice, new challenges, issues, and questions.

Scope of Australian measurement laws

The existing form of legal metrology is suitable for the traditional measurement of quantities but has not been extended for quality measurements (Australian Government, 2020). For example, payments to farmers for cane sugar and cereals are based not only on mass but also on other factors such as the sugar content, protein content and moisture of these agricultural products.

In addition, measurement is increasingly used in service-based transactions. While mass and volume measurements are commonly used to determine the price of postage, freight or the cost of waste disposal, there has been a shift towards less traditional measurements when determining the price paid for a service.

The digital sector has experienced rapid reliance on measurements of data usage by Internet service providers and telecommunications operators. New types of time-based services in the growing sector

of charging electric vehicles and the shared-service economy, such as car-sharing services, are examples of new developments in the way trade measurements are made.

With the shift away from traditional analogue to digital instruments, combined with more and more innovations in measuring instrument technology, the question of what constitutes a measuring instrument is becoming increasingly important. Examples are software-controlled instruments, measuring instruments with interchangeable components, virtually connected instruments and multidimensional handheld measuring instruments. It is difficult to accommodate all these innovations within the current Australian measurement laws.

A future measurement framework should meet the needs of both trading purposes and regulators.

Traceable measurement

In recent years, self-calibrating measuring instruments have become increasingly widespread (Australian Government, 2019a). One example is temperature sensors that "self-calibrate" according to the manufacturers' specifications and digitally store a calibration history. So far, there is no legal framework for metrological traceability and control of these new technologies.

Amendments to the Metrology Act in 2003 brought new tasks for the NMI in chemical and biological measurements into the legislation and into the functions of the NMI. However, metrological traceability requires appropriately certified reference materials. So far, however, certified reference materials are still lacking in important new areas.

Measuring instruments

To maintain confidence in measurement systems, reliable and accurate measurement devices are required (Australian Government, 2019b). The measurement laws provide the legal framework for proving the reliability of measuring instruments. The benefits of these control systems within the framework of the applicable Australian measurement laws include:

- Regulated measuring instruments used in the market are fit for purpose;
- Protection of consumers against fraudulent measurement practices in commerce, and
- Comparable competitive conditions between commercial competitors on the basis of the independently certified performance of regulated measuring instruments.

Due to technical progress and the increasing global trade of measuring instruments, the regulations for calibration of measuring instruments and type approval need to be revised.

Measurement-based transactions

The demands on the measuring accuracy and on the objects of measurement of the economy and the control authorities are continuously increasing (Australian Government, 2019c). Often different threshold values are required for different uses of the same material. This is particularly important in the circular economy, which involves the reuse of built products and materials. Previous measuring methods are not entirely suitable for this.

Often, the measurement methods used are too rigid to implement requirements in line with the market. One problem, for example, is the different packaging of the same products. The average quantities system applicable in Australia is no longer in line with international best practice. Consequently, the requirements in Australia differ from those of its overseas trading partners. As a result, a product is compliant in the country where it is packaged but is rejected as non-compliant in the country of destination.

Third-party arrangements

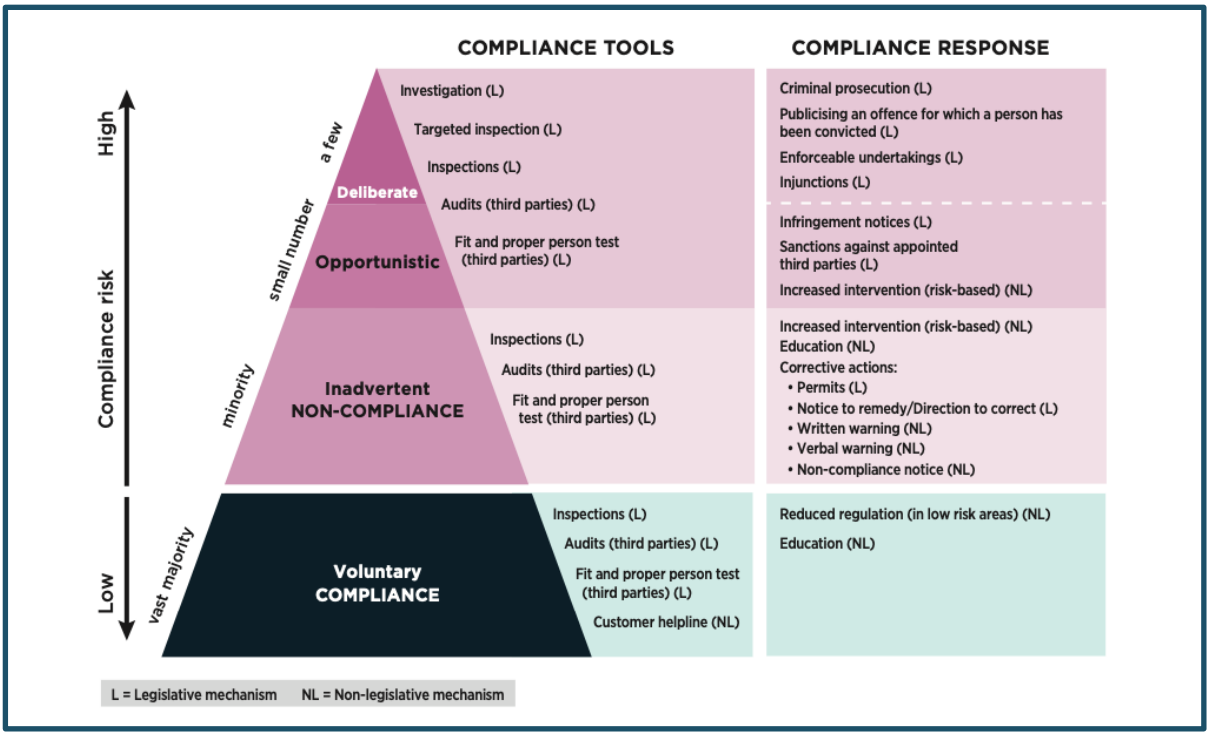
The NMI works with public and private bodies for legal metrology activities such as the supply, calibration or maintenance of measuring instruments. These institutions prove their competence in the rules by accreditation by NATA. The different types of third parties that are defined in the Australian measurement framework are:

- Service licensees who support the measurement system for commerce by testing and verifying measurement instruments used for commerce;
- Utility meter verifiers who test and verify utility meters;
- Public weighbridge licensees that provide weighbridges for public use; and
- Legal metrology authorities, which are composed of the authorities that verify measurement standards and artefacts; certify measuring instruments or certify reference materials; and test measuring instruments and approve samples of measuring instruments (Australian Government, 2019d).

Compliance arrangements

NMI already follows a risk-based approach in its compliance arrangements. The approach is called the escalation model for compliance (see Figure 1). If non-compliance results in a low level of harm and the likelihood of continued non-compliance is minimal, low-compliance options are typically used. If the risk and damage associated with non-compliance increases, or if there is repeated non-compliance, the NMI will escalate the compliance options used.

Figure 1: The compliance pyramid



Source: Australian Government. Department of Industry, Innovation and Science 2019. Measurement Law Review 2019. Discussion Paper: Compliance Arrangements (Australian Government, 2019e).

However, the problem is that the regulatory activities are not covered by existing legislation. The compliance options outlined in the metering legislation focus heavily on the threat of criminal offences and the provisions on notification of violations. There are only a limited number of legislative, administrative options and a lack of different levels of penalties for reporting violations. This limits the NMI's ability to take an even more flexible approach to compliance and enforcement.

Way forward

All the discussion papers form the basis for a public consultation process involving regulated institutions and relevant stakeholders, including governmental institutions. The review should consider the impact of possible changes on other regulatory frameworks and relevant policy drivers of government as a whole. The government was expecting to conclude the review process in 2020.

4.2 Standards and technical regulations

4.2.1 Australian standards

Australian standards are voluntary standards or technical specifications for companies and other market participants. As are a registered trademark of Standards Australia. In many cases, Australia and New Zealand have common Australian and New Zealand standards).

Standards Australia develops the Australian standards with the participation of all interested parties and based on international standards, Standards Australia's processes are based on the balance of interest, transparency, openness and consensus. Standards Australia aims to adopt international standards as far as possible. Only in the absence of a suitable existing international standard, and in accordance with an assessment that the proposed standard will not be anti-competitive, will a committee prepare a draft new Australian standard. Standards Australia is also responsible for ensuring that Australia's position is heard and taken into account in the development of international standards and their subsequent adoption as Australian standards.

As at November 2019, Standards Australia had a catalogue of about 5 400 Australian standards (WTO, 2019),of which the State and Territory Governments reference approximately one third as technical regulations. These cover everything from consumer goods and services, construction, engineering, business, information technology, human services, energy and water supply to the environment.

When organisations claim to comply with Australian standards, they must justify their claim. If an organisation falsely claims that its goods or services meet a particular standard, this may give rise to concern under the misleading or deceptive conduct and misleading provisions of Australian consumer law. If an allegation is false or misleading, consumers may lodge a complaint with the Australian Competition & Consumer Commission (ACCC) under the Australian Consumer Act (ACCC, n.d.) or with the Fair-Trade Offices of the States or Territories.

Compliance with Australian standards should not be confused with consumer guarantees, which apply to all goods and services sold in Australia under the Australian Consumer Rights Guarantees Act 2011. Consumer guarantees ensure that goods are of acceptable quality, suitable for the stated purpose and meet their description.

An exclusive distribution agreement has been in place with Australian Standards SAI Global since 2003. Since 2019, Standards Australia has continued to work with SAI Global as a non-exclusive distributor.

Standards Australia had plans to add more new distributors in 2020. These future partners should help to spread Australian standards in new and different ways, with innovation a key criterion.

4.2.2 Standards Development Organisations

Standards Australia has accredited five SDOs – for the timber industry, telecommunications, fisheries, pharmacists and railway safety. Standards Australia seeks to ensure that all accredited SDOs with a legitimate interest in international standardisation have equal access to this funding in the form of travel grants. Standards Australia also seeks to ensure that the level of funding allows participation in a range of international standardisation projects in the public interest.

4.2.3 Support for Industry Service Organisations programme

Standards Australia oversees the transparent management of funding under SISO programme for international participation and the selection of delegates to attend international meetings (Standards Australia, 2020). The SISO programme is a longstanding initiative of the Australian government. Its purpose is to ensure continued Australian participation and representation in key international standards and compliance bodies. The SISO programme provides funding to Standards Australia and NATA to support this activity.

Standards Australia co-ordinates Australia's participation in international standardisation activities. Standards Australia requires information on all Australian delegates attending international meetings in order to fulfil this role and maintain comprehensive records of Australia's international participation. In its role as an Australian member of ISO and IEC, Standards Australia must also verify that all delegates represent the Australian view for the public benefit.

Each year the Department of Industry, Science, Energy and Resources, as part of its Standards Australia grant, provides funding to assist selected delegates to attend ISO and IEC meetings on behalf of Australia. These funds are provided as part of the government's commitment to the development and adoption of international standards and its obligations under the WTO Agreement on Technical Barriers to Trade. The programme is intended to complement funding from other sources, as it is expected that other Australian organisations will also provide practical support for international standardisation activities and contribute to the costs of participation.

4.2.4 Technical regulations

Regulatory reform

Technical regulations are still referred to in Australia as "mandatory standards", which can be explained by the historical development of this concept but is not in line with modern WTO language. They serve safety, health, environmental and consumer protection. Various government departments, authorities and subnational governments are responsible for this, including the NMI with its competencies in legal metrology.

At the beginning of the 20th century, as in other OECD member states, the Australian regulatory system showed various weaknesses. The laws of various state and territorial bodies were inconsistent, and there was duplication. Regulations were prescriptive, slowing innovation and increasing compliance costs for businesses (Cousins, 2011).

In 2006, the Australian government undertook a fundamental regulatory reform, which also reorganised the responsibilities for consumer protection. In this context, Australia introduced a risk-based approach at all levels of regulation.

Today, Australia is, in many ways, a model for a proactive approach to regulatory reform in OECD countries (OECD, 2010). The government estimates that the annual cost reduction in compliance is listed at AUD1.1 billion per year, which should have contributed to an overall cost reduction of around AUD7 billion since the introduction of the deregulation agenda in 2013.

Regulator Performance Framework

In 2014, Australia adopted a Regulator Performance Framework, under which federal regulators and federal departments evaluate their performance against six performance indicators. The indicators relate to the reduction of regulatory burdens; communication with regulated entities; that regulatory actions are proportionate and risk-based; compliance and monitoring procedures are streamlined; regulators are transparent in their actions; and regulators strive for continuous improvement.

Australia continues to have sound regulatory management and is working to improve methods that focus on stakeholder involvement and ex-ante or ex-post evaluation practices. Australia has given regulators more flexibility to compensate for the increased compliance costs for companies resulting from new regulations (OECD, 2018).

NMI also self-assessed its performance using the Regulator Performance Framework. As outlined in this report (NMI, 2019), the NMI applies a proportionate and risk-based approach to compliance and enforcement actions; involves stakeholders in development and improvement of regulatory frameworks; is open and transparent in its dealings and clear in its communication with regulated entities; and takes a pro-active approach to continuously improving regulatory performance.

Regulatory Compliance Mark

As early as 1995, the Kean Inquiry (Kean, 1995) proposed the concept of a single national mark, similar to the CE (Conformité Européenne) mark used in the European Union. The authors argued that this could increase consumer confidence and break the monopolistic use of proprietary marks by different regulators. The idea was that such a mark would help to distinguish between regulatory requirements for health and safety and those to meet voluntary industry standards for performance or other characteristics.

At the beginning of 2000, the most visible mandatory conformity marks were those used by the Australian Communications Authority for the compliance of radiocommunications equipment with the Radiocommunications Act 1992 and for the compliance of various products with the Telecommunications Act 1997. For the latter, the mark was the “A-Tick” mark, and for electromagnetic compatibility of electrical and electronic goods, the corresponding mark was the “C-Tick” mark.

In 2013, the Australian Regulatory Authority (RCM) began the transition to replace the “C-Tick” and “A-Tick” marks and to introduce the new Electrical Equipment Safety System (EESS). The Regulatory Compliance Mark (RCM) is a mandatory approval mark for telecommunications, electrical and wireless products in Australia and New Zealand. It has been mandatory since 1 March 2016 (Zombolas, 2016). The RCM is a single mark of conformity and may only be used by Australian/New Zealand suppliers after compliance with all applicable regulations including telecommunications, radio communications, electromagnetic radiation (EMC) and electrical safety has been demonstrated.

The EESS mandates the use of the RCM for all equipment within the scope and has replaced the current state and territorial electrical safety licensing systems, except for those in New South Wales. Use of the RCM requires manufacturers, importers or suppliers located in Australia to register their company and all medium- and high-risk products with the EESS national database.

The RCM mark is based on similar technical requirements to the European Union CE mark. However, the RCM mark is explicitly applicable to products marketed and sold in Australia and New Zealand. While some test results and technical documents can be used for both, any applicable product must be registered for and receive an RCM mark.

Through mutual recognition, some test data from the CE marking can be reused to produce the Australia/New Zealand test reports. This avoids double costs of conformity assessment.

4.2.5 Conformity assessment

Australia has a wide range of conformity assessment bodies. NATA and JAS-ANZ share the tasks of accreditation:

- NATA focuses on the accreditation of test (currently 2 479), calibration (203) to ISO/IEC 17025 and medical laboratories (292) to ISO 15189 and inspection bodies (166) to ISO/IEC 17020, proficiency test providers (10) to ISO/IEC 17043 and producers of certified reference materials (13) to ISO/IEC 17034.
- JAS-ANZ has focused on the accreditation of certification bodies for products to ISO/IEC 17065 and management systems (Quality Management System - QMS to ISO 9001 with 86 accredited Conformity Assessment Bodies (CABs), Environmental Management system (EMS) to ISO 14001 with 73 CABs, Food Safety Management system (FSMS) to ISO 22000 with 33 CABs, Information System Management System (ISMS) according to ISO/IEC 27001 with 22 CABs, Occupational Health and Safety Management System (OHS) according to 45001 with 55 CABs, Medical Devise Management System (MDMS) according to ISO 13845 with five CABs) as well as person certification according to ISO/IEC 17024 (four CABs) and greenhouse gas validation and verification according to ISO 14065 (one CAB).

Both accreditation bodies are also internationally active in cross-border accreditation. Thus, NATA and JAS-ANZ support the development of accreditation and conformity assessment globally and generate relevant revenues for their organisations themselves.

4.3 Awareness and training

An important part of the quality infrastructure is raising awareness and training professionals. Australian Organisation for Quality Ltd (AOQ), founded in 1968, is a leading independent provider in this area (AOQ, n.d.).

AOQ is an organisation with members from the public and private sectors as well as the industrial and service sectors. AOQ works with more than 25 000 quality practitioners across Australia.

5 CO-ORDINATION AND COMMUNICATION MECHANISMS

5.1 Leadership and co-ordination

The quality infrastructure in Australia serves both free trade and the protected interests of citizens. Standards Australia and the accreditation bodies (NATA and JAS-ANZ) have a significant degree of autonomy and are integrated into the National Quality Infrastructure (NQI) system through MoUs.

The Department of Industry, Science, Energy and Resources manages the quality infrastructure from the government side. Within the state administration, the department assumes a moderating function, since state and territorial regulatory authorities are autonomous. Since the government reform on 1 February 2020, the Department of Industry, Science, Energy and Resources is also responsible for the reform of metrology legislation, which is a central element of a modern regulatory framework.

At the same time, the QI key institutions (SA, NMI, NATA and JAS-ANZ) have a pronounced capacity for self-regulation and co-ordination. Co-ordination body ATIA offers a valuable platform for articulating and representing common interests. Through its involvement in international specialist institutions, it brings Australia's interests in the global trading system and brings valuable knowledge back into the national context. The Australian quality infrastructure increasingly refers to a binational framework with New Zealand and contributes significantly to integration in the Asia-Pacific region.

Despite significant reforms, Australia has not yet developed an explicit overarching strategy or a formal National Quality Policy. So far, the Australian government has primarily prioritised deregulation. International goals, as set out in the United Nations 2030 Agenda for Sustainable Development, have not yet played a strategic role in Australian QI.

5.2 International and regional co-operation

5.2.1 International co-operation

The Australian quality infrastructure institutions are active members of their regional and international specialist institutions. Mutual recognition of measurements and results of conformity assessment enable Australian companies to participate in world trade successfully.

In the field of scientific metrology, NMA is a signatory to the International Committee for Weights and Measures (CIPM) Mutual Recognition Agreement (MRA). Dr Barry Inglis, former Executive Director and Chief Metrologist at NMI, was a member of CIPM from 2000 to 2019. He was President of CIPM from 2011 to 2019, President of the Advisory Committee on Electricity and Magnetism from 2003 to 2015 and Vice-President of CIPM from 2002 to 2011. The Australian Radiation Protection and Nuclear Safety Agency and the Australian Nuclear Science and Technology Organisation, participate in CIPM MRA as designated institutes (BIPM, n.d.).

In legal metrology, the NMIA represents Australia in the International Organization of Legal Metrology (OIML). The NMIA is user and issuing authority of the new OIML Certification System (2018). As issuing authority, the NMIA is responsible for global measurement standards and certifications for automatic weighing instruments (belt weighers) and non-automatic weighing instruments.

In the field of standardisation, Standards Australia is a member of the ISO and the IEC, providing a direct link to the international arena and further increasing efficiency in the development of standards (ISO, n.d.).

Standards Australia holds the secretariat in 23 Technical Committees (TCs) of ISO (see Table 1). Australia is a member of 285 ISO-TC and an observer in 85 (ISO, n.d.).

Table 1: ISO TC in which Standards Australia serves as the secretariat

Number	Subject
ISO/IEC JTC 1/SC 40	IT Service Management and IT Governance
ISO/TC 21/SC 3	Fire detection and alarm systems
ISO/TC 21/SC 8	Gaseous media and firefighting systems using gas
ISO/TC 27/SC 1	Coal preparation: Terminology and performance
ISO/TC 27/SC 5	Methods of analysis
ISO/TC 46/SC 11	Archives/records management
ISO/TC 89/SC 1	Fibre boards
ISO/TC 89/SC 2	Particle boards
ISO/TC 94	Personal safety -- Personal protective equipment
ISO/TC 94/SC 4	Personal equipment for protection against falls
ISO/TC 94/SC 14	Firefighters' personal equipment
ISO/TC 96/SC 9	Bridge and gantry cranes
ISO/TC 98/SC 1	Terminology and symbols
ISO/TC 102/SC 2	Chemical analysis
ISO/TC 108/SC 5	Condition monitoring and diagnostics of machine systems
ISO/TC 121/SC 8	Suction devices
ISO/TC 180	Solar energy
ISO/TC 180/SC 1	Climate - Measurement and data
ISO/TC 183	Copper, lead, zinc and nickel ores and concentrates
ISO/TC 207/SC 3	Environmental labelling
ISO/TC 272	Forensic sciences
ISO/TC 307	Blockchain and distributed ledger technologies
ISO/PC 316	Water efficient products - Rating

Source: Standards Australia. TC participation. Available at: https://www.iso.org/member/1524.html?view=participation&t=S. Accessed 28.9.2020.

In the field of accreditation, NATA is a founding member of the International Laboratory Accreditation Cooperation (ILAC) and the Asia Pacific Laboratory Accreditation Cooperation (APLAC). APLAC has merged with another regional accreditation cooperation, the Pacific Accreditation Cooperation (PAC), and the Asia Pacific Accreditation Cooperation (APAC) was established on 1 January 2019. APAC covers many of Australia's major trading partners in Southeast Asia, the Americas and the Pacific and, like ILAC, makes an essential contribution to the removal of trade barriers related to conformity assessment in the region.

JAS-ANZ is a member of the International Accreditation Forum (IAF), the world association of bodies interested in conformity assessment in the fields of management systems, products, services, personal and other conformity assessment programmes. JAS-ANZ is a founding member and signatory to the IAF Multilateral Recognition Agreements (MLAs) on Management Systems and Product Certification (JAS-ANZ, n.d.-b).

Through the SISO programme, the Australian government supports the participation of experts in meetings of Technical Committees of the various international QI associations.

5.2.2 Regional co-operation

Regional trade integration

Australia is actively engaged in economic integration in the Asia-Pacific region. Bilateral trade agreements are an essential vehicle for regional trade integration. A starting point was the 1983 Trade Agreement between Australia and New Zealand (ANZCERTA), which the WTO recognised as one of the most comprehensive, practical and multilaterally compatible free trade agreements in the world. This was followed by trade agreements with (listed with the entry-into-force date):

- Australia-New Zealand (ANZCERTA or CER) – 1 January 1983
- Singapore-Australia (SAFTA) – 28 July 2003
- Australia-United States (AUSFTA) – 1 January 2005
- Thailand-Australia (TAFTA) – 1 January 2005
- Australia-Chile (ACl-FTA) – 6 March 2009
- ASEAN-Australia-New Zealand (AANZFTA) – 1 January 2010 for eight countries: Australia, New Zealand, Brunei, Burma, Malaysia, the Philippines, Singapore and Vietnam. For Thailand: 12 March 2010. For Laos: 1 January 2011. For Cambodia: 4 January 2011. For Indonesia: 10 January 2012
- Malaysia-Australia (MAFTA) – 1 January 2013
- Korea-Australia (KAFTA) – 12 December 2014
- Japan-Australia (JAEPA) – 15 January 2015
- China-Australia (ChAFTA) – 20 December 2015
- Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) – 30 December 2018
- Australia-Hong Kong (A-HKFTA) – 17 January 2020
- Peru-Australia (PAFTA) — 11 February 2020
- Indonesia- Australia Comprehensive Economic Partnership Agreement (IA-CEPA) – 5 July 2020 (Australian Government, n.d.-e)

Australia was a founding member of the Asia-Pacific Economic Cooperation APEC in 1989. This forum of 21 Asia-Pacific economies is home to more than 2.7 billion people, who account for more than half of global GDP.

APEC partners account for more than 70% of Australia's total trade in goods and services. Closer regional economic integration contributes to the growth and prosperity of the Australian economy.

APEC was established to promote a growing and prosperous regional economy:

- Trade and investment liberalisation and facilitation – at the border, across the border and beyond.
- Reduced costs of cross-border trade to support business.
- Economic and technical co-operation.
- Exchange of best practice information on trade and investment.
- Simplified regulatory and administrative processes.
- Enhanced institutional capacity to implement and reap the benefits of trade and investment reform.

The Australian government sees APEC as a success story of regional economic integration and an incubator for new trade policy approaches. APEC works against protectionist constraints. Australia supports this by integrating services, creating a regional free trade area and a commitment to global value chains and open markets (Australian Government, n.d.-f).

Specialist regional bodies

Since 1994, the regional quality infrastructure organisations have been integrated into APEC structures through the Sub-Committee on Standards and Conformance (SCSC). SCSC aims to reduce the negative impact that different standards and conformance agreements have on trade and investment flows in the Asia-Pacific region. In this way, the SCSC supports the Committee for Trade and Investment in implementing the APEC trade facilitation and investment liberalisation agenda.

The main objectives of the SCSC are to:

- Reduce technical barriers to trade and enhance market access through standards and conformance;
- Align each economy's standards with international standards;
- Promote good regulatory practices in the preparation, adoption and application of standards, technical regulations and conformity assessment procedures;
- Progress mutual recognition arrangements for conformity assessment within the region;
- Pursue regional co-operation by international agreements;
- Ensure greater transparency; and
- Encourage participation in standards education and awareness programmes to build capacity and capability to enhance the competitiveness of businesses, including micro, small and medium enterprises (APEC, n.d.).

The SCSC comprises of representatives nominated by the 21 member economies who are drawn from agencies responsible for standards and conformance issues as well as trade policy matters.

Nominated representatives come from specialist regional bodies such as APLAC, the Asia-Pacific Legal Metrology Forum, the Asia Pacific Metrology Programme (APMP, 2020), the Asia Pacific Accreditation Cooperation (APAC) (APAC, n.d.), and the Pacific Area Standards Congress (PASC, n.d.) participate in SCSC meetings as expert regional bodies responsible for the development of standards and conformance infrastructure in the Asia-Pacific region.

6 CONCLUSIONS

The Australian quality infrastructure is a sophisticated system that has continued to develop over the past 20 years. Similar to other industrialised countries, the standards body is privately run. Standards Australia concentrates on its core business of standard development and plays an active role in the international standard-setting process for future topics (blockchain and smart city). At the same time, Standards Australia's experience also shows that outsourcing its own standard shop did not necessarily lead to the desired results. However, it was more positive for it to no longer be active in conformity assessment itself.

NMI integrates functions of scientific, regulatory and industrial metrology. At the same time, it is integrated into the government structure of the Department of Industry, Science, Energy and Resources. With the current revision of the metrology legislation, the department enables a fundamental modernisation of the country's metrology. The discussion paper on the subject and the consultation process are also exemplary in both technical and procedural aspects.

The sectoral focus of the metrology institute is interesting. The interaction with companies and research on priority sectors of the national economy allows a specific contribution to the economic development of the country. In combination with its own test laboratories, this strategy allows the NMI to finance itself.

In contrast to other countries, Australia has two accreditation bodies. The division of tasks is clear, NATA accredits in the field of laboratories and inspection bodies while JAS-ANZ specialises in the accreditation of certification bodies. It is also helpful that JAS-ANZ has a binational structure and thus supports the trade integration of Australia and New Zealand. Due to the merger of ILAC and IAF on the international level, it remains to be seen whether it makes sense to concentrate accreditation in one body also in Australia and New Zealand.

With the establishment of ATIA, Australia has strengthened the co-ordination between the key organisations of the NQI. Unlike National Quality Councils in other countries, this form of organisation is light and flexible. However, regulators and also the private sector and academia which are not part of ATIA, so co-ordination of the entire QI system is informal or through mutual participation in steering committees.

The Australian government's efforts to reform technical regulation and market surveillance are also advanced. The regulatory system follows Good Regulatory Practices and reforms regularly.

The quality infrastructure remains a model for South Africa. Since the SQAM Review, the Australian QI system has developed considerably. Australia has already successfully tackled various challenges that South Africa's quality infrastructure is currently facing and has found new solutions. In this respect, the results of this study could be an impulse to engage in a closer exchange again; although caution is required as the evolution of the Australian standards system took place against the backdrop of a significant decline of the Australian manufacturing sector, while South Africa has stated its objectives as supporting industrial development.

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