Study and Workshop on the Identification and Analysis of Public Policies Promoting Quality Infrastructure Services for the Implementation of Circular Economy in APEC Economies

APEC Sub-Committee on Standards and Conformance

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Executive Summary

This document is part of the "*Study and Workshop on the Identification and Analysis of Public Policies Promoting Quality Infrastructure Services for the Implementation of Circular Economy in APEC Economies*" project (APEC Project SCSC 106 2024A), which is being carried out by the Peruvian Institute of Quality (INACAL) under the guidance of the APEC Sub-Committee on Standards and Conformance (SCSC). Its aim is to identify and evaluate public policies that promote Quality Infrastructure (QI) services, such as domestic and international technical standards, conformity assessment, certification, and metrology services, as mechanisms to support the implementation of the Circular Economy in APEC economies, and to pinpoint best practices in this area.

The initiative responds to the growing importance of the circular economy (CE) as a driver of sustainable development in the Asia-Pacific region. Although the CE is becoming more widely recognised, there is still limited systematic knowledge on how public policies integrate QI services, such as standardisation, metrology, accreditation and conformity assessment, as tools that enable the effective implementation of the CE.

This study is based on the following main sources: desk research to identify and analyse CE-related public policies in the APEC region; a regional survey of QI institutions and Circular Economy stakeholders in APEC economies; and the outcomes of the workshop held in Incheon, Republic of Korea, on 3 August 2025, where economies exchanged findings, best practices, and challenges, and jointly developed recommendations.

Twenty-one representatives from eleven APEC economies completed the survey, identifying thirteen recent policies related to the Circular Economy (CE). While it confirmed the relevance of the six key themes for QI support in CE, the survey revealed that QI's role in policy formulation, implementation and evaluation remains limited. The main barriers are QI preparedness, limited interaction with CE stakeholders, and a lack of awareness of the importance of CE. This is reflected in the low priority given to the CE by QI institutions in their strategies. Nevertheless, some standardisation bodies have adopted the ISO 59000 standards and are developing further CE-related standards. Meanwhile, metrology institutes and accreditation bodies have begun offering services such as testing recycled materials, assessing biodegradability, developing environmental evaluation methods and monitoring microplastics.

Thirteen respondents reported best practices on the use of QI in CE policies. Analysis of the survey results produced findings and recommendations on how to promote the use of QI in CE policy formulation, implementation and evaluation, and how to improve the QI institution preparedness.

During the project workshop in Incheon, the preliminary results of the study were presented and discussed. The workshop was enriched by presentations of best practice from China, Peru, Mexico and Thailand. Based on the discussions, recommendations on how to promote the use of QI in CE policies, and how to improve QI institution preparedness, were validated and strengthened.

The recommendations on how to promote the use of QI in CE policies are described in terms of the three stages of formulation, implementation and evaluation. These recommendations are illustrated with short accounts of the best practices presented by China, Peru, Mexico and Thailand during the project workshop in Incheon.

The recommendations for QI institutions to prepare to support CE policies in their economies include possible short- and medium-term actions. These recommendations are also informed by the best practices presented at the project workshop.

Finally, the document presents general conclusions and recommendations. Based on the findings and workshop experience, a key recommendation for the SCSC and its members is to establish a regional platform for APEC members to exchange ideas and collaborate on QI for the Circular Economy. This platform could begin to address the extensive list of requirements identified by participants in the project workshop for QI to effectively and efficiently support the transition to a Circular Economy.

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Glossary and Acronym List

ASEAN	Association of Southeast Asian Nations
APEC	Asia-Pacific Economic Cooperation
CE	Circular Economy
DPP	Digital Product Passport
EN	European Norm
EPR	Extended Producer Responsibility
FAIR principles	Principles to improve the Findability, Accessibility, Interoperability, and Reusability of digital assets.
ISO	International Organisation for Standardisation
LCA	Life-Cycle Assessment
PET	Polyethylene Terephthalate
PO	Project Overseer
QI	Quality Infrastructure
QI4CE	Quality Infrastructure for Circular Economy
R&D&I	Research, Development and Innovation
SCSC	Sub-Committee on Standards and Conformance
TC	Technical Committee

List of abbreviations of institutions that participated in the survey

BSN	“National Standardisation Agency of Indonesia”, INA
CENAM	“Centro Nacional de Metrología”, MEX
CNIS	“China National Institute of Standardisation”, PRC
INACAL-DA	“National Institute of Quality” -Accreditation Division, PE
INACAL-DM	“National Institute of Quality” -Metrology Division, PE
INACAL-DN	National Institute of Quality -Standardisation Division, PE
INN	“National Standardisation Institute”, CHL
KPKT	Ministry of Housing and Local Government, MAS
METI	Ministry of Economy, Trade and Industry, JPN
MIDAGRI	Ministry of Agrarian Development and Irrigation, PE
MINAM	Ministry of Environment, PE
MME	Ministry of Environment, CHL
MSL	Measurement Standards Laboratory of New Zealand, NZ
NIMT	“National Institute of Metrology” Thailand, THA
NORMEX	Sociedad Mexicana de Normalización y Certificación S.C., MEX
PRODUCE	Ministry of Production, PE
TISI	Thai Industrial Standards Institute, THA

APEC Nomenclature

AUS	Australia
BD	Brunei Darussalam
CDA	Canada
CHL	Chile
PRC	People’s Republic of China (China also acceptable)
HKC	Hong Kong, China
INA	Indonesia
JPN	Japan
ROK	Republic of Korea (Korea also acceptable)
MAS	Malaysia
MEX	Mexico
NZ	New Zealand
PNG	Papua New Guinea
PE	Peru
PH or PHL	The Republic of the Philippines (the Philippines also acceptable)
RUS	The Russian Federation*
SGP	Singapore
CT	Chinese Taipei
THA	Thailand
US or USA	United States
VN	Viet Nam

*The term 'The Russian Federation' is to be used for all APEC meetings at and above Ministerial level. The informal 'Russia' can be used for APEC meetings below that level and also for publications.

1. Introduction

The transition to a Circular Economy is increasingly recognised as a relevant approach to achieving sustainable development. It addresses the growing demand for minerals and other natural resources, as well as the increasing problems of waste challenges and environmental pollution, climate change, energy shortages and the increasing scarcity of critical minerals and other natural resources.

There is still a need to develop and disseminate a better understanding of how QI responds to the needs of Circular Economy initiatives and public policies.

Therefore, the APEC Sub-Committee on Standards and Conformance (SCSC) initiated the APEC Project SCSC 106 2024A, titled "Study and workshop on the identification and analysis of public policies promoting quality infrastructure services for the implementation of Circular Economy in APEC economies".

This document was prepared as part of this project and aims to identify and evaluate public policies that promote Quality Infrastructure (QI) services (including domestic and international technical standards, conformity assessment, certification and metrology services) as mechanisms to support the implementation of Circular Economy in APEC economies.

The study is primarily based on desk research and a survey of QI institutions and Circular Economy stakeholders in APEC economies. It also draws on the identification of best practices and the results of a one-day SCSC participatory workshop held on 3 August 2025 in Incheon, Republic of Korea. Finally, the findings were analysed in collaboration between the consultant and the Project Overseer.

2. Background and Objectives

The global economy is largely linear as it is based on the logic of extraction, production, consumption and disposal. The Circularity Gap Report (Circle Economy, 2023) highlights how the circular economy can help to achieve climate goals and foster innovation. It can also improve competitiveness, reduce costs, and generate new business opportunities. However, global material extraction has more than tripled in the last fifty years, reaching an unprecedented 100 billion tonnes per year. If this trend continues, it is projected to increase by a further 60% by 2060 (Circle Economy, 2025). Regarding waste, Kaza et al. (2018) reported that the world produces 2.01 billion tonnes of municipal solid waste each year, with at least 33% of which is not being managed in an environmentally safe manner. They predict that this figure will rise to 3.4 billion tonnes by 2050 (Kaza et al., 2018).

Regarding biodiversity, the Ellen MacArthur Foundation (2021) states that it is being lost at an unprecedented rate. Having lost around 83% of all wild mammals and 50% of all plants, the Earth is experiencing its sixth mass extinction event. This crisis is largely due to five key human-driven factors: changes in land and sea use, overexploitation of species and natural resources, climate change, pollution and the invasion of alien species.

The study ‘Completing the Picture: How the circular economy helps tackle climate change’ (Ellen MacArthur Foundation, 2019) states that climate change initiatives focused on transitioning to renewable energy and improving energy efficiency could reduce global greenhouse gas (GHG) emissions by 55%. However, the adoption of circular practices could combat the remaining 45% and help achieve climate neutrality targets.

ISO defines a Circular Economy as follows:

An “economic system that uses a systemic approach to maintain a circular flow of resources, by recovering, retaining or adding to their value, while contributing to sustainable development” (ISO 59004:2024).

Quality Infrastructure (QI) facilitates an effective and efficient transition to the Circular Economy in various ways. Based on Canelas-Santiesteban, E. *et al.* (2022), a relevant QI response can be seen in the following six key themes, which address the needs of Circular Economy:

a. Using standardised Circular Economy concepts;
b. Assuring enabling policies and cooperation;
c. Promoting a culture of responsible production and consumption;
d. Assuring trustworthy data and information systems;
e. Enabling impactful Research, Development and Innovation (R&D&I);

f. Assuring competitive circular materials, products and services.

The following describes each of the six key themes in more detail:

a. Using standardised Circular Economy concepts

"Using standardised Circular Economy concepts" can be further described through the following Circular Economy needs:

- The need for a common language between CE actors, including definitions, concepts and circularity assessment.
- The need to standardise circular characteristics and performance requirements on materials, products, processes and systems. This could include Environmental, Social and Governance (ESG) considerations; Post-Consumer Recycled (PCR) materials; express delivery packaging; and high-level techno-economic and environmental assessments of recycling and sorting technologies.
- The need to update existing standards relevant to the circular economy to ensure their positive impact. This could involve analysing how current composting infrastructure aligns with existing compostability standards and certification.

b. Assuring enabling policies and cooperation

"Assuring enabling policies and cooperation" can be further described through the following Circular Economy needs:

- The need for policies:
  - that support markets and technologies for a Circular Economy;
  - that create incentives and financing for circular projects and enterprises;
  - for circular public procurement;
  - for strengthening and adapting Technical Regulations in line with Circular Economy principles.
- The need for a gradualist strategy.
- Strengthening cooperation is important:
  - for integrated circular value chains and networks;
  - for industrial symbiosis;
  - for articulation with QI institutions;
  - for international cooperation.
- The need for territorial coverage:
  - to promote the Circular Economy throughout the territory;
  - to develop circular cities and territories.

c. Promoting a culture of responsible production and consumption

"Promoting a culture of responsible production and consumption" can be further described through the following needs of the Circular Economy:

- The need for awareness and education campaigns to ensure that leaders in business, government, non-profits and the media, as well as consumers, understand the importance of transitioning to a Circular Economy.
- The need for leaders and customers to change their behaviour towards a circular decision-making and culture.
- The need to develop and disseminate Circular Economy knowledge, expertise and skills, considering e.g.:
  - Circular Economy capacity-building programmes for trainers and educators;
  - Circular Economy concepts in primary, secondary and tertiary education curricula;
  - Circular Economy skills and know-how for technical professionals and the workforce.
- The need to assess the circularity performance of systems, organisations, products and materials.
- The need for circular labelling and certification schemes for circular products, systems and organisations.
- The need for circular certification programmes for circular materials.
- The need to review the suitability, effectiveness and uptake of existing and emerging circular labelling and certification schemes and to provide guidance on opportunities for improvement.

- The need to disseminate and scale up good circular practices, including circular technologies and digital solutions.

d. Assuring trustworthy data and information systems

“Assuring trustworthy data and information systems” can be further described through the following Circular Economy needs:

- The need for traceability of resources, materials and products, as well as reporting systems.
- The need for information on the properties and performance of recovered materials.
- The need to manage and monitor stocks, flows, and circularity indicators(e.g. those that decrease with the transition, such as material footprint, household and sectoral waste, landfilled waste, water use and pollution,sectoral GHG emissions, total energy use; and those that increase with the transition, such as resource recovery rates, water, soil and air quality, nutrient capture and reuse, energy from renewable sources, recovery rates, and recycled content).
- The need for trustworthy information systems that ensure transparency, consistency and interoperability of data and information.
- The need for information systems to ensure territorial connectivity and international interoperability.
- The need for access to knowledge, state-of-the-art technology and laboratory infrastructure.

e. Enabling impactful Research, Development and Innovation (R&D&I)

“Enabling Impactful R&D&I” can be further described through the following Circular Economy needs:

- The need to strengthen the circular R&D&I system, including enhanced funding mechanisms to support it.
- The need to ensure an advanced and sophisticated research ecosystem for circularity.
- The need to develop technological capabilities for circularity, including those in chemistry for green chemistry, carbon-neutral or carbon-negative chemistry and chemical recycling technologies.
- The need to accelerate circular innovation, for example in advanced materials development, circular business models and in upstream innovation.
- The need to disseminate and effectively scale circular solutions.
- The need to access and utilise digital technologies and solutions.

f. Assuring competitive circular materials, products and services

“Assuring competitive circular materials, products and services” can be further described by the following Circular Economy needs:

- The need to increase resource use efficiency and material productivity.
- The need for high-quality circular products that are competitive and characterised by durability, repairability, reusability, low carbon performance and/or sustainability.
- The need for efficiently organised, innovative and competitive circular value chains and networks, including:
    - ensuring the valorisation of recovered materials;
    - ensuring the cold chain transport of food;
    - improving the performance of collection, sorting and recycling processes;
    - stimulating upstream and downstream innovations.
- The need for a well-functioning market for high-quality recovered materials, such as those for minerals, plastics, organics, construction materials and reusable product and packaging components.
- The need to stimulate the market for competitive circular goods and services.
- The need to maintain and increase participation in international trade. This is because:
    - the international trade of circular products will increase;
    - circular value chains could be organised across several economies;
    - trading partners are adopting the circular economy through higher product and materials standards;
    - a strong reputation for quality, standards and trust is a key asset.

However, there is still a need to develop and disseminate a better understanding of how QI responds to the needs of Circular Economy initiatives, including Circular Economy public policies. To this end, the APEC Sub-Committee on Standards and Conformance (SCSC) undertook the APEC Project SCSC 106 2024A, "A Study and workshop on the identification and analysis of public policies promoting quality infrastructure services for the implementation of Circular Economy in APEC economies".

The objective of this research is to produce the following:

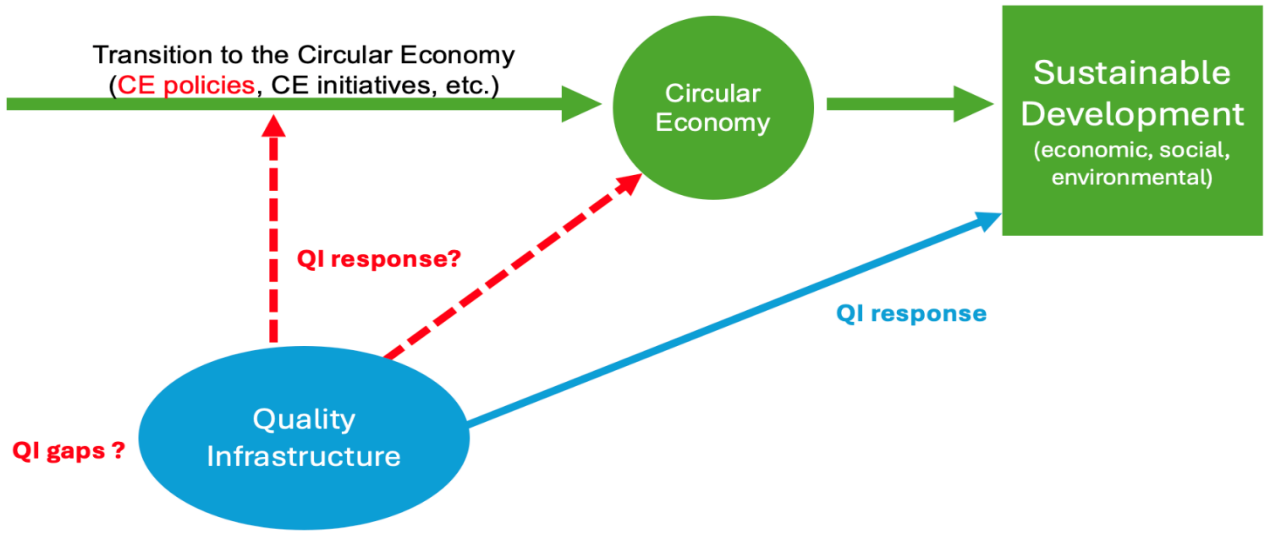
A. Key findings on public policies adopted by APEC member economies in relation to the use of Quality Infrastructure (QI) to support the implementation of the circular economy. Whereby QI focuses on technical standards, accredited conformity assessments and metrological services.

B. Impact evaluation (regarding effectiveness, efficiency and sustainability) of the use of QI in Circular Economy public policies and their implementation.

C. Identification of obstacles or challenges to strengthen the use of QI services in the implementation of Circular Economy policies.

D. A set of recommendations for future projects of SCSC and its members to promote the use of QI through appropriate mechanisms in the implementation of circular economy.

Graphic 1: QI response in support of the transition to a Circular Economy



Source: Valqui, A. (2025)

The study is primarily based on desk research and a survey of QI institutions and Circular Economy stakeholders in APEC economies. It also draws on the identification of best practices and the results of a one-day SCSC participatory workshop held on 3 August 2025 in Incheon, Republic of Korea. Finally, the findings were analysed in collaboration between the consultant and the Project Overseer.

3. Research design and methodology

This research is designed as an exploratory study in three phases:

First Phase:

Expert knowledge enriched with internet and desk research to provide an initial analysis of policies regarding the use of QI services for implementing a circular economy in APEC economies.

This initial analysis was used to design the surveys to be conducted in the second Phase. The survey addressed the perspectives of two target groups: QI institutions and the actors involved in the Circular Economy. A questionnaire was developed for each target group:

1. A questionnaire for the three pillar QI institutions, covering standardisation, metrology and accreditation, which was ideally completed by SCSC members together or in consultation with other QI institutions.

2. A questionnaire for CE actors, which was ideally completed by representatives of the public institutions that lead the formulation and implementation of the Circular Economy in APEC economies.

The questionnaires cover the following main themes, which are given different weights.

The questionnaire for the three pillar institutions is organised as follows:

- General questions:
  - Information about the respondent;
  - Description and assessment of the main Circular Economy (CE) policy in APEC economies.
- For each QI institution
  - Readiness to support CE policies;
  - Participation in CE policy processes;
  - Use of QI in CE policies.
- Identification and sharing of lessons and best practices .

The questionnaire for the Circular Economy actors is organised as follows:

- General questions:
  - Information about the respondent;
  - Description and assessment of the main Circular Economy (CE) policy in APEC economies;
  - Experiences with the Quality Infrastructure (QI) in the Circular Economy policy process;
- Identification and sharing of lessons and best practices.

For more details, please refer to the two questionnaires attached as separate documents (Appendices 5 and 6).

Second Phase:

The APEC Secretariat distributed the surveys to the SCSC members, who then distributed them to the relevant QI institutions and Circular Economy actors identified within their respective economies.
Eleven APEC economies participated in the survey. The analysis comprises the feedback and insights into the experiences of 21 participants: 14 from QI institutions and seven from CE actors (see Table 1). Further information on the participating CE actors and QI institutions can be found in Table A in Appendix 1.

Table 1: General information on the questionnaires received	N=21
Criteria	#
Participating Economies	11 (AUS; CHL; PRC; INA; JPN; MAS; MEX; NZ; PE; PH; THA)
Questionnaires considered	21
From QI institutions	14
From CE actors	7
Include Best practices	13
Declared to be interested in presenting their Best Practices in the project Workshop	4 (PRC; MEX; PE; THA)

Note: VMI, Viet Nam informed that they will not be able to participate in the survey at this time (19 June 2025)
Source: Own elaboration based on survey results.

A Preliminary Research Report was produced based on the survey and analysis. This report formed the basis for the third phase.

Third Phase

At the heart of the third phase was a one-day participatory validation workshop held at SOM3 2025 on 3 August 2025 in Incheon, Republic of Korea. Preliminary findings were presented and discussed with members of the Sub-Committee on Standards and Conformance (SCSC) at this workshop. To prepare the participants, the Preliminary Research Report was sent to them in advance.
Contributions and feedback received during the workshop were used to finalise the final Research Report.

4. Analysis of Circular Economy policies regarding the use of QI services for implementing the Circular Economy in APEC economies

The analysis will cover key findings, impacts, obstacles and best practices on the following:

A. Analysis and characterisation of the CE policies considered in the survey
B. Analysis of the direct use of QI in CE policy formulation, implementation and monitoring
C. Analysis of the potential use of QI in policy formulation, implementation and monitoring
D. Analysis of QI preparedness to support CE initiatives

A. Analysis and characterisation of the CE policies considered in the survey

Of the twenty-one respondents, nineteen provided the requested information about the circular economy policies in their respective economies. Thirteen policies were reported on in total. In some cases, more than one respondent reported on the same policy (see Table 2).

Table 2: Circular Economy policies reported as the main CE policy in the Economy of the respondents		N=21
#	Institution	CE policy
1	AUS-Standards Australia	Domestic Circular Economy Framework
2	CHL-INN	Domestic Circular Economy Roadmap 2040
3	CHL-MME	Domestic Circular Economy Roadmap 2040
4	PRC-CNIS	The 14th Five-Year Plan for Circular Economy Development
5	INA-n.a.	Domestic Circular Economy Roadmap
6	INA-BSN	Domestic Circular Economy Roadmap
7	JPN-METI	Circular Economy Vision 2020
8	MAS-KPKT	Circular Economy Blueprint for Solid Waste in Malaysia (2025 - 2035)
9	MEX-CENAM	Mexico City Circular Economy Policy/Law (2023) and of other Mexican states, see Note MEX below.
10	MEX-Normex	n.a.
11	NZ-MSL	None, see Note NZ below
12	PE-INACAL-DA	Integral Solid Waste Management Law (D.L. 1278)
13	PE-INACAL-DM	Domestic Circular Economy Roadmap 2030
14	PE-INACAL-DN	Domestic Circular Economy Roadmap 2030
15	PE-MINAM	Domestic Circular Economy Roadmap 2030
16	PE-MIDAGRI	Roadmap of Circular Economy in the Agrarian Sector
17	PE-PRODUCE	Industry and Trade Circular Economy Roadmap, see Note PER below
18	PH-DTI-BPS	Extended Producer Responsibility Act of 2022
19	THA-Get Solutions	BCG Economy Model (Bio-Circular-Green Economy Model)
20	THA-NIMT	BCG Economy Model (Bio-Circular-Green Economy Model)
21	THA-TISI	BCG Economy Model (Bio-Circular-Green Economy Model)

Note MEX: Mexico still lacks a general legal framework for domestic public policies that facilitate the transition to a circular economy as a sustainable development model. The most significant legislative progress has been made in five of the 32 states, which have enacted laws aimed at the circular economy. The most recent of these is the Mexico City Circular Economy Law, which was issued in 2023.
Note NZ: NZ is only just beginning to consider this issue, but its intentions are evident in the emissions reduction plan, the infrastructure plan, and updates to waste legislation.
Note PER: The Industry and Trade Circular Economy Roadmap is a project developed by the Ministry of Production, within the framework of the Peruvian Circular Economy Roadmap 2030 (Supreme Decree No. 003-2025-MINAM), which establishes the development of sectoral roadmaps.
Source: Own elaboration based on survey results.

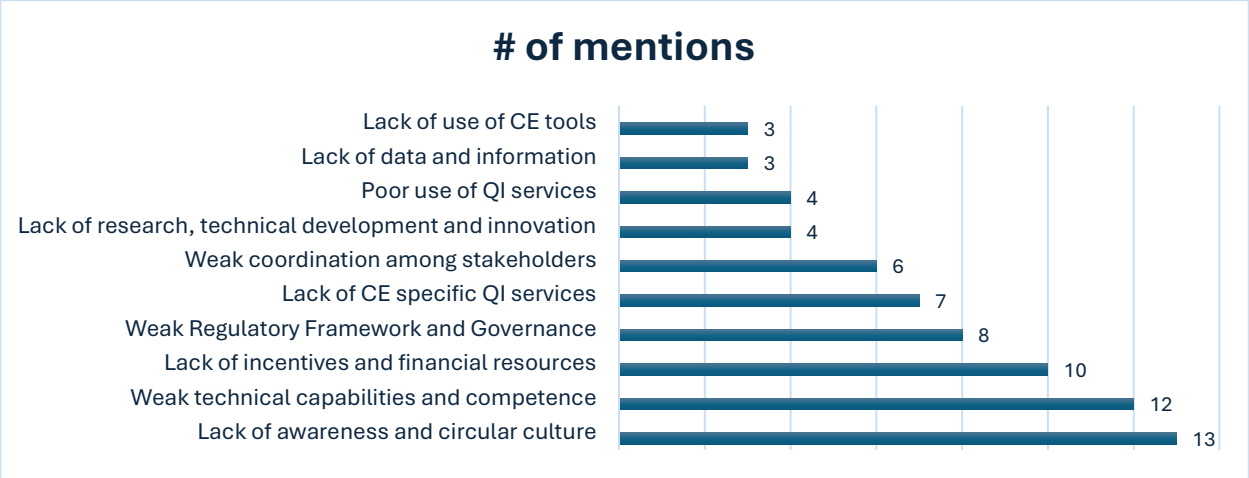
Most of the Circular Economy policies reported (see Table A in Appendix 2) are classified as follows:

- are being classified as “Roadmaps” (6 out of 19) or “Policies in the narrower sense” (6 out of 19). The other classifications used were “Strategy”, “Plan” and “Strategic planning document and policy direction”.

- started between 2020 and 2024 (nine out of 18) or in 2025 (five out of 18). Three of them started before 2020, with Japan's "1999 Circular Economy Vision" being the predecessor of "Circular Economy Vision 2020" and the oldest documented policy.
- are declared to have the "Domestic" intervention level (13 out of 18). The other intervention levels are "Sectoral – public" (four out of 18) and "Regional or local level" (one out of 18). In the case of Mexico, there are Circular Economy policies at state level, but not at the domestic level yet.
- have the scope as "Pure Circular Economy policy" (eight out of 19) and "Sustainable development policies with Circular Economy approach" (eight out of 19).

Participants in the survey were asked to indicate up to three of the main challenges facing the implementation of CE policies. Respondents mentioned a total of 70 main challenges, which were clustered by type (see Graphic 2).

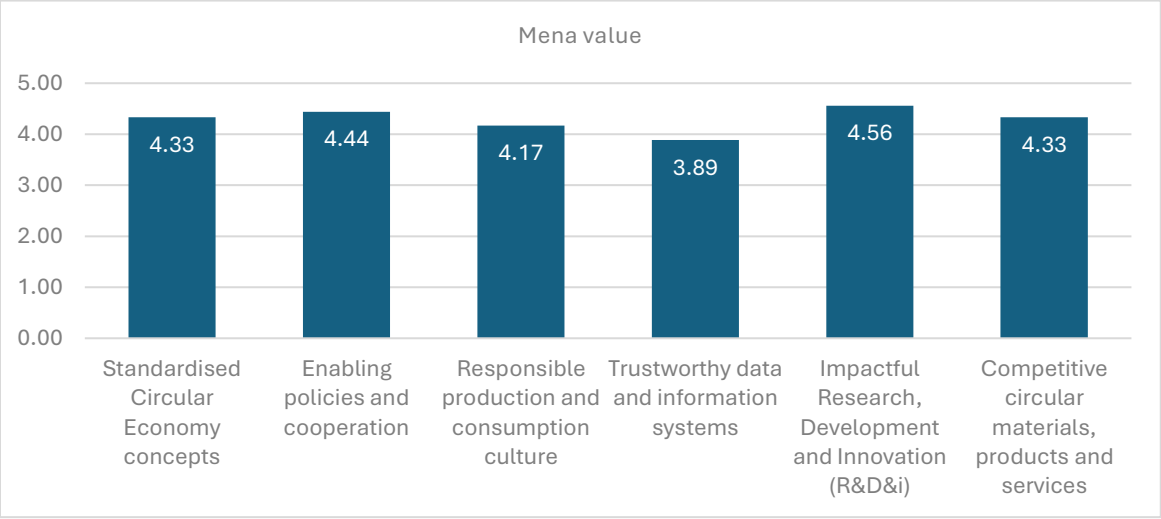
Graphic 2: Lessons learnt reported by respondents: the three main challenges facing the implementation of the Circular Economy policies (n=19)



Note: Each respondent could report up to three lessons learnt; a total of 70 were reported. The author clustered these lessons learnt.
Source: Own elaboration based on survey results.

As shown in Graphic 2, several of the challenges are directly linked to the six proposed key themes for Circular Economy policies, in which QI can play a supporting role.
Survey participants were asked to rate the relevance of these proposed six themes for Circular Economy policies. On average, all proposed six key themes were rated as at least high relevance for the CE policies (see Graphic 3), which validates the relevance of the proposed six themes for Circular Economy policies and their implementation (in Chapter 2 it is described which specific needs are covered by these six key themes).

Graphic 3: Relevance of the key themes for the CE policy (n=18)



Note: the rating was done based on the following scale: 0 - not relevant at all; 1 - very low relevance; 2 - low relevance; 3 - medium relevance; 4 - high relevance; 5 - very high relevance.
Source: Own elaboration based on survey results.

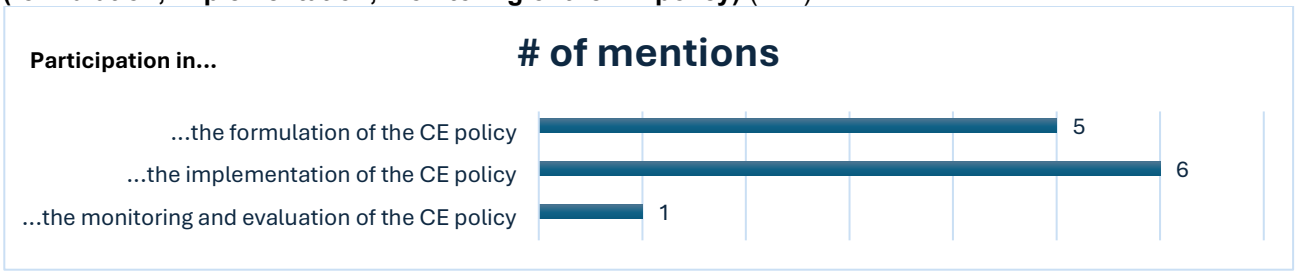
Participants in the survey were asked to provide an assessment of the perceived and expected impacts of the Circular Economy policies. It should be noted that a personal, rather than an in-depth assessment was expected. Most respondents reported the following (see Tables D to G in Appendix 2):

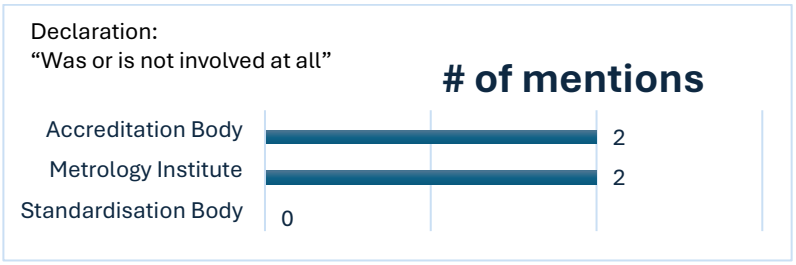
- that a partial positive economic, environmental and social impact could be observed (ten out of 19 respondents);
- that this impact could be categorised as a "moderate positive impact" (seven out of 16 respondents);
- regarding the efficiency of implementation, that the "CE policy has been or is being implemented as expected" (seven out of 16 respondents). However, four respondents also indicated that "CE policy implementation required or requires more resources and time than expected";
- regarding the sustainability of the achieved impacts, that the "sustainability of impacts is partly assured" (seven out of 16 respondents) or "sustainability of impacts is assured" (three out of 16 respondents).

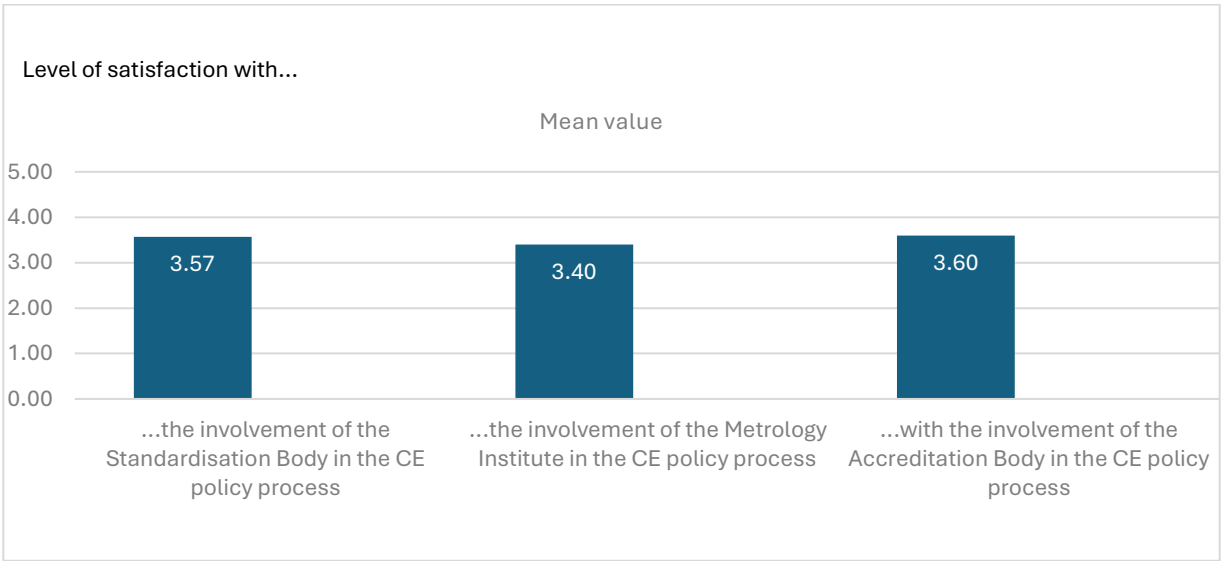
B. Analysis of the direct use of QI in CE policy formulation, implementation and monitoring

The analysis of how QI is directly used in the formulation, implementation and monitoring of Circular Economy policies began with an examination of QI's involvement in CE policies. This part of the analysis differentiates between the perspectives of CE and QI actors.

Graphic 4: From the CE actors' perspective: the involvement of QI at any stage of the CE policy process (formulation, implementation, monitoring of the CE policy) (n=7)





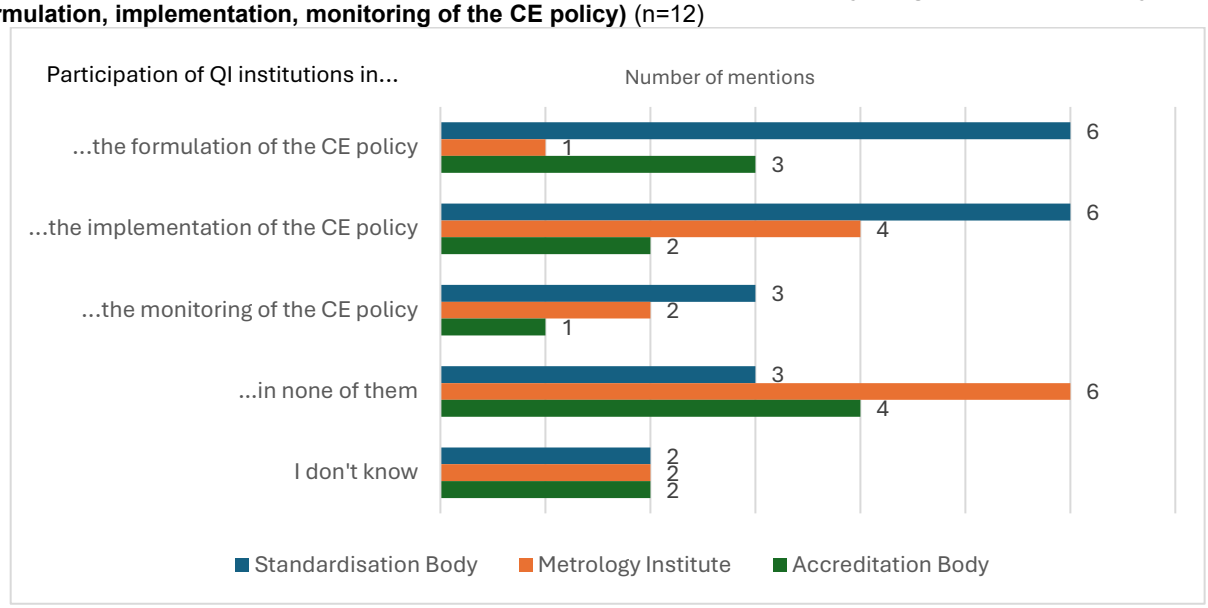


Note: the rating was done based on the following scale: 1 - very low satisfaction; 2 - low satisfaction; 3 - medium satisfaction; 4 - high satisfaction; 5 - very high satisfaction
Source: Own elaboration based on survey results.

From the perspective of the CE actors (see Graphic 4), QI institutions are primarily involved in CE policy formulation and implementation (six out of seven respondents). Of the three QI pillar institutions, the Standardisation Bodies seem to be the most involved. Satisfaction with the involvement of the three QI institutions is average, ranging from “medium satisfaction” to “high satisfaction”.

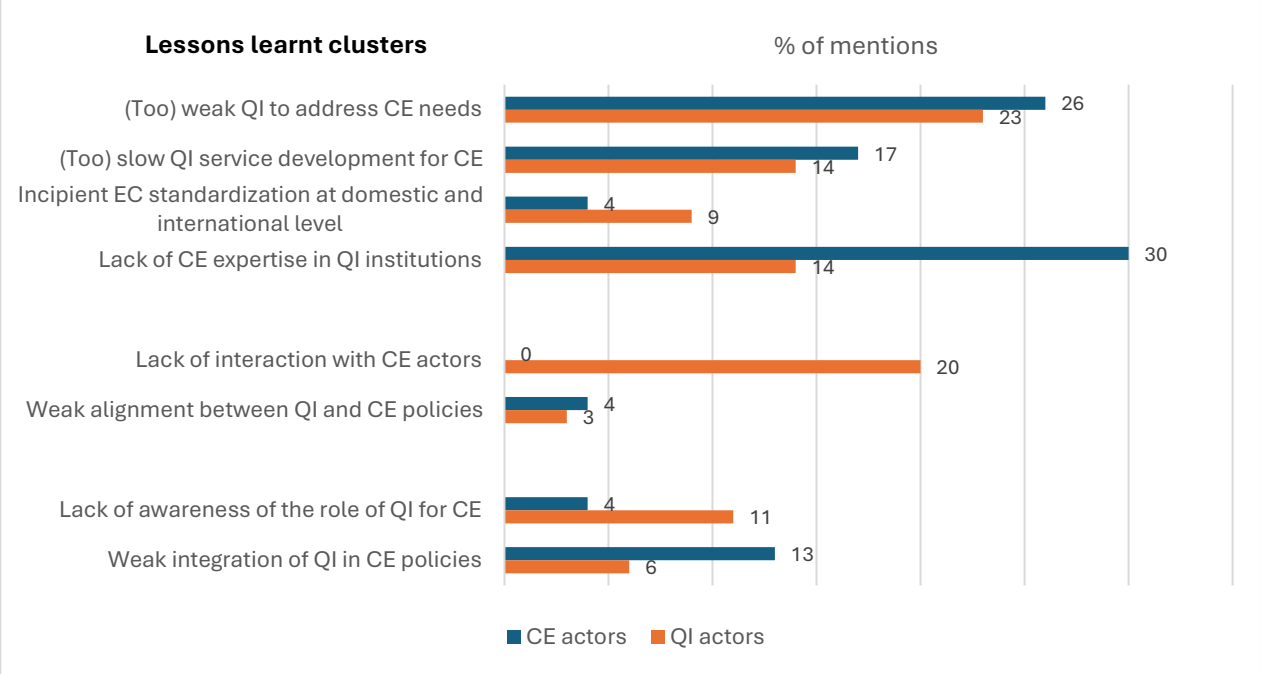
From the perspective of the QI institutions themselves, they report involvement in CE policies less frequently than the CE actors do. The Standardisation Body reports the highest level of involvement, followed by the Accreditation Body. The Metrology Institute reports the lowest level of involvement (see Graphic 5).

Graphic 5: From QI institutions' perspective: the involvement of QI at any stage of the CE policy process (formulation, implementation, monitoring of the CE policy) (n=12)



Source: Own elaboration based on survey results.

Graphic 6: Lessons learnt reported by respondent: three main challenges for QI institutions in becoming effectively involved in CE policy processes (n=19)



Note: Each respondent could report up to three lessons learnt; a total of 23 were reported by CE actors and a total of 35 were reported by QI actors. The author clustered these lessons learnt.
Source: Own elaboration based on survey results.

When asked about the main challenges facing QI institutions in becoming effectively involved in CE policies, respondents differentiated between challenges that fall within the remit of QI institutions, challenges relating to the interaction between QI and CE, and challenges that fall within the remit of CE actors (see Graphic 6). For the latter, a lack of awareness of the role of QI in CE policies is seen as the primary reason for the exclusion of QI institutions from such policies. On the QI side, a lack of CE expertise and an inability to address CE needs were identified as the main challenges faced by QI institutions in becoming involved in CE policy processes. Additionally, a lack of interaction between QI and CE actors was reported as an important challenge.

Examining the responses regarding the direct use of QI in the CE policies (see Table 3) reveals that 10 to 30% of QI respondents are uncertain about the utilisation of QI components in CE policies. One possible explanation is that these QI actors have not even read the CE policies.

Furthermore, standards and standardisation were reported to be in the highest use, while metrology was reported to be in the lowest use. This was particularly the case because most of the CE actors did not recognise the direct use of metrology.

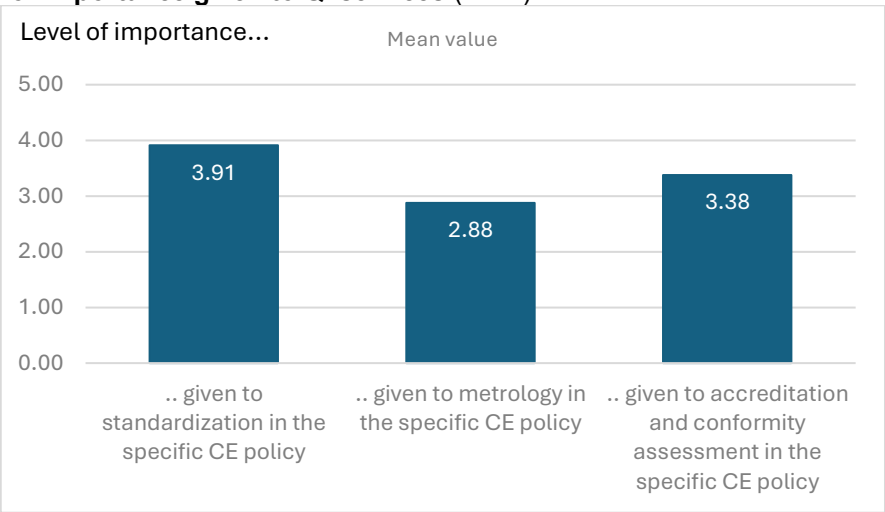
Table 3: From QI institutions' and CE actors' perspective: Direct use of QI in the CE policy

		Yes, several times or very pronounced	Yes, few times	Yes, but only once or very vaguely	No	I do not know	TOTAL
		% of mentions					
Does the policy document quote or refer to the definitions or content of the ISO 59000 standards?	QI	9	18	9	45	18	100 (11)
	CE	29	14	14	43	0	100 (07)
Does the policy document mention or refer to other standards, tech. standards, standardisation?	QI	36	18	9	18	18	100 (11)
	CE	14	43	14	29	0	100 (07)
Does the policy document mention metrology or related metrology services, such as measurements, calibration, or reference materials?	QI	20	10	20	20	30	100 (10)
	CE	14	0	14	71	0	100 (07)
Does the policy document mention conformity assessment, certification, certificates, laboratory testing, or related concepts?	QI	22	11	44	11	11	100 (09)
	CE	14	14	43	29	0	100 (07)

Source: Own elaboration based on survey results.

Similar results were obtained when the importance of QI and its components in CE policies was rated. QI actors give the highest importance to standardisation and the lowest to metrology (see Graphic 7).

Graphic 7: Level of importance given to QI services (n=12)



Note: the rating was done based on the following scale: 0 - not at all important; 1 - very little importance; 2 - little importance; 3 - medium importance; 4 - great importance; 5 - very great importance
Source: Own elaboration based on survey results.

Overall, the direct application of QI in CE policies requires improvement. QI institutions could clarify how QI provide components could support the formulation, implementation and monitoring of CE policies. In particular, the role of metrology is unclear to all stakeholders.

The following **best practices** have been reported regarding the direct use of QI in CE policies, cooperation with QI in CE policies, and knowledge dissemination (see Appendix 3 for further information):

Scope of Best Practice	#	Title of the Best Practices	Economy-Institution
1. Promoting QI in CE Policies	1.1.	Incorporation of Peruvian Technical Standards (NTPs) and Technical Guides in the Development and Implementation of the Circular Economy Roadmap	PE-PRODUCE
2. Cooperation between QI and CE actors	2.1.	Integration of Green Product Certification with Domestic Standards	PRC-CNIS
	2.2.	Promote communication enhancement of government authorities and standardisation bodies with NMIs and R&D institutions.	MEX-CENAM
	2.3.	Promoting collaboration between quality institutions, regulatory bodies and productive sectors to boost the circular economy	MEX-NORMEX
	2.4.	Support different sectors, like tourism, manufacturers and agribusiness, to incorporate CE through standards	PE-INACAL-DN
3. Dissemination of CE & QI knowledge	3.1.	Spread Knowledge (CE&QI) at regional level	PE-INACAL-DN

C. Analysis of the potential use of QI in policy formulation, implementation and monitoring

In order to make better use of QI, it would be beneficial to analyse the elements, strategies and instruments employed in CE policies, and to identify how QI could support the development and execution of these.
Almost all CE policies contain a section that defines the circular economy and its related concepts and principles (see Table 4). The ISO 59000 series provide an ideal basis for ensuring state-of-the-art, internationally harmonised circular economy definitions and concepts.

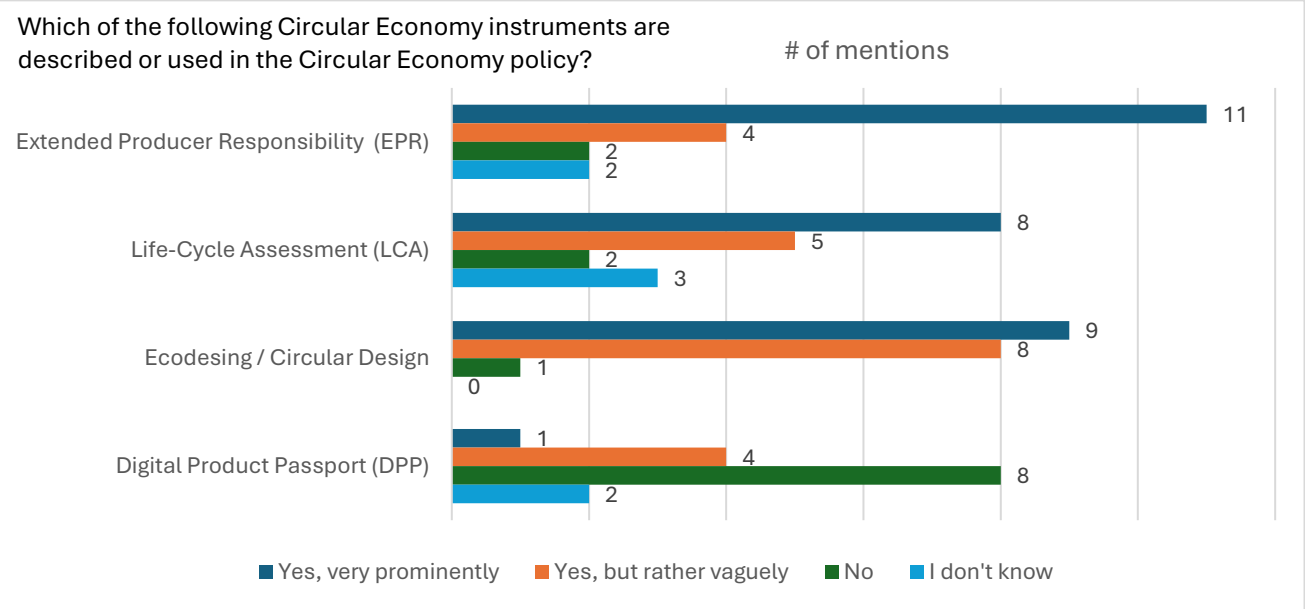
As CE policies frequently utilise CE instruments such as Extended Producer Responsibility, Life-Cycle Assessment and Eco-Design/Circular Design (see Graphic 8), QI institutions are encouraged to demonstrate how QI can support and enable the implementation of these instruments and others through standards, accredited certification schemes and reliable measurement results. Although the Digital Product Passport is not

currently part of most CE policies, its role in the CE is expected to grow. This is of particular interest to QI because it is integral to Digital Product Passports.

Table 4: Use of QI in the CE policy					n=18
	Yes, very prominently	Yes, but rather vaguely	No	I do not know	TOTAL
	# of mentions				
Is there a section in the policy document where the Circular Economy and its related concepts and principles are defined?	14	3	1	0	18

Source: Own elaboration based on survey results.

Graphic 8: Use of QI in the CE policy (n=19)



Note: Other CE instruments mentioned included: Carbon footprint, eco-efficiency strategies, clean production agreements, innovation hubs, standards development and certification schemes (e.g., for organic agriculture and green buildings), wastewater reduction roadmaps, product and material traceability and knowledge management.

Source: Own elaboration based on survey results.

Table 5: Lessons learnt reported by respondent: three main ways in which QI can support the implementation of CE policies	n=16
Lessons learnt cluster	# of mentions
Using standardised Circular Economy concepts	
Standards to harmonise CE concepts	4
QI for developing CE Knowledge	1
Ensuring enabling policies and cooperation	
QI for CE policy formulation and implementation	5
QI for coordination	1
Promoting a culture of responsible production and consumption	
QI for Eco-Design	3
QI for trust in CE product declarations	8
QI to achieve and demonstrate CE compliance	7
Ensuring trustworthy data and information systems	
QI for evidence-based decisions	2
Metrology and QI for reliable data for measuring and monitoring CE parameters	11
Enabling impactful Research, Development and Innovation (R&D&I)	
Metrology for innovation	3
Ensuring competitive circular materials, products and services	
Standards and QI for circular product specifications	5
Standards and QI for recovered material specifications	4
Standards and QI for circular process and resource efficiency	5
Certification and QI for circular markets	2
General	
QI for general CE needs	8
TOTAL reported	69

Note: Each respondent could report up to three lessons learnt; a total of 69 were reported. The author clustered these lessons learnt. The clusters were then organised according to the six key themes of QI support for CE needs, as well as a general cluster.
Source: Own elaboration based on survey results.

Participants in the survey were asked to share up to three main ways in which QI can support the implementation of CE policies, based on their experience. The expert then clustered their answers and organised them into the six key CE needs themes to which QI can respond (see Table 5).

Most of the main ways clusters could easily be organised into these six themes. This suggests that the six themes are closely aligned with the CE needs.

Interestingly, despite metrology being considered less important for CE policies, the respondents still provided around 20% of the main ways in which CE policies can be supported through QI that are directly related to metrology: “Metrology and QI for reliable data for measuring and monitoring CE parameters” and “Metrology for innovation”.

According to Schmidt et al. (2024), digital technologies and solutions enable the Circular Economy by facilitation of networking between stakeholders, acquiring data, modelling processes and automating them. Generating, acquiring, analysing, interpreting, storing and recycling data are key to making production systems and circular value networks efficient.

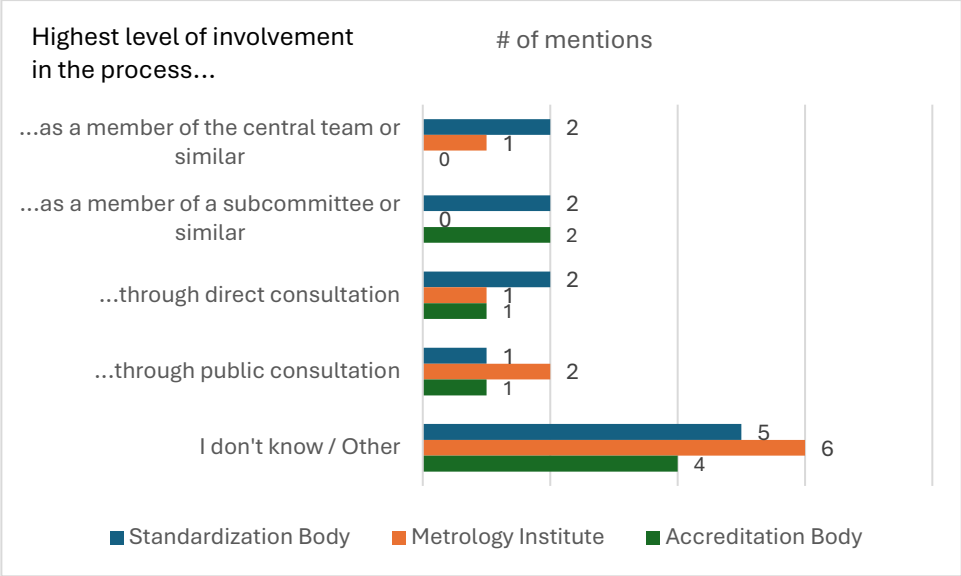
The following **best practices** have been reported regarding the use of QI in CE instruments (see Appendix 3 for further information):

Scope of Best Practice	#	Title of the Best Practices	Economy-Institution
9. Promoting CE Awards with QI elements	9.1.	Promotion of Sustainable Resource Management for Circular Economy with I-EA-T Circular Economy Awards (2024)	THA-Get solutions

D. Analysis of QI preparedness to support CE initiatives

As previously noted, QI institutions are not regularly involved in the CE policy formulation and implementation. When QI institutions were asked how they are being involved, it became clear QI institutions are not always part of the central team, subcommittee or similar, but only participate through consultations (see Graphic 9).

Graphic 9: From QI institutions' perspective: the highest level of involvement of QI institutions in the CE policy process (n=12)

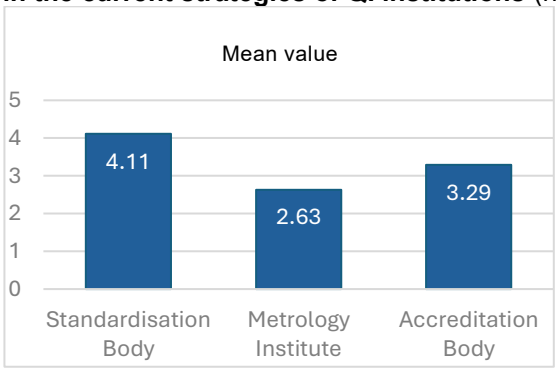


Source: Own elaboration based on survey results.

The following presents feedback on various questions regarding the preparedness of QI institutions.

The first question is how relevant the Circular Economy is to the current strategies of QI institutions. While CE is reported to be highly relevant for the Standardisation Bodies, it is only moderate relevant for the Accreditation Bodies and the Metrology Institute, which has the lowest rating (see Graphic 10).

Graphic 10: Relevance of CE in the current strategies of QI institutions (n=11)



Note: the rating was done based on the following scale: 0 - not relevant at all; 1 - very low relevance; 2 - low relevance. 3 - medium relevance; 4 - high relevance; 5 - very high relevance
Source: Own elaboration based on survey results.

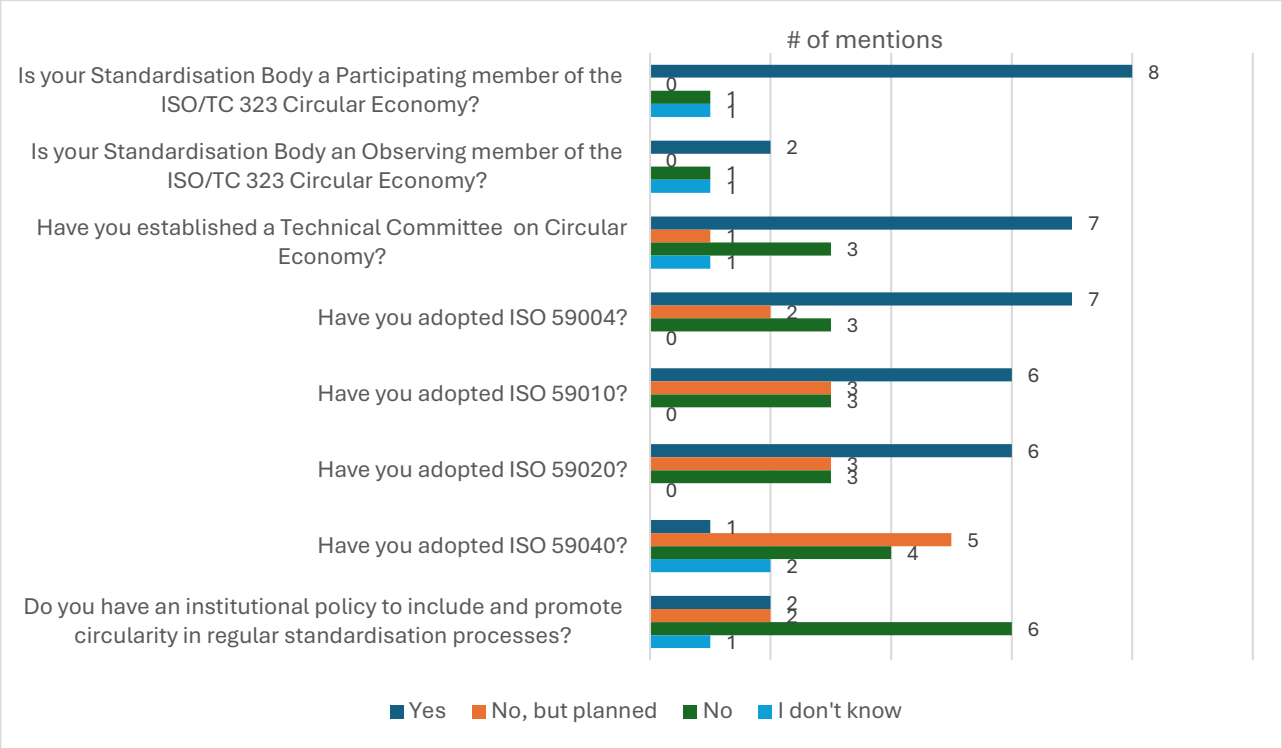
Further questions were asked about the readiness of QI institutions.

Regarding the Standardisation Body's readiness (see Graphic 11), most of the respondents declared that their Standardisation Body participates as a Participating or Observing member in the ISO/TC 323 and has established a Technical Committee on CE.

Around half of the respondents said that the ISO standards from the ISO 59000 series, published in 2024, had already been adopted as domestic standards. Only one respondent stated that the ISO 59040 standard published in 2025, had already been adopted. Almost half of those who declared that they had not adopted the ISO 59000 standards are planning to do so.
Half of the respondents said that they had not implemented an institutional policy to include and promote circularity in regular standardisation processes.

While some of the Standardisation Bodies are well prepared to support CE policies and their implementation, others still lack a clear definition of CE as relevant in their institutional strategy. They should adopt the ISO 59000 standards and implement a policy to promote circularity in standardisation processes as soon as possible.

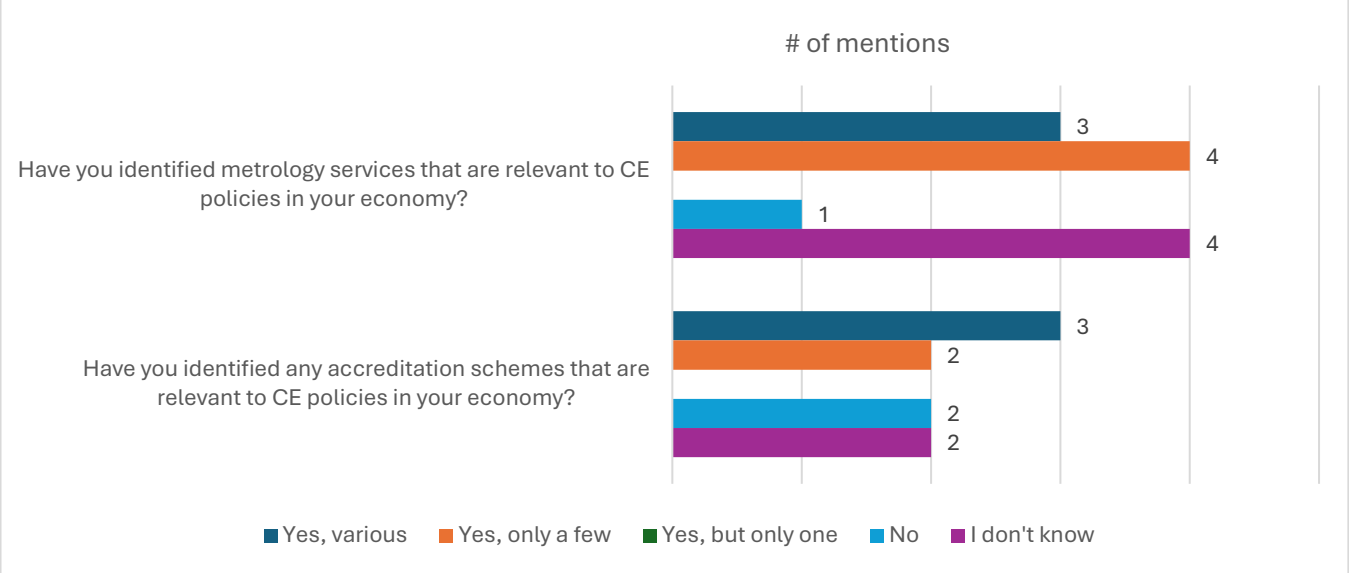
Graphic 11: Readiness of the Standardisation Bodies to support the CE policies (n=12)



Source: Own elaboration based on survey results.

Regarding the readiness of the Metrology Institute and the Accreditation Body, the respondents were asked to identify new services within their area of competence that are relevant to CE policies in their respective economies. More than half of the respondents declared that they had identified new services (see Graphic 12).

Graphic 12: Readiness of the Metrology Institutes and Accreditation Body to support the CE policies (n=12)



Source: Own elaboration based on survey results.

Five of the respondents declared that their Metrology Institutes are developing new metrology services in the following areas:

- Microplastics: Development of microplastic reference materials (e.g. compost and water); Reference materials for microplastic.
- Identifying recycled materials: Development of measurement reference systems for identifying recycled materials in finished products (e.g. plastics).
- Analysing the performance of recycled materials: Testing and measurement of post-consumer recycled (PCR) materials; Development of measurement reference systems that promote the circularity of materials (e.g. cement, steel and electronics) and assessing the durability, reusability and repairability of products or emerging materials (e.g. nanomaterials and semiconductors); Durability and reuse performance measurement for circular products.
- Analysing biodegradability of materials: Physicochemical measurements to characterise plastics in claimed biodegradable/compostable products, and to identify mainly chemical constituents and potential materials harmful to the environment. This service complies with the international standards ISO 18606 and EN 13432.
- Analysing environmental parameters: Reference materials for measuring chemical and biological parameters for water quality (for use in water reuse projects); Proficiency testing of chemical parameters for the reuse of wastewater treatment plant effluents (wastewater and/or biosolids); Characterisation of materials used for water treatment; Calibration standards for environmental monitoring (e.g. waste emissions and water reuse).
- Environmental evaluation methods: Measurement services to support life-cycle assessment (LCA); Metrology for carbon footprint measurement and verification.

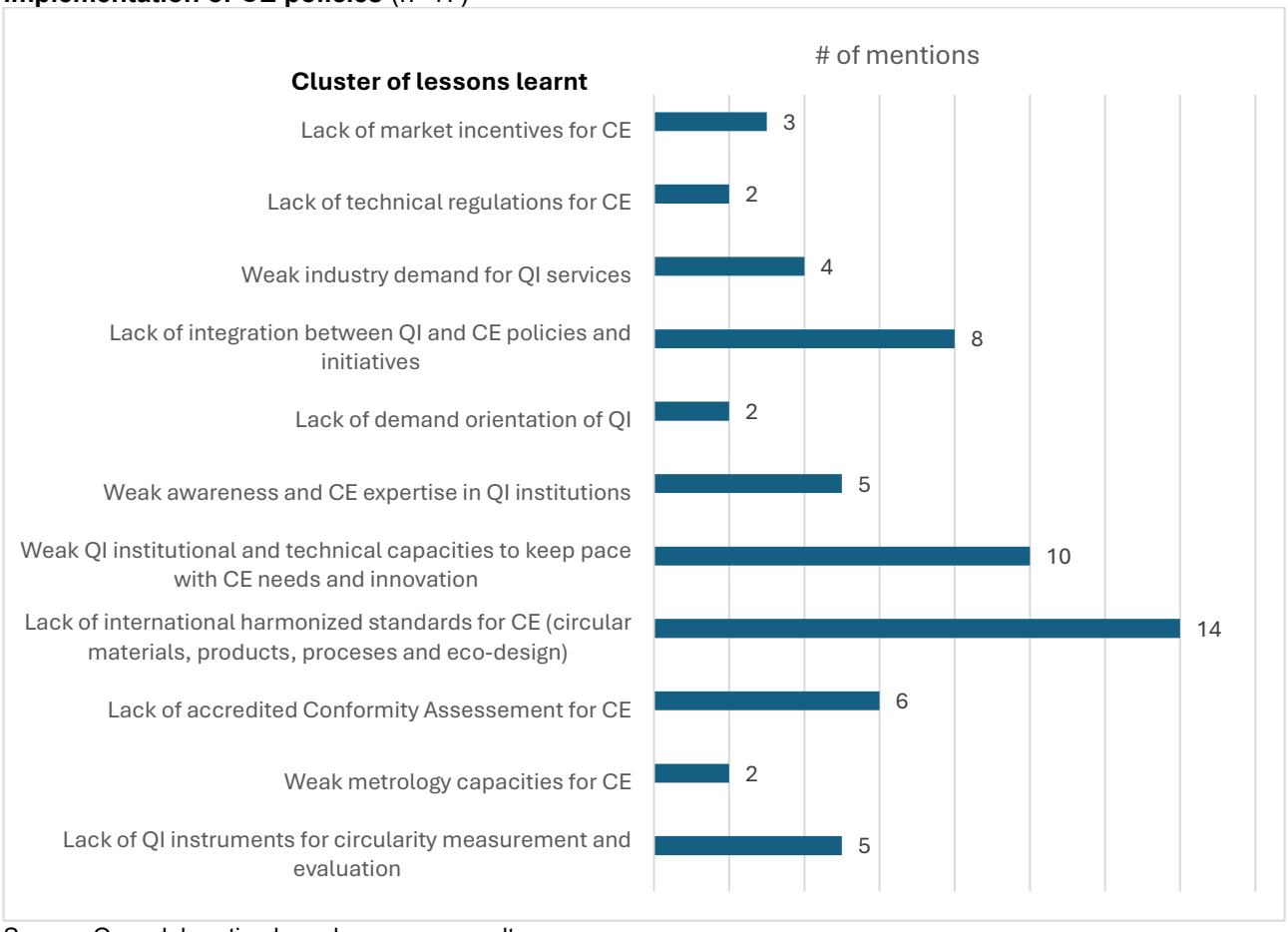
With regard to conformity assessment, respondents were asked to estimate the number of testing laboratories that could provide relevant testing services for the CE in the economy. Most respondents either did not answer the question or said they did not know the numbers, suggesting a lack of information regarding the needs and capacities of conformity assessment (see Table 6).

Table 6: Estimated number of testing laboratories that could provide testing services that are relevant to the CE in the Economy	n=8 # of mentions
0	0
1 to 4	1
5 to 10	1
11 to 20	1
21 to 50	1
more than 50	0
I don't know	4

Source: Own elaboration based on survey results.

Participants in the survey were asked to identify up to three main challenges for QI in supporting the implementation of CE policies based on their experience (see Graphic 13). Almost a quarter of the reported main challenges are linked to "Lack of international harmonised standards for CE (circular materials, products, processes and eco-design)" and around a sixth are linked to "Weak QI institutional and technical capacities to keep pace with CE needs and innovation". The latter is the most challenging response for QI institutions. CE needs are characterised as very dynamic and with increasing demands that can be met by QI institutions. If QI institutions do not provide an agile response, there is a risk of disappointment and of choosing solutions other than those offered by QI institutions. These other solutions may be of lower quality and confidence, but are more accessible for CE.

Graphic 13: Lessons learnt reported by respondent: three main challenges for QI to support the implementation of CE policies (n=17)



Source: Own elaboration based on survey results.

The following **best practices** have been reported regarding the development of QI services for CE policies (for further information see Appendix 3):

Scope of Best Practice	#	Title of the Best Practices	Economy-Institution
4. Establishment of Standardisation Technical Committee for Circular Economy	4.1.	Establish a domestic TC in EC	PE-INACAL-DN
	4.2.	Establishment of the Subcommittee on Circular Economy	THA-TISI
5. Standardisation for circularity in products, Organisations and sectors	5.1.	Financing Standardisation from various sources of resources.	CHL-MME
	5.2.	Develop Standardisation plans linked to labour skills training plans and regulatory implementation plans.	CHL-MME
	5.3.	Advance specifically in a differentiated manner, with Standardisation for different economic sectors.	CHL-MME
	5.4.	Development of SNI Standards for Recycled Plastic Materials	INA-TBC
	5.5.	Development of Standards and Guides focused on quality for the circular economy.	MEX-NORMEX
	5.6.	Peruvian technical standards specific to the circular economy	PE-MINAM
6. Metrology for circularity in products and organisations	6.1.	MESURA Methodology with circular perspective	MEX-CENAM
	6.2.	Development and adoption of metrological reference systems for the optimisation of conformity assessment practices.	MEX-CENAM
7. Conformity Assessment for CE	7.1.	Integration of Circular Economy Principles into Domestic Standardisation Priorities and Eco-Labelling Schemes	INA-BSN
	7.2.	Promoting conformity assessment as a key tool for building trust in circular products and processes	MEX-NORMEX
8. Promoting CE Management Systems in organisations	8.1.	Development and Implementation of the Circular Economy Management System (CEMS) Auditing and Certification Scheme in Thailand	THA-Get solutions
	8.2.	Development and performance enhancement of Circular Economy Management System for industrial sector (2021-2025)	THA-Get solutions
10. Strengthening QI	10.1	Enhance resourcing for Quality Infrastructure (QI) institutions	AUS-Standards AUS

5. Promoting the use of QI in CE policies

The policymaking process includes three main stages: formulation, where goals and solutions are developed; implementation, where the policy is put into action; and monitoring and evaluation, where the policy's effectiveness and impact are assessed, and adjustments to its implementation are made if necessary. Governments typically use spending, taxation, regulation and public procurement to achieve their policy objectives (see OECD, 2020). Having analysed the use of QI in CE policies, the following recommendations are presented to promote the involvement of QI actors and the use of QI in CE policies at different stages of the policymaking process. In addition, recommendations for preparing QI to support CE policies are provided. Where appropriate, these recommendations are supported by examples of best practice from China; Mexico; Peru; and Thailand, which were presented at the project workshop in Incheon on 3 August 2025.

When formulating the policy, it is recommended that the vocabulary, principles and guidance for implementation defined in ISO 59004:2024 'Circular Economy – Vocabulary, principles and guidance for implementation' are used wherever possible when defining the goals, principles and relevant CE concepts for the CE policy. This will ensure coherence throughout the process and the CE policy itself. Several individuals from different backgrounds will be involved in identifying the problem, gathering evidence and conducting research, identifying policy options and drafting the policy document. Using standardised vocabulary and concepts will facilitate discussions and the decision-making process.

The formulation of goals and solutions is preceded by research and analysis of the current situation, available resources, potential solutions and policy options. When it comes to an innovative approach such as the circular economy, it is particularly important to consider developments, solutions and experiences from other economies as part of the analysis. Domestic QI actors can access QI solutions that are being developed or have already been implemented to support the circular economy in other economies through their peers and the regional and global QI networks.

In general, a team comprising representatives from different institutions is established to formulate a CE policy, ensuring a broader perspective and approach, as well as, securing the buy-in of critical stakeholders. To ensure that QI contributes to CE policy goals and priorities, it is recommended that QI actors should be involved in the CE formulation process from the outset.

Best Practices from Peru:
The Peruvian Institute of Quality (INACAL) has extensive experience in participating in the formulation and implementation of public policies and sectoral plans. These include the Competitiveness and Productivity Policy, the Industrial Development Policy, the Science, Technology and Innovation Policy, the Strategic Development Plan for Peru (PEDN), the Competitiveness and Productivity Enhancement Plan, the Cocoa Value Chain Development Plan in Peru,the Peruvian Coffee Action Plan and the Handicrafts Strategic Plan in Peru (PENDAR). INACAL also participates in CE platforms and regulatory initiatives such as the Circular Economy Coalition in Peru (CNEC), the Technical Multisectoral Commission on Single-Use Plastics Management and the Peruvian Circular Economy Platform Task Force.
Consequently, INACAL has participated in CE policies such as the Circular Economy Roadmap for Peru to 2030, the CE Roadmap for the Industrial Sector and the CE Roadmap for the Agricultural Sector.
(extracted from Gonzales, S. et al. (2025))

By providing first-hand information on existing QI capacities and the need to further develop these capacities, QI actors can influence the formulation of CE policies and ensure an adequate QI response during their implementation. The development of QI capacities should be incorporated into CE policy action lines. Furthermore, involving QI actors in the process makes them better prepared to support CE policies. For example, they can activate their regional and international networks to accelerate the development of CE-relevant QI services. Acknowledging QI as an enabler of CE policies will encourage the participation of QI stakeholders and facilitate the use of QI to support the development, implementation and evaluation of CE policies.

CE policy strategies, such as incentives and gradualism, also require well-defined, coherent and transparent criteria. A gradual approach is necessary when transitioning to a circular economy in stages. ISO 59000 standards provide a sound basis for developing differentiated criteria.

Moreover, stakeholder consultation will be more effective if stakeholders are well oriented by a consistent vocabulary and set of concepts in the proposed policy, based on ISO 59004. This enables them to focus on the expected changes, benefits and risks of the policy, allowing them to make an informed decision.

During the implementation of CE policies, QI is considered essential for supporting the implementation of policy priorities, strategic lines and actions:

- Promoting cooperation between public and private actors in different sectors can help to integrate circular value chains and networks, create industrial symbiosis, and utilise opportunities for international cooperation. Standardisation, including the ISO 59000 series, can establish a common language. QI can also align and harmonise concepts related to materials, processes, conformity assessment procedures and even measurement units across different sectors. This eases interaction, interoperation and cooperation between diverse actors.

Best Practices from China:
The Circular Economy Promotion Law in China states that:

- The standardisation authority under the "State Council", in conjunction with the comprehensive administrative departments for circular economy development, environmental protection and other relevant departments, shall establish and improve the circular economy standards system and formulate and enhance standards for energy conservation, water conservation, material savings, waste reuse and resource recovery.
- Recycled electronic and electrical products that are repaired and resold must comply with reuse product standards and be clearly labelled as such.
- The quality of remanufactured and refurbished products sold must meet domestic standards and be clearly labeled as such.
- The economy shall establish and improve product resource consumption labelling systems, such as energy efficiency labels.
- Industrial enterprises shall strengthen water-use metering management, equip themselves with qualified water metering instruments and establish systems for water consumption statistics and usage analysis.

(extracted from Pengcheng, L. (2025))

- Disseminate the use of Circular Economy instruments such as Extended Producer Responsibility EPR, Life-Cycle Assessment, Circular Design, Carbon Footprint and develop new instruments such as the Digital Product Passport. Through standardisation and in general QI, the use and the recognition of these instruments and their results could be promoted. If international recognition is required, standardisation should be based on ISO and IEC standards.

- Promote the CE throughout an economy's territory: standards are key to ensuring the dissemination of CE concepts, technologies and solutions throughout a territory. They are also essential to ensuring the standardisation level needed throughout an economy's territory, while allowing flexibility to adapt to local realities. If necessary, standardisation could also incorporate local specifics into the standards. The CE policy should also promote the accessibility of QI capacities throughout the territory to ensure that rural areas can also benefit from the Circular Economy.

- Implement Circular Economy awareness campaigns for leaders (in business, government, non-profits and the media), as well as consumers. Standardised Circular Economy concepts are essential for effective awareness campaigns.

Best Practices from Mexico:
The Mexican Metrology Centre, together with the Accreditation Body, standardisation institutions, and Circular Economy stakeholders from the public and private sector, created and developed a platform called "Circularity with Quality". This platform facilitates collaboration and exchange between actors in the CE and QI to promote the use of QI in the transition towards a CE.
(extracted from Ortega, T. et al (2025))

- Create and develop knowledge, expertise and skills in the CE: Firstly, the domestic QI institutions should be seen as knowledge hubs with access to the knowledge of the regional and global QI networks they are embedded in. Secondly, the standards and laboratory capacity offered by QI could strengthen capacity-building programmes for technical professionals and the wider workforce. Thirdly, CE concepts based on the ISO 59000 series could enhance capacity-building programmes for trainers and educators, as well as the curricula of primary, secondary and tertiary education on the Circular Economy.

- Implement and promote certification and labelling schemes for circular materials, products, systems and organisations. These schemes require defined requirements and conformity assessment procedures. If these are based on QI — i.e. on standards, accredited conformity assessment services, and traceable, reliable measurements — then the harmonisation and recognition of certificates and labels is more assured. This includes the international level.

Best Practices from China:
There is a well-developed inventory of standards for the circular economy, energy conservation, and the energy labelling programme. This includes 314 domestic energy conservation standards, 58 mandatory energy efficiency standards, and China's mandatory energy labelling programme, which covers 45 product and equipment categories across five major sectors: household appliances; refrigeration and air conditioning; lighting appliances; electronic information; and industrial equipment. More than 26,000 manufacturing enterprises registered over 4 million product models in total, using more than 2,000 accredited testing laboratories, under the energy labelling programme.
(extracted from Pengcheng, L. (2025))

Best Practices from Mexico:
The Mexican Metrology Centre CENAM provides and develops measurement traceability for testing the biodegradability and recycled content of plastics through the use of Standard Reference Materials (SRM). SRM are also used for the metrological characterisation and standardisation and qualification of measurement processes.
CENAM is also developing measurement reference systems for emerging contaminants, such as microplastics.
(extracted from Ortega, T. et al (2025))

Best Practices from Thailand:
The project, 'Development and Implementation of the Circular Economy Management System (CEMS) Auditing and Certification Scheme in Thailand', was carried out by various stakeholders, including the Thai Industrial Standards Institute (TISI). The project established a clear and comprehensive auditing and certification framework for CE management within organisations. This framework ensures domestic and international recognition by aligning with established standards (TCAS No. 2, Part 2-2564 (2021): Circular Economy Management System for Organisations, Part 2: Requirements). This approach fosters confidence among stakeholders by providing reliable certification and promoting consistent CE practices across multiple industries. As a result of the project, 26 pilot companies were certified under the TCAS No. 2 Part 2–2564 standard; over 500 auditors and assessors were trained to strengthen the competitiveness of the private sector; and a public registry of certified professionals was created to promote the circular economy across industries.
(extracted from Punmatharith, T. (2025))

- Disseminate good circular practices: standardisation is one approach to disseminating effective good practices more widely, including those involving circular technologies and digital solutions, alongside other methods such as patents. For some of these practices, access to further QI services, such as laboratories and accredited conformity assessment, is essential for successful implementation.

Best Practices from Peru:
INACAL has formulated and implemented international cooperation projects that promote the development and the use of QI in CE. These projects are:
- Promoting Quality Infrastructure for the Circular Economy in Latin America and the Caribbean funded by the German government and implemented by the Physikalisch-Technische Bundesanstalt (PTB), Germany and the Quality Infrastructure Council of the Americas.
- Implementing Circular Economy Strategies to Reduce Pollution in the Urban Productive Sector of Metropolitan Lima funded by the German Government and implemented by GIZ, Germany.
- Promoting the CE in Peru's tourism and manufacturing sectors through capacity-building in quality infrastructure, funded by the Spanish government and implemented by AECID, Spain.

(extracted from Gonzales, S. et al (2025))

- Develop traceability and reporting systems for resources, materials and products. Standards for these systems should be developed to ensure harmonisation between sectors, territorial connectivity and interoperability, even at international level.

- Develop information systems on the properties and performance of recovered materials, and to manage and monitor stocks, flows and circularity indicators. Standardised data and metadata formats, as well as traceable and reliable testing and measurement results, are essential to ensure the transparency, consistency and interoperability of data and information, and to have trustworthy information systems, especially when these systems should operate based on digital technologies and solutions. QI services are also supportive for digitalised information systems in complying with the FAIR principles for data (Findable, Accessible, Interoperable and Reusable).

- Strengthen the circular R&D&I ecosystem, including accelerating circular innovations for advanced materials development and circular business models. QI institutions are knowledge hubs with access to international knowledge and state-of-the-art technology through their regional and global QI Networks. QI institutions offers internationally recognised metrology and testing laboratory capacities, and, together with standardisation, can disseminate and scale up innovative circular solutions.

Best Practices from China:
The Circular Economy standardisation pilot programme involved 169 organisations, 100 of which have completed and had their pilot projects accepted to date. The participating organisations comprise enterprises, industrial parks and cities. This initiative has effectively enhanced the circular performance of the organisations involved, strengthened their green competitiveness, and delivered significant economic, environmental, and social benefits. For example, a holistic standardisation approach was applied to specific circular industrial chains to develop a series of standards for core products and industrial chains. A series of standards for the circular economy in the rice processing industry has been developed, achieving standardised, precision-based, high-value product development in companies. In an industrial park, a system of standards enables the closed-loop recovery of recycled copper, gold, and etching solutions across manufacturing processes.
(extracted from Pengcheng, L. (2025))

Best Practices from Thailand:
Through the Promotion of Sustainable Resource Management for Circular Economy with Industrial Estate Authority of Thailand (IEAT) Circular Economy Awards a total of 27 enterprises participated in the I-EA-T Circular Economy Awards, competing in two categories:
- Circular Economy Product – recognising market-ready products designed and manufactured based on CE principles and
- Circular Economy Prototype – acknowledging innovative products in the research and development phase.

To complement the awards, the program also organises seminars addressing regulatory compliance and ISO standards related to Circular Economy. These knowledge-sharing sessions support participating enterprises in aligning their operations with international sustainability frameworks and strengthening their readiness for future circular economy transitions.
Awarded innovations have included high-quality recycled aluminium coils, an HCl acid recycling process, recycled concrete garden blocks, 100% recycled PET beverages and recycled rubber flooring tiles made from condom production waste.
(extracted from Punmatharith, T. (2025))

- Mobilise resources and create incentives for public and private investments. The use of standardised vocabulary and concepts enables transparent, comparable and complementary financial instruments and incentive programs. Accredited certification and conformity assessment are key to evaluating compliance with the defined eligibility criteria and demonstrating the expected achievements, and to maintaining an efficient and trustworthy system.

Best Practices from China:
The *Value-Added Tax Preferential Catalogue for Comprehensive Resource Utilisation Products and Services (2022 Edition)* refers to domestic standards such as GB/T 40009-2021 Technical specification of waste tyre/rubber pyrolysis and GB/T 36577-2018 Classification and code of waste glass.

In addition, the Policy for Green and Low-Carbon Transition Finance's 2024 Edition of the Guidance Catalogue for Green and Low-Carbon Transition Industries clarifies the specific scope, latest regulatory policies and standard requirements for the circular economy and other green transition sectors. The catalogue emphasises advanced technological leadership and prevents blind investment and low-level

redundant construction, while driving higher-quality development across relevant industries. This guidance directly references 19 standards.
(extracted from Pengcheng, L. (2025))

- Increase resource use efficiency and material productivity. Standardisation and the ability to carry out reliable testing and accurate measurements are essential for improving efficiency and productivity.

Best Practices from Mexico:
The Mexican Metrology Centre (CENAM) adapted its well-established MESURA methodology for analysing and continuously improving enterprises to meet the needs of the circular economy. This addresses resource efficiency and the monitoring of stocks and flows by improving measurement systems, processes and equipment. The MESURA methodology provides a comprehensive metrological analysis of the quality, quantity and flow of resources, materials and products, as well as critical measurements, tolerances and uncertainties. Accurate measurements allow for the calculation of material, energy and water consumption balances, the identification of inefficiencies in resources and materials, and the evaluation of proposed solutions and any improvements, both qualitatively and quantitatively.
CENAM also maintains Mexico's primary standard facilities for measuring liquid flow and offers calibration services for liquid flow. Accurate water flow and quality measurements, together with the corresponding Standard Reference Materials, are essential for reducing water consumption, increasing water use efficiency, and promoting water reuse.
(extracted from Ortega, T. et al (2025))

- Promote the development and provision of high-quality and competitive products and services, characterised by durability, repairability, reusability, low carbon performance and/or sustainability. Standards are needed to establish the criteria and measurements and conformity assessment procedures to help producers and service providers meet these criteria. This will also enable them to demonstrate fulfilment of the criteria in domestic and international markets.

- Ensure and promote well-functioning markets for high-quality recovered materials, such as minerals, plastics, organics, construction materials, and reusable product and packaging components, as well as for competitive circular goods. These markets require reliable certificates and conformity assessment results that evaluate the properties and performance of materials and goods based on standards, regardless of their origin or the amount of recovered material they contain.

Best Practices from China:
The General Office of the State Council recommended for accelerating the establishment of a waste recycling and utilisation system the following:
- Improve the recycled materials standard system;
- Establish a certification framework for recycled materials through research and promote international mutual recognition;
- Conduct studies on carbon footprint accounting standards and methodologies for key recycled materials;
- Develop green government procurement criteria to incorporate qualified recycled materials and products;
- Align with the extended producer responsibility system and implement an action plan to upgrade recycled material applications, guiding manufacturers (e.g. of automobiles and electronic products) to increase usage ratios;
- Encourage enterprises to include the adoption of recycled materials in their corporate social responsibility (CSR) reporting.

(extracted from Pengcheng, L. (2025))

- Promote the development of efficient, innovative and competitive circular value chains and networks by implementing standards. This would make interaction within the circular value chains and networks more efficient. This means that all the actors “speak the same language”, which eases the communication and understanding. Trustworthy and recognised certificates and conformity assessment results facilitate the efficient exchange of materials and goods, including across global value chains.

- Maintain and increase the participation of domestic producers in international trade, while trading partners implement their transition to the Circular Economy. Some global value chains are also seeking to contribute to Circular Economy. Domestic standardisation based on international standards as well as, measurements

and conformity assessment with international recognition, are key to maintaining and increasing the competitiveness of the domestic producers.

As shown above, QI is essential for supporting the implementation of the different policy priorities, strategic lines and actions. If QI needs to be further developed to achieve the expected impact, the CE policy should prioritise the development of QI itself. This has to be included as a policy priority, strategic line and/or action. The development of new standards, of new metrological and testing laboratory capabilities, as well as conformity assessment and accreditation schemes, requires resources and time that must be allocated and considered in the Circular Economy policy.

Best Practices from China:
The following objectives are stated in the chapter on the Circular Economy Development Plan of the 14th Five-Year Plan:

- Improve the circular economy standard system;
- Establish sound standards and specifications for green design, clean production, remanufacturing, recycled materials, green packaging and waste-utilising building materials;
- Advance the domestic circular economy standardisation pilot program.

Furthermore, the National Standardisation Development Outline:

- consolidates the foundation for green production standards;
- establishes and improves clean production standards; and
- continuously refines standards for the recycling of resources, eco-design of products, green packaging, green supply chains and the comprehensive utilisation of industrial waste.

(extracted from Pengcheng, L. (2025))

Best Practices from Peru:
oth QI and INACAL are used and referenced in the Circular Economy Roadmap for Peru:

- The Circular Economy Roadmap for Peru to 2030 uses ISO 59000 terminology and concepts. One of the 35 key actions it defines is to “Promote the development and implementation of quality infrastructure services for Circular Economy (CE) at the domestic level” (AE1.9), with INACAL as the lead agency. The roadmap includes a QI-related indicator (Number of quality infrastructure services available related to Circular Economy) and QI-related milestones (six standards from the ISO 59000 family (ISO/TC 323 Circular Economy) and related standards, and dissemination of Peruvian Technical Standards (NTP) adopted from the ISO 59000 family).
- In the CE Roadmap for the Industrial Sector, the vocabulary and concepts of the ISO 59004:2024 are applied and the development and adoption of CE-related quality standards are defined as an Action line. Furthermore, the following strategic action lines have been defined, with INACAL being one of the responsible entities: “Develop technical standards based on the ISO 59000 series and other related standards on CE” (AE 1.6); “Design and implement training programmes on CE and quality standards to incorporate the CE into the Peruvian Quality Infrastructure System” (AE 1.7); “Design and implement an accreditation model for CE in the Peruvian Quality Infrastructure System through Conformity Assessment Bodies, both public and private” (AE 1.8); and “Promote circular economy certification within the Peruvian Quality Infrastructure System through public and private Conformity Assessment Bodies”.
- The CE Roadmap for the Agricultural Sector also uses the vocabulary and concepts of the ISO 59004:2024. It elaborates on quality infrastructure interventions across the value chain of the agrarian and irrigation sectors to support the transition towards a circular economy in these sectors.

However, it is also challenging and not best practice, that the INACAL is not explicitly considered in the key actions of the Circular Economy Roadmap for Peru to 2030, in which QI could support the successful implementation of the Roadmap. These include: Funds to promote research and development in CE; Development of a public investment portfolio in CE; Technical assistance programmes to promote circular businesses; Promotion of CE as part of business and bio-business strategies; Promotion of the integration of CE into public procurement; Development of tools to encourage sustainable consumption among citizens; Regional development and innovation strategies integrating CE; and Development of a regional public investment portfolio in CE.
(extracted from Gonzales, S. et al (2025))

In the monitoring and evaluation stage of Circular Economy, ISO and other standards are useful for ensuring the use of state-of-the-art, and harmonised methodologies for monitoring and evaluating the diverse impacts that a Circular Economy policies could have. When formulating the indicators to establish the monitoring system

and gathering the information to evaluate the implementation of Circular Economy policy, the ISO standards should be considered. The ISO 14000 standards family, in particular, contains standards for quantifying and reporting e.g. greenhouse emissions (ISO 14064 series) and life-cycle assessment (ISO 14040 / ISO 14044).

Furthermore, ISO 59020:2024 “Circular economy – Measuring and assessing circularity performance” provides a solid foundation for a consistent and harmonised approach to assessing the circularity performance of systems, organisations, products and materials.

For the preparedness of QI to support the CE policy formulation, implementation and evaluation the following recommendations are made.

QI institutions could improve their understanding of the needs arising from the transition to a Circular Economy and how QI can support this transition. It is important to recognise that the needs of the CE are multifaceted and diverse. The six main needs and actions identified can help organise understanding and capacity building, as well as communication and interaction with CE actors, to identify the necessary QI response:

a. Using standardised Circular Economy concepts.
b. Ensuring enabling policies and cooperation.
c. Promoting a culture of responsible production and consumption.
d. Ensuring trustworthy data and information systems.
e. Enabling impactful research, development and innovation (R&D&I).
f. Ensuring competitive circular materials, products and services

QI institutions could prepare to address the upcoming CE needs more effectively. Possible short- and medium-term actions are:

- Include the CE as a relevant topic in the institutional strategies.
- Promote awareness and capacity building on CE in QI institutions.
- Get in contact with the CE community and try to be included in their coordination and communication platforms.
- Participate in the ISO/TC 323 and adopt the ISO 59000 standards.
- Establish a CE TC and ensure the participation of key CE actors from the public and private sector.
- Develop step by step a CE perspective as a standards approach in your institution, e.g. in the Technical Committees.
- Analyse the existing and upcoming CE needs, ideally together with CE actors.
- Identify already existing QI services that can quickly respond to the identified CE needs.
- Define the new QI services to be developed, ideally together with CE actors.
- Participate as a partner in research, technology and innovation projects.

The ISO 59000 series is a good basis for QI institutions that are beginning to support CE. Adopting these standards will enable QI institutions to address the actions of using standardised circular economy concepts, ensuring enabling policies and cooperation, and promoting a culture of responsible production and consumption. Almost all CE policies contain a section that defines the circular economy and its related concepts and principles. The ISO 59000 series provides an ideal foundation for ensuring state-of-the-art, internationally harmonised circular economy definitions and concepts.
Conversely, CE stakeholders must use and encourage the use of the ISO 59000 series to ensure standardised concepts are employed by all relevant CE stakeholders. This will ensure that different CE initiatives and policies use harmonised concepts and terminology, facilitating complementarity between them within their own economies and internationally.

Another area of opportunity ('low-hanging fruit') concerns QI needs related to frequently used CE instruments, such as Extended Producer Responsibility, Life-Cycle Assessment, and Eco-Design/Circular Design. QI institutions should communicate the role of QI for these instruments and develop the provision of corresponding standards, accredited certification schemes, and metrology services.

In the medium term, important future and emerging CE instruments should be identified. The focus should then be on those that will require QI services, such as the Digital Product Passport (DPP). The DPP requires standardised data and metadata formats, as well as reliable, interoperable data. Accessing state-of-the-art knowledge on these emerging solutions through regional and global QI Networks will help QI institutions to become a knowledge hub in their respective economies.

Best Practices from China:
China has already developed the following standards:

- 11 basic and general standards for the circulation and use of resources;
- 19 standards for classification, grading and recycling of recyclable resources;
- 12 standards for waste classification and comprehensive utilisation;
- 11 standards for Circular Economy standards for industrial parks;
- four standards for Circular Economy evaluation;
- four standards for technical guidelines for Circular Economy practices.

(extracted from Pengcheng, L. (2025))

Best Practices from Peru:
At an international level, the Peruvian Institute of Quality (INACAL) is participating member of the ISO/TC 323 Circular Economy, is active involve in the WG and has adopted already the ISO 59004:2024, ISO 59010:2024 and ISO 59020:2024. INACAL also leads the ISO Spanish Translation Task Force on Circular Economy.
At a domestic level, it has established the Peruvian Mirrow Technical Committee CTN 160 on Circular Economy, which is responsible for organising the standardisation work, including the adoption of the ISO 59000 series standards; for organising and representing the Peruvian interests at the ISO/TC 323 Circular Economy; developing further domestic Circular Economy standards; and for promoting Circular Economy through standardisation.
INACAL has developed the Peruvian guide "GP 127:2021 CIRCULAR ECONOMY – Framework for implementing circular economy principles in organisations (1st edition)". Other circular economy-related standards include: NTP-ISO 14067:2019 Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification (1st edition); NTP-ISO 18605:2020 Packaging and the environment – Energy recovery (1st edition); NTP-ISO 14006:2021 Environmental management systems – Guidelines for incorporating eco-design (1st edition); NTP-ISO 20400:2022; Sustainable procurement – Guidance (1st edition); and ASP-IWA 42:2022 Guidance on achieving net zero (1st edition).
INACAL which also holds the Peruvian Accreditation Body are accrediting entities for verifying / validating Green House Gas inventories and testing laboratories for wastewater.
(extracted from Gonzales, S. et al (2025))

Best Practices from Thailand:
Through Thailand's CE Action Plan and Standardisation Framework the following domestic standards have been developed:

- TCAS 2–2562:2019 Framework for implementing the principles of the circular economy in organisations – guide
- TCAS 2 Part 2–2564:2021 Circular economy management system for organisation Part 2: Requirements
- TCAS 9–2565: 2022 Plastics recycling traceability and assessment of conformity and recycled content: Requirement
- TCAS 10–2565:2022 Industrial waste management towards zero landfill: requirement

TISI has also adopted the ISO 59004:2024, ISO 59010:2024 and ISO 59020:2024 standards.
The "Development and performance enhancement of Circular Economy Management System for industrial sector (2021-2025)" project was implemented by the Department of Primary Industries and Mines, the Ministry of Industry, the Management System Certification Institute and the Thai Industrial Standards Institute (TISI). This project is a best practice example, as it establishes a domestically standardised and aligned framework for circular economy implementation in the industrial sector. The initiative combines certified CE management systems, a web-based assessment platform and expert consulting services to build organisational capacity. By linking assessment results to high-level industry awards, the initiative promotes continuous improvement and accelerates CE adoption on a large scale. It is supported by four key domestic standards issued by TISI:

- TCAS 2–2562 (CE implementation guide),
- TCAS 2 Part 2–2564 (CEMS requirements),
- TCAS 9–2565 (Plastics recycling traceability) and
- TCAS 10–2565 (Zero landfill waste management).

It provides a structured framework and web-based self-assessment platform for evaluating and improving CE performance. In-depth consulting further supports organisational implementation. Assessment outcomes are linked to the Circular Economy Industry Excellence Awards, which incentivise sustainable practices and enhance industrial competitiveness.
(extracted from Punmatharith, T. (2025))

6. Conclusions and recommendations

The following presents conclusions and recommendations regarding CE policies, the use of QI, and its impact, and how to overcome obstacles.

6.1. Conclusions

In most participating economies, the transition to a Circular Economy is being addressed through Circular Economy policies. This is particularly evident at the domestic level, where Circular Economy roadmaps and policy documents are being developed and implemented. The majority of these policies date back to recent years. Japan's "1999 Circular Economy Vision" is arguably the region's first comprehensive CE policy.

The Circular Economy is still at an emerging stage, with numerous developments occurring at various levels. These include developing a shared understanding of circularity and the Circular Economy itself. Consequently, the needs of the Circular Economy are still evolving and not well defined, which makes it particularly challenging for QI to develop the adequate responses and services.

Conclusions on public policies and the use of QI to support CE policies

Three types of QI use can be identified when analysing the CE policy documents. The first is direct use, for example through referencing ISO 59000 standards and defining actions to develop specific standards and certification scopes. Secondly, indirect use, e.g. promoting CE instruments based on QI. Thirdly, QI acts as an enabler of CE actions.

Regarding the direct use of QI in CE policies, it was found that QI components and QI services are not commonly or explicitly used elements in QI policies. For example, in fewer than half of the considered CE policies, a quotation or reference to ISO 59000 has been reported. In this regard, standardisation is also more prevalent than metrology.

With regard to indirect QI use, it can be said that more than half of the reported CE policies utilise CE instruments, such as Extended Producer Responsibility, Life-Cycle Assessment and Eco-Design/Circular Design. QI contributes to these instruments, particularly through standards, accredited certification schemes and reliable measurement results.
Furthermore, future CE instruments based on new technologies, such as the Digital Product Passport, will require QI services, including standardising data and metadata formats, and ensuring data and information are interoperable and reliable.

When considering QI as an enabler of QI actions, it must be acknowledged that CE's needs are multifaceted, diverse and highly dynamic. While this situation poses challenges for QI, it also presents opportunities. This study reinforced the idea that the following actions, in which QI can be seen as an enabler, could help address relevant CE policy initiatives and challenges:

a. Using standardised Circular Economy concepts.
b. Ensuring enabling policies and cooperation.
c. Promoting a culture of responsible production and consumption.
d. Ensuring trustworthy data and information systems.
e. Enabling impactful research, development and innovation (R&D&I).
f. Ensuring competitive circular materials, products and services.

QI is indispensable for these actions and can therefore be considered an enabler of the Circular Economy.

Conclusions on the impact of QI on Circular Economy policies (regarding effectiveness, efficiency and sustainability)

As the Circular Economy is still at an emerging stage, CE policies are not so widespread, and those that do exist are relatively new. Therefore, a thorough impact assessment of the Circular Economy policies itself, as well as of QI on Circular Economy policies, is not possible for this study at this time.

The personal assessment of the impacts of the CE policies from the survey suggested that most CE policies generate at least some positive economic, environmental and social impacts, the sustainability of which is partially assured.

Regarding the impact of QI on circular economy policies, particularly with regard to effectiveness, efficiency and sustainability, the following more detailed hypotheses are produced by this study:

- The use of standardised vocabulary and concepts based on the ISO 59000 series facilitates and increases the efficiency of the multistakeholder processes involved in formulating, implementing and evaluating CE policies.
- The use of circular standards and of internationally recognised measurement and conformity assessment increases the efficiency and effectiveness of cooperation, interaction and the exchange of materials and goods within circular value chains and networks.
- Data and information systems that adhere to the FAIR principles and are based on standards for data and metadata formats, on traceable measurements, and on results and certificates issued by accredited laboratories and conformity assessment bodies, ensure interoperability and efficiency in the exchange and management of the information within circular value chains and networks.
- The circular R&D&I ecosystem that uses QI services and integrates QI institutions is more impactful and effective. For example: using metrology to ensure the accuracy and comparability of measurements when evaluating the performance of recycled materials and new circular products; using standardisation to disseminate and effectively scale up circular solutions; and using accredited conformity assessment to build confidence in new circular products in markets.
- The use of QI services ensures the competitiveness of new circular materials and products, thus ensuring the sustainability of the circular developments.

These hypotheses need to be proven in future studies. These studies could analyse either individual CE policies as case studies, or CE policies collectively based on surveys. For the latter approach, it is important to wait until there are enough implemented CE policies available.

Conclusions on the obstacles and challenges to strengthening the use of QI services in support of CE policies.

QI institutions are not automatically involved in the formulation and implementation of CE policies. With regard to QI components, standardisation bodies are more actively engaged in CE processes than accreditation bodies and metrology institutes.

QI institutions' weak participation in CE policy processes leads to QI being absent or underused in CE policies, preventing QI from providing the support necessary for the successful implementation of the CE policies.

There are different reasons for the non-inclusion of QI in CE policies. On the one hand, not all CE stakeholders recognise the value of QI in successfully implementing their CE initiatives, and consequently, the interaction with the QI community is absent or weak.

On the other hand, some QI actors lack CE expertise, meaning QI institutions are unable to respond fully to CE needs. This could result in QI institutions being perceived as uninteresting partners and allies for CE initiatives.

The reasons identified for QI institutions' weak preparedness to support CE policies are as follows:
- when CE is not relevant to the institutional strategy of QI;
- when QI institutions are unaware of the CE needs;
- when standardisation bodies do not participate in ISO/TC 323, have not established a technical committee on CE, have not adopted ISO 59000 standards and have not developed additional circular standards.
- when metrology institutes, accreditation bodies, and conformity assessment bodies have not mapped CE needs against the QI services on offer and existing QI development gaps;
- when QI institutions are unable to keep pace with the growing demand for QI services for CE.

6.2. Recommendations for overcoming the barriers and promoting the use of QI in CE policies

CE actors need to recognise and understand that QI is an important enabler of CE implementation. Consequently, they should integrate QI institutions into the CE policy formulation and implementation processes. CE actors should establish good communication channels with QI institutions to inform them of existing and emerging needs in a timely manner. The QI institutions can then understand the CE needs and respond to them. CE actors should bear in mind that developing new capacities takes time and could require

substantial human and financial resources. This is especially true in the case of metrology, where it could take years of development.

The ideal situation would be for CE and QI policies to be aligned, facilitating the efficient and effective use of resources to achieve “circularity with quality”.

The preparedness of QI institutions to serve the CE needs could be improved.

The importance of CE in QI institutions’ strategies could be enhanced. This is particularly true of accreditation bodies and metrology institutes. demand for metrological services is currently rather low, but it will increase substantially. Given that developing metrological capacities takes time, it would be wise to start now with a CE-based approach to capacity development in metrology. This is particularly pertinent given that “weak QI institutional and technical capacities to keep pace with CE needs and innovation” was identified as one of the main challenges for QI institutions in supporting the implementation of CE policies.

Participation in ISO/TC 323 is essential for keeping up to date with international developments and discussions, as well as for contributing one's own perspectives and requirements to the international standardisation process. Although most standardisation bodies participate in ISO/TC 323, the survey indicates that only around half of the economies have adopted the ISO 59000 standards to date. A “Lack of internationally harmonised standards for CE (circular materials, products, processes and eco-design)” was also identified as one of the main challenges for QI in supporting the implementation of CE policies.

The recommendations on how to promote the use of QI in CE policies are described in terms of the three stages of formulation, implementation and evaluation.

- The first stage involves using the vocabulary, principles and implementation guidance defined in ISO 59004:2024 'Circular Economy – Vocabulary, principles and guidance for implementation' when defining the CE policy's goals, principles and relevant concepts, and involving QI stakeholders in the CE policy process from the outset.
- It describes how QI can support the second stage with the implementation of CE policy priorities, strategic directions and actions. These include promoting cooperation between public and private sector actors, disseminating the use of CE instruments and good circular practices, implementing CE awareness campaigns, and developing CE knowledge, expertise and skills. Other actions include implementing and promoting circular certification and labelling schemes, developing traceability and reporting systems, and creating information systems. QI can strengthen the circular R&D&I ecosystem and support the mobilisation of resources, the creation of incentives for public and private investment, the increase resource use efficiency and material productivity, and the development and provision of high-quality, competitive products and services. It can also ensure well-functioning markets for recovered materials and foster efficiently organised, innovative and competitive circular value chains and networks. This can maintain and increase the participation of domestic producers in international trade.
- The use of existing ISO and other standards to define indicators and methodologies ensures an effective monitoring and evaluation of CE policy implementation.

6.3. Recommendations for SCSC and its members

Given that QI is an important enabler of CE and CE is increasingly requesting QI services, the SCSC should continue to implement CE-related projects. The first step is to raise awareness of the importance of QI engaging in and with CE initiatives, and the second is to support the coordinated development of QI responses, including developing the capabilities of new SCSC members. Participants at the Project Workshop in Incheon on 3 August 2025 provided various recommendations and feedback that can be summarised as follows:

- Organise a regional platform for APEC members to exchange ideas and collaborate on QI for Circular Economy (e.g. an APEC Working Group or a Task Force). This platform could address the following needs expressed needs by participants:
    - To communicate the conclusions and outcomes of the workshop and the project;
    - To disseminate general information and knowledge about QI4CE, e.g. like through the workshop;
    - To encourage more APEC economies to engage with the QI4CE topic;
    - To share relevant QI developments for the Circular Economy;
    - To track the different QI4CE initiatives in the APEC economies;
    - To identify common needs and focus areas and if appropriate to make use of economies of scale;
    - To identify regional needs and explore solutions that go beyond domestic policies;

    - To facilitate the collaboration between QI institutions to address the CE needs at the domestic and regional levels;
    - To harmonise standards on CE, especially on the use of QI;
    - To develop regional guidelines to address specific regional needs;
    - To identify more use cases and best practices;
    - To organise the collaboration between different APEC institutions;
    - To develop regional data standards to encourage data sharing and facilitate the consolidation of data needs across the region, avoiding multiple engagements;
    - To organise collective actions.

- The platform could be supported by a web-based QI4CE application, which would provide QI institutions with information and guidelines to help them engage with QI4CE. The platform will allow the creation of a shared database that can be used by all members.

- Through the platform a regional capacity-building programme can be organised to develop CE expertise in QI institutions, as well as metrology and testing laboratory capacities can be organised (APEC QI4CE Academy). To facilitate the capacity building, a framework could be developed to categorise the preparedness of QI in the economies. Furthermore, the regional QI service providers need to be identified and the sharing of laboratory facilities needs to be explored.

- The exchange of information on QI4CE could also be promoted beyond APEC, for example within in ASEAN or the international metrology community.

Last but not least, support is needed for the QI ecosystem, including financing, research and development, because weak QIs could be overwhelmed by the expected response. When designing programmes offering subsidies, funds and incentives to promote the transition to a circular economy, it should be evaluated whether QI will be able to develop the necessary capacities and services in parallel. Investing some of these resources in QI developments may be necessary.

Together with the best practices reported and presented in this study, these recommendations will hopefully contribute to increased and improved use of QI in circular economy policies and consequently ensure the transition to a circular economy.

Appendixes

Appendix 1: Information about the participating institutions

Table A: Participating institutions			N=21
#	Economy	Institution	CE or QI actor
1	Australia - AUS	Standards Australia	QI
2	Chile - CHL	INN	QI
3	Chile - CHL	MME	CE
4	Indonesia - INA	BSN	QI
5	Indonesia - INA	n.a.	CE
6	Japan - JPN	METI	QI
7	Malaysia - MAS	KPKT	CE
8	Mexico - MEX	CENAM	QI
9	Mexico - MEX	Normex	QI
10	New Zealand - NZ	MSL	QI
11	People's Republic of China - PRC	CNIS	QI
12	Peru - PE	INACAL-DA	QI
13	Peru - PE	INACAL-DM	QI
14	Peru - PE	INACAL-DN	QI
15	Peru - PE	MIDAGRI	CE
16	Peru - PE	MINAM	CE
17	Peru - PE	PRODUCE	CE
18	The Philippines - PH	DTI-BPS	QI
19	Thailand - THA	Get Solutions	CE
20	Thailand - THA	NIMT	QI
21	Thailand - THA	TISI	QI

Note: VMI, Viet Nam informed that they will not be able to participate in the survey at this time (19 June 2025)
Source: Own elaboration based on survey results.

Appendix 2: Characterisation of Circular Economy policies and assessing their impacts

Table A: Characterisation of the reported CE policies							n=18
#	Economy	CE policy	Year	CE policy type	Level of intervention	Scope of CE policy	Matureness level
1	AUS	Domestic Circular Economy Framework	2024	Strategy	Domestic level	Pure Circular Economy policy	Circular economy, 2nd Generation
2	CHL	Domestic Circular Economy Roadmap 2040	2020	Roadmap	Sectoral - public	Pure Circular Economy policy	Circular economy, 1st Generation
3	CHL				Domestic level		n.a.
4	PRC	The 14th Five-Year Plan for Circular Economy Development	2021	Plan	Domestic level	Pure Circular Economy policy	Circular economy, 2nd Generation
5	INA	Domestic Circular Economy Roadmap	2018	Strategic planning document and policy direction	Domestic level	Pure Circular Economy policy	Linear economy with waste management and recycling
6	INA	Domestic Circular Economy Roadmap	2021				
7	JPN	Circular Economy Vision 2020	before 2015	Strategy	Domestic level	Pure Circular Economy policy	Circular economy, 2nd Generation
8	MAS	Circular Economy Blueprint for Solid Waste in Malaysia (2025 - 2035)	2025 has already started	Plan	Domestic level	Waste management policies with Circular Economy approach	Circular economy, 2nd Generation
9	MEX	Mexico City Circular Economy Policy/Law (2023) and of other Mexican states	2023	Policy (in the narrower sense)	Regional or local level	Sustainable development policies with Circular Economy approach	Circular economy, 1st Generation
10	PE	Ley de Gestión Integral de Residuos Sólidos	2016	Policy (in the narrow sense)	Sectoral - public	Waste management policies with Circular Economy approach	I do not know
11	PE	Domestic Circular Economy Roadmap 2030	2025	Roadmap	Sectoral - public	Sustainable development policies with Circular Economy approach	Circular economy, 2nd Generation
12	PE						
13	PE					Pure Circular Economy policy	
14	PE	Roadmap of Circular Economy in the Agrarian Sector	beyond 2026	Roadmap	Sectoral - public	Sustainable development policies with Circular Economy approach	Circular economy, 1st Generation
15	PE	Industry and Trade Circular Economy Roadmap	2025	Roadmap	Sectoral - public	Industrial development policies with Circular Economy approach	Circular economy, 2nd Generation
16	PH	Extended Producer Responsibility Act of 2022	2023	Policy (in the narrower sense)	Domestic level	Waste management policies with Circular Economy approach	Circular economy, 1st Generation
17	THA	Bio-Circular-Green Economy Model	2021	Policy (in the narrower sense)	Domestic level	Sustainable development policies with Circular Economy approach	Circular economy, 2nd Generation
18	THA		2022				Linear economy with waste management and recycling
19	THA		n.a.				I do not know

Source: Own elaboration based on survey results.

Table B: Demonstrated positive economic, environmental and social impact?		N=18
Answer	# of mentions	Respondents
Yes, fully	3	PRC(4); THA(17); MEX(9)
Yes, partially	10	CHL(2); INA(5); INA(6); JPN(7); MAS(8); PE(10-12); PH (16); THA(19)
No, but it is expected	2	THA(18); PE(13)
No	1	PE(15)
I do not know	2	AUS(1); MEX(9)

Source: Own elaboration based on survey results.

Table C: Rating (0 to 5) level of real impact		N=16
Answer	# of mentions	Respondents
0 - No impact yet		
1 - very little positive impact		
2 - little positive impact	3	INA(6); MEX(9); THA (18)
3 - moderate positive impact	7	CHL(2); INA(5); JPN(7); MAS(8); PE(10-12)
4 - strong positive impact	1	THA(17)
5 - powerful positive impact	3	PRC(4); PE(13); THA (19)
I do not know	2	AUS(1); MEX(9)

Source: Own elaboration based on survey results.

Table D: Efficiency of the implementation of the CE policy		N=16
Answer	# of mentions	Respondents
Efficiency of CE policy implementation cannot yet be assessed.		
1 - CE policy implementation required or requires significantly more resources and time than expected	4	PRC(4); PE(10-12)
2 - CE policy implementation required or requires more resources and time than expected	2	INA(5); MEX(10)
3 - CE policy has been or is being implemented as expected	6	CHL(2); INA(6); JPN(7); MAS(8); THA(18-19)
4 - CE policy used or is using fewer resources and time than expected	1	THA(17)
5 - CE policy used or is using significantly fewer resources and time than expected	1	PE(13)
I do not know	2	AUS(1); MEX(9)

Source: Own elaboration based on survey results.

Table E: Sustainability of the impacts achieved by the CE policy		N=16
Answer	# of mentions	Respondents
Sustainability of impacts cannot yet be assessed	3	PE(10-12)
Sustainability of impacts is not assured	1	THA(18)
Sustainability of impacts is partly assured	7	PRC(4); INA(5); INA(6); JPN(7); MAS(8); MEX(10); THA(17)
Sustainability of impacts is assured	3	CHL(2); PE(13); THA(19)
I do not know	2	AUS(1); MEX(9)

Source: Own elaboration based on survey results.

Appendix 3: Best Practices reported

Overview

Scope of Best Practice	#	Title of the Best Practices	Economy-Institution
1. Promoting QI in CE Policies	1.1.	Incorporation of Peruvian Technical Standards (NTPs) and Technical Guides in the Development and Implementation of the Circular Economy Roadmap	PE-PRODUCE
2. Cooperation between QI and CE actors	2.1.	Integration of Green Product Certification with Domestic Standards	PRC-CNIS
	2.2.	Promote communication enhancement of government authorities and standardisation bodies with NMIs and R&D institutions.	MEX-CENAM
	2.3.	Promoting collaboration between quality institutions, regulatory bodies and productive sectors to boost the circular economy	MEX-NORMEX
	2.4.	Support different sectors, like tourism, manufacturers, agribusiness, to incorporate CE through standards.	PE-INACAL-DN
3. Dissemination of CE & QI knowledge	3.1.	Spread Knowledge (CE&QI) at regional level	PE-INACAL-DN
4. Establishment of Standardisation Technical Committee for Circular Economy	4.1.	Establish a domestic TC in EC	PE-INACAL-DN
	4.2.	Establishment of the Subcommittee on Circular Economy	THA-TISI
5. Standardisation for circularity in products, organisations and sectors	5.1.	Financing standardisation from various sources of resources.	CHL-MME
	5.2.	Develop standardisation plans linked to labour skills training plans and regulatory implementation plans.	CHL-MME
	5.3.	Advance specifically in a differentiated manner, with standardisation for different economic sectors.	CHL-MME
	5.4.	Development of SNI Standards for Recycled Plastic Materials	INA-TBC
	5.5.	Development of Standards and Guides focused on quality for the circular economy.	MEX-NORMEX
	5.6.	Peruvian technical standards specific to the circular economy	PE-MINAM
6. Metrology for circularity in products and organisations	6.1.	MESURA Methodology with circular perspective	MEX-CENAM
	6.2.	Development and adoption of metrological reference systems for the optimisation of conformity assessment practices.	MEX-CENAM
7. Conformity Assessment for CE	7.1.	Integration of Circular Economy Principles into Domestic Standardisation Priorities and Eco-Labelling Schemes	INA-BSN
	7.2.	Promoting conformity assessment as a key tool for building trust in circular products and processes	MEX-NORMEX
8. Promoting CE Management Systems in organisations	8.1.	Development and Implementation of the Circular Economy Management System (CEMS) Auditing and Certification Scheme in Thailand	THA-Get solutions
	8.2.	Development and performance enhancement of Circular Economy Management System for industrial sector (2021-2025)	THA-Get solutions
9. Promoting CE Awards with QI elements	9.1.	Promotion of Sustainable Resource Management for Circular Economy with I-EA-T Circular Economy Awards (2024)	THA-Get solutions
10. Strengthening QI	10.1	Enhance resourcing for Quality Infrastructure (QI) institutions	AUS-Standards AUS
11. General initiatives	11.1.	Establishment of Domestic Circular Economy Council (NCEC)	MAS-KPKT
	11.2.	Strategic campaign with retailers on the ban of single-use plastic bags	MAS-KPKT
	11.3.	Malaysia Clean-Up Day: Mega Cleaning Programme	MAS-KPKT
	11.4.	Implementation of traceability in agricultural supply chains.	PE-MIDAGRI
	11.5.	Compliance with standards and regulations in agriculture	PE-MIDAGRI
	11.6.	Application of the continuous process improvement approach in agriculture	PE-MIDAGRI

1. **Promoting QI in CE Policies (PE)**

1.1. Promoting QI in CE Policies	
Economy-Institution	PE-PRODUCE
Title	Incorporation of Peruvian Technical Standards (NTPs) and Technical Guides in the Development and Implementation of the Circular Economy Roadmap
Justification	Although the development of Peruvian Technical Standards (NTPs) is the responsibility of INACAL (the governing body of the Peruvian Quality System), the Ministry of Production (PRODUCE) applied NTPs and Technical Guides during the design and implementation of the Circular Economy Roadmap for the Manufacturing Industry and Trade to 2030. This practice enhanced the document's technical coherence, quality and practical relevance, enabling the effective integration of circular economy principles in the productive sector. It also supported alignment with quality infrastructure components and fostered systemic consistency in regulatory and planning efforts.
Actors involved	Ministry of Production (Ministerio de la Producción – PRODUCE): Lead institution in drafting and coordinating the Circular Economy Roadmap. National Institute of Quality (INACAL): Entity responsible for developing and approving NTPs and providing guidance on their application. Technical teams from sectoral public and private institutions: Participated in the application and testing of the standards. Industrial companies (pilot cases): Provided feedback for the operationalisation of circular economy principles using NTPs
General description	While the development of Peruvian Technical Standards (NTP) is the responsibility of INACAL, the Ministry of Production has considered the guidelines of these standards in the design and implementation of the Peruvian roadmap for the Circular Economy of the Manufacturing and Trade by 2030. The main standards used include: NTP-ISO 59010:2025: Guidelines for integrating circular economy into existing management systems. NTP-ISO 59004:2024: General framework for the circular economy. GP 127:2021: Framework for implementing circular economy principles in organisations. Additionally, a standardised technical format and editorial guide was developed to ensure consistency in the drafting of all documents. This practice improved technical coordination, facilitated monitoring and evaluation and aligned regulatory efforts with international quality standards.

2. **Cooperation between QI and CE actors (PRC; MEX; PE)**

2.1. Cooperation between QI and CE actors	
Economy-Institution	PRC-CNIS
Title	Integration of Green Product Certification with Domestic Standards
Justification	It links CE policy targets with market-access requirements, accelerating uptake by producers.
Actors involved	SAC, Ministry of Ecology and Environment, Certification and Accreditation Administration of China (CNCA), industrial associations.
General description	China's green product certification program uses standardised criteria (developed by SAC) to evaluate life-cycle performance, recycled content and low-carbon design of products. Certification enables producers to participate in green procurement schemes and CE pilot projects.
2.2. Cooperation between QI and CE actors	
Economy-Institution	MEX-CENAM
Title	Promote communication enhancement of government authorities and Standardisation bodies with NMIs and R&D institutions.
Justification	It is important for authorities and Standardisation bodies to understand the main technical and metrological aspects that are directly or intrinsically involved in the conformity assessment protocols for the standards, laws and regulations issued related to the circular economy.
Actors involved	Government (institutions of the different municipal, state and federal orders), NMIs, R&D institutions, Standardisation bodies.
General description	The NMIs and R&D need to share and disseminate information, reliable, useful, without conflict of interest, for the development of standards, laws and regulations, as well as, conformity assessment procedures, verification and

	surveillance protocols, all of them supported metrologically, to contribute to the feasibility of its application, from the technical point of view.
2.3. Cooperation between QI and CE actors	
Economy-Institution	MEX-NORMEX
Title	Promoting collaboration between quality institutions, regulatory bodies and productive sectors to boost the circular economy
Justification	The circular economy requires coordinated action among policymakers, regulators and practical implementers. Fostering this collaboration ensures that public policies are technically feasible, sectoral relevant and measurable from a quality perspective.
Actors involved	QI institutions; Government agencies; Chambers and industry associations; Leading companies and MSME; Academia and research centres
General description	Multisectoral working groups, Technical Standardisation Committees, inter-institutional roundtables and strategic alliances are being promoted to facilitate the co-creation of normative, technical and regulatory solutions to accelerate the transition toward circular models.
2.4. Cooperation between QI and CE actors	
Economy-Institution	PE-INACAL-DN
Title	Support different sectors, like tourism, manufacturers, agribusiness, to incorporated CE through standards
Justification	As an NSB, we are looking for cooperation entities to support us to develop in some strategy sectors activities of Standardisation that help them in incorporating CE, through standards
Actors involved	Government, Technical Committees experts, SMEs, Industry, Universities, Cooperation entities
General description	n.a.

3. Dissemination of CE & QI knowledge (PE)

3.1. Dissemination of CE & QI knowledge	
Economy-Institution	PE-INACAL-DN
Title	Spread Knowledge (CE&QI) at regional level
Justification	It is important to spread knowledge at regional level specially in regional government
Actors involved	SMEs, Regional authorities, NSB, Universities
General description	As NSB we travel to the different regions of Peru to develop standards in different Domestic technical committees, in each travel we dedicate one day in to spread to all stakeholders in the importance to apply the principles of CE, this is focused in different sectors.

4. Establishment of Standardisation Technical Committee for Circular Economy (PE; THA)

4.1. Establishment of Standardisation Technical Committee for Circular Economy	
Economy-Institution	PE-INACAL-DN
Title	Establish a domestic TC in EC
Justification	It is important to develop domestic standards with all the stakeholders involved, also to adopted ISO international standards
Actors involved	Government, Academy, SMEs, Industry
General description	n.a.
4.2. Establishment of Standardisation Technical Committee for Circular Economy	
Economy-Institution	THA-TISI
Title	Establishment of the Subcommittee on Circular Economy
Justification	To adopt and implement relevant standards related to the Circular Economy, including ISO 59004 (Terminology, principles and guidance), ISO 59010 (Guidance on business models and value chains) and ISO 59020 (Measuring and assessing circularity performance)
Actors involved	To gather Circular Economy (CE) experts for the development of CE-related standards.
General description	1. Organise meetings of the Subcommittee on Circular Economy (CE) 2. Survey and consult with experts and stakeholders to identify the needs for CE-related standards 3. Develop an annual action plan for submission and approval 4. Adopt relevant Circular Economy standards 5. Announce and disseminate the adopted CE standard

5. Standardisation for circularity in products, organisations and sectors (CHL; INA; MEX; PE)

5.1. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	CHL-MME
Title	Financing standardisation from various sources of resources.
Justification	Allows for the continuation of standardisation work lines and speeds up the normalisation dynamics.
Actors involved	MMA, CORFO, MINVU.
General description	In the construction sector, in Chile, Corfo pays for the standardisation of ISO standards in the area of circular economy, MMA commissions a set of technical standards for circularity attributes, MMA and MINVU commission specific technical standards for waste management in construction and demolition.
5.2. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	CHL-MME
Title	Develop Standardisation plans linked to labour skills training plans and regulatory implementation plans.
Justification	Allow the scheduling of efforts by the domestic standardisation entity.
Actors involved	MMA INN FCh, PNUMA.
General description	With GEF resources, a standardisation plan for circular economy in construction will be developed.
5.3. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	CHL-MME
Title	Advance specifically in a differentiated manner, with standardisation for different economic sectors.
Justification	Advances in various economic sectors enable the integration of efforts to measure circularity. It should be noted that practices in one sector affect the metrics of other sectors.
Actors involved	MMA CORFO INN
General description	Chile is advancing with developments in Standardisation in sectors such as circular economy in construction, mining, tire recycling, among others, in parallel way.
5.4. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	INA-TBC
Title	Development of SNI Standards for Recycled Plastic Materials
Justification	This initiative supports the circular economy by ensuring the quality, safety and consistency of recycled materials used in manufacturing. It fosters industry confidence, promotes the use of secondary raw materials and provides a reference point for regulators and consumers. Additionally, it bridges the gap between environmental goals and industrial practice through standardisation.
Actors involved	Badan Standardisasi Nasional (BSN); Ministry of Environment and Forestry (KLHK); Plastics and packaging industry associations; Testing laboratories and certification bodies; Academia and research institutions.
General description	BSN facilitated the development of Indonesian National Standards (SNI) for recycled plastic materials, involving multi-stakeholder technical committees. The process included technical research, benchmarking with ISO and other international standards and stakeholder consultations. The standards provide specifications for different types of recycled plastics (e.g., PET, HDPE), ensuring their suitability for reuse in various applications while meeting safety and quality requirements. This best practice demonstrates how QI can directly support CE implementation by establishing clear criteria, enabling product certification and aligning market practices with sustainability objectives.
5.5. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	MEX-NORMEX
Title	Development of Standards and Guides focused on quality for the circular economy.
Justification	It provides a clear, measurable and verifiable framework for productive sectors to apply circular principles without compromising quality.
Actors involved	National Standardisation Organisations (NSOs); Government entities; Companies and industrial chambers; Academic institutions and research centres; Consumers.
General description	This practice consists of promoting the development and adoption of Standards and Guides that integrate circular economy criteria into products, materials and

	processes. This includes establishing specifications for the safe use of recycled materials, defining durability levels, facilitating product repairability and establishing requirements for remanufacturing or composting processes.
5.6. Standardisation for circularity in products, organisations and sectors	
Economy-Institution	PE-MINAM
Title	Peruvian technical standards specific to the circular economy.
Justification	Peruvian technical standards on eco-efficiency issues are worked on through the INACAL Circular Economy Technical Standardisation Committee and all standards related to ISO 59000 are worked on, standards that are being and will be applied in the context of the Domestic Circular Economy Roadmap to 2030.
Actors involved	Public institutions, academies, companies, business associations and consultants.
General description	Approved standards: GP 127-2021 Circular Economy. Framework for the implementation of circular economy principles in organisations. GP 144-2024 Circular Economy. Guidelines for addressing circularity in standards. NTP ISO 14006, Environmental management systems — Guidelines for incorporating eco-design. NTP 721.100-2021 Circular Economy. General methods for assessing the recyclability and recovery of energy-related products. NTP 721.101-2022 Circular Economy. General method for evaluating the proportion of reused components in energy-related products. NTP 721.105-2023 Circular Economy. Circular Economy Project Management System. Requirements and Guidelines. NTP ISO 20400-2022 Sustainable Procurement. Guidelines. NTP ISO 59004-2024 Circular Economy. Vocabulary, principles and implementation guidance. 1st Edition.

6. Metrology for circularity in products and organisation (MEX)

6.1. Metrology for circularity in products and organisation	
Economy-Institution	MEX-CENAM
Title	MESURA Methodology with circular perspective
Justification	The MESURA methodology is a systematised tool developed by CENAM and registered as a trademark for more than 20 years. Its fundamental principles, through the appropriate use of metrological knowledge and practices, include the efficiency of processes and the quality of products and services. MESURA has been transferred to various National Metrology Institutes (NMI) in economies such as Panama, Colombia, Peru, Uruguay and Argentina recently.
Actors involved	CENAM (National Metrology Institute) and some other NMI's of Latin America
General description	The MESURA methodology, created by Mexico's National Metrology Centre (CENAM), has been used for more than twenty years to improve and streamline production processes and their inputs from a measurement perspective, ensure product quality, promote technological development and innovation and facilitate accreditation processes for conformity assessment bodies, particularly testing and calibration laboratories. Metrology, supported by tools such as the MESURA methodology, has the potential to enrich, evaluate and make more reliable aspects of the circular economy, such as the following: ✓ Analysis of material flows and their quality and quantity characteristics ✓ Material-energy balances ✓ Traceability and quality of products, materials and/or components (support to Digital Product Passport, DPP) ✓ Eco-design and technological innovation ✓ Waste recovery / shelf-life extension ✓ Circularity measurement/definition and measurement of CE impact indicators from nano to macro levels ✓ Integration into value chains by productive sector / Life cycle assessment (LCA) ✓ Technical expertise of conformity assessment bodies (testing, calibration and measurement laboratories and inspection units) ✓ Industrial symbiosis
6.2. Metrology for circularity in products and organisations	

Economy-Institution	MEX-CENAM
Title	Development and adoption of metrological reference systems for the optimisation of conformity assessment practices.
Justification	Metrological reference systems provide certainty and support the traceability of materials, products, processes, services and data, optimising technical and economic aspects of conformity assessment practices and product, process, service and data quality.
Actors involved	Mainly NMIs, but it is critical the support and participation of Standardisation and accreditation bodies, laboratories, all chain valour sectors including manufacturing and waste treatment companies (e.g. recycling and compost) and government.
General description	Development of metrological reference systems for the optimisation of conformity assessment practices. Two cases: Case 1: Biodegradable-compostable products: There is a global lack of certified reference materials for biodegradable-compostable polymer blends consistent with the chemical constituents of finished-commercialised products of this nature, enabling traceability and, therefore, technically and economically optimising conformity assessment processes, particularly in emerging markets such as Mexico. Case 2: In the plastics industry, including the applicable standards, it is recognised that to date, there is no definitive characterisation method to identify qualitatively and/or quantitatively the presence of recycled polymer in a finished plastic product, or to distinguish a product made from recycled material from one made from virgin polymer. Despite technological advances, there are no metrological reports or systematic research focused on determining the identification of recycled material in finished–commercialised polymeric products, which commonly claim that they are made from recycled polymers, that supports and optimises the conformity assessment process.

7. Conformity Assessment for CE (certification, auditing, labelling) (INA; MEX)

7.1. Conformity Assessment for CE (certification, auditing, labelling)	
Economy-Institution	INA-BSN
Title	Integration of Circular Economy Principles into Domestic Standardisation Priorities and Eco-Labelling Schemes
Justification	This initiative aligns domestic standards (SNI) with sustainability and circular economy goals. It encourages industries to adopt environmentally friendly practices by providing measurable, verifiable criteria through standards and labelling. It demonstrates how QI tools (standards, certification, testing) can drive CE implementation.
Actors involved	National Standardisation Agency of Indonesia (BSN), Ministry of Environment and Forestry (KLHK), Ministry of Industry, UNDP Indonesia, Relevant Technical Committees (TCs), Private sector and industry associations, Certification and testing bodies
General description	BSN, through its Standardisation program, has developed and promoted the adoption of SNI related to eco-labelling, recycled material content, product durability and environmental performance (e.g., SNI for green buildings, organic products and sustainable agriculture). These standards are then used by conformity assessment bodies to certify products or processes that support the objectives of a circular economy. Coordination with line ministries and development partners, such as the UNDP, has strengthened the integration of CE into domestic priorities. The eco-labelling scheme allows consumers and producers to recognise and choose products that support CE goals, while QI infrastructure ensures the reliability of testing and certification processes.
7.2. Conformity Assessment for CE (certification, auditing, labelling)	
Economy-Institution	MEX-NORMEX
Title	Promoting conformity assessment as a key tool for building trust in circular products and processes.
Justification	In the context of the circular economy, which promotes the use of recycled materials, unconventional processes and innovative forms of production, this assessment helps demonstrate that quality and safety are not compromised, thereby strengthening consumer, regulatory and market confidence.
Actors involved	Conformity assessment bodies; Accreditation bodies; Standardisation and Metrology Bodies; Regulatory authorities; Companies and manufacturers; Consumers.

General description	This practice involves incorporating conformity assessment schemes into the framework of circular economy policies to ensure that circular products and processes comply with specific technical standards and requirements. For example, products made with recycled materials, utilising safe recycling processes, implementing circular management systems, or employing life-cycle assessment methodologies can be certified.

8. Promoting CE Management Systems in Organisations (THA)

8.1. Promoting CE Management Systems in Organisations	
Economy-Institution	THA-Get solutions
Title	Development and Implementation of the Circular Economy Management System (CEMS) Auditing and Certification Scheme in Thailand
Justification	This project established a clear and comprehensive auditing and certification framework tailored for Circular Economy management within organisations. It ensures domestic and international recognition by aligning with established standards (TCAS No. 2 Part.2-2564 (2021): Circular economy management system for organisation Part 2: Requirements). The approach fosters confidence among stakeholders by providing reliable certification and promoting consistent CE practices across multiple industries.
Actors involved	Program Management Unit for Competitiveness (PMUC), Ministry of Higher Education, Science, Research and Innovation (Funding Agency); Thai Industrial Standards Institute (TISI) (Research Collaboration); Kasetsart University (Project Researcher); Certification Bodies and Accreditation Bodies; Consulting Companies trained for CE auditing and certification; Target industries including agro-industry, construction materials, plastics, packaging, fashion & lifestyle and clean energy.
General description	The development of the Circular Economy Management System (CEMS) standard, supported by Thailand's Ministry of Higher Education and the Thai Industrial Standards Institute (TISI), marks a significant step in advancing Circular Economy policies aligned with the BCG economic model. The project successfully certified 26 pilot companies and trained over 500 auditors and assessors to strengthen Thailand's private sector competitiveness domestically and internationally. TCAS No. 2 Part 2-2564 standard aligns with the BCG economic model, focusing on Bio Economy, Circular Economy and Green Economy, to drive the business sector towards Net-Zero Emissions and build trust in the marketplace. This initiative also provided comprehensive training for consultants and auditors, ensuring deep understanding of CE management systems. Certified professionals, including consultants and academics, are publicly listed to support the widespread adoption of CE standards across industries, helping drive sustainable business practices and progress toward Net Zero Emissions.
8.2. Promoting CE Management Systems in Organisations	
Economy-Institution	THA-Get solutions
Title	Development and performance enhancement of Circular Economy Management System for industrial sector (2021-2025).
Justification	This project represents a best practice because it establishes a comprehensive and standardised framework for the implementation of Circular Economy (CE) principles within industrial organisations. By developing clear and locally re-cognised standards aligned with international benchmarks, it ensures consistency and reliability in CE management and certification processes. The integration of a web-based assessment platform and in-depth consulting services enhances organisational capacity to apply CE effectively. Furthermore, linking the assessment results to eligibility for prestigious industry awards incentivises continuous improvement and wider adoption of CE practices across the industrial sector.
Actors involved	Department of Primary Industries and Mines (DPIM), Ministry of Industry Management System Certification Institute (Thailand). Industrial enterprises from target sectors: 50 companies /year.
General description	The project focuses on the development and enhancement of a Circular Economy Management System (CEMS) tailored for Thailand's industrial sector, supported by key standards developed by the Thai Industrial Standards Institute (TISI), including (1) TCAS No. 2-2562 (2019) Framework for implementing the principles of the circular economy in organisations - guide, (2) TCAS No. 2 Part.2-2564 (2021) Circular economy management system for organisation Part

	2: Requirements, (3) TCAS No. 9-2565 (2022) Plastics recycling traceability and assessment of conformity and recycled content: Requirement and, (4) TCAS No. 10-2565 (2022) Industrial waste management toward zero landfill: requirement. It provides a structured and systematic approach for industrial enterprises to evaluate and improve their CE performance through a web application and platform for self-assessment and monitoring. The project also offers in-depth consulting to strengthen the implementation capabilities of organisations. The assessment outcomes serve as documentation for companies seeking to participate in the Circular Economy Industry Excellence Awards, promoting sustainable practices and competitiveness in the industrial sector.

9. Promoting CE Awards with QI elements (THA)

9.1. Promoting CE Awards with QI elements	
Economy-Institution	THA-Get solutions
Title	Promotion of Sustainable Resource Management for Circular Economy with I-EA-T Circular Economy Awards (2024)
Justification	This initiative effectively promotes the practical implementation of Circular Economy (CE) principles within industrial organisations by providing a structured assessment and recognition system. It incentivises enterprises to adopt sustainable resource management, reduce landfill waste and optimise material utilisation. The inclusion of awards recognises exemplary organisa-tions, fostering motivation and setting benchmarks for others. The program also enhances knowledge exchange through seminars and expert lectures, supporting capacity building and alignment with international standards.
Actors involved	Industrial Estate Authority of Thailand (IEAT); Industrial enterprises participating in the competition (27 companies); Federation of Thai Industries (FTI).
General description	The project, led by IEAT, promotes sustainable resource management in industrial estates by encouraging closed-loop resource exchange among enterprises to minimise waste and maximise value creation. In 2024, 27 enterprises participated in the I-EA-T Circular Economy Awards, competing in two categories: Circular Economy Product (market-ready circular products) and Circular Economy Prototype (products in R&D phase). Awardees included leading companies such as UACJ (Thailand) Ltd., NS-Siam United Steel Co., Ltd., Quality Construction Products PCL, Suntory PepsiCo Beverage (Thailand) Ltd. and Thai Nippon Rubber Industry PCL. The program also hosts seminars on regulatory responsibilities and ISO standards related to CE, providing expert knowledge to support enterprises in aligning their practices with global sustainability and circular economy requirements.

10. Strengthening QI (AUS)

10.1. Strengthening QI	
Economy-Institution	AUS-Standards Australia
Title	Enhance resourcing for Quality Infrastructure (QI) institutions
Justification	QI institutions, often operating as non-profit entities or within the public sector, typically serve multiple industries and may have limited dedicated resources to support the implementation of Circular Economy (CE) policies. Strengthening their capacity, particularly through increased personnel or targeted funding, can enable these institutions to more effectively align their services with domestic CE priorities and contribute meaningfully to implementation efforts.
Actors involved	Government, industry
General description	Governments can play a critical role in strengthening the capacity of QI institutions by providing targeted funding and strategic support. Such support can enable QI bodies to actively contribute to the development and implementation of circular economy-related standardisation, metrology and accreditation initiatives. This would not only facilitate the prioritisation of CE workstreams within QI institutions, but would also ensure greater alignment with domestic policy objectives.

11. General initiatives (MAS; PE)

11.1. General initiatives	
Economy-Institution	MAS-KPKT
Title	Establishment of Domestic Circular Economy Council (NCEC)

Justification	A domestic platform to monitor the implementation of all initiatives under the Circular Economy Blueprint.
Actors involved	This Council is chaired by the Minister of Housing and Local Government.The members of NCEC include Government agencies, private sectors, academia and associations.
General description	Among the circular economy initiatives that have been approved by NCEC: 1) A legislative transformation to ensure the circular economy for solid waste can be implemented economy-wide 2) EPR Policy Framework 3) Mandatory eco-design implementation 4) Strengthening the involvement of informal sectors and the need for incentives to encourage their involvement.
11.2. General initiatives	
Economy-Institution	MAS-KPKT
Title	Strategic campaign with retailers on the ban of single-use plastic bags
Justification	Malaysia's strategic efforts with the industry in the retail sector to address the negative impact of single-use plastic, especially plastic carrier bags, on the environment and solid waste management in Malaysia.
Actors involved	A total of 20 retailers with 7,601 premises throughout the economy have pledged to commit and support this campaign.
General description	The effort is in line with the government's goal to achieve a circular economy transformation by maximising resource efficiency and minimising waste generation.
11.3. General initiatives	
Economy-Institution	MAS-KPKT
Title	Malaysia Clean-Up Day: Mega Cleaning Programme
Justification	Malaysia’s annual event in localising an international effort (World Clean-Up Day) towards enhancing cleanliness habits in society.
Actors involved	Malaysia Clean-Up Day involves a wholistic approach, with the participation of various ministries, government agencies, state governments and local councils.
General description	The event promotes community engagement and collaboration, bringing together different groups to work towards a common goal of creating a cleaner and more sustainable environment Malaysia Clean-Up Day 2024 was held at Pasar Seni, Kuala Lumpur and 649 other locations throughout Malaysia. This event has made its way into Malaysia Book of Record (MBOR) with three new records: • Largest simultaneous participation: 58,007 participants • Heaviest waste collected in a day: 4,645.50 metric tons • Longest non-stop operation: 12 hours (8:00 am to 8:00 pm)
11.4. General initiatives	
Economy-Institution	PE-MIDAGRI
Title	Implementation of traceability in agricultural supply chains.
Justification	Traceability systems significantly enhance the quality and safety of agricultural products, reducing environmental impact by enabling agricultural businesses to identify and manage pollution sources and empowering consumers to make informed choices.
Actors involved	Agricultural producers as main actors and other actors from the supply chain, such as suppliers of inputs, storage, primary processing, transportation and trade.
General description	Best practices of traceability include the use of unique identifiers, standardising processes, training employees and implementing regular audits.
11.5. General initiatives	
Economy-Institution	PE-MIDAGRI
Title	Compliance with standards and regulations in agriculture.
Justification	Compliance with domestic and international standards in agriculture ensures quality, safety, facilitates global trade and minimises the environmental impacts of agricultural activity throughout the production chain.
Actors involved	Agricultural producers, as main actors, are joined by other actors from the supply chain, including suppliers of inputs, storage, primary processing, transportation and trade.
General description	Best practices include establishing standard procedures and adapting processes to improve the quality, safety and competitiveness of agricultural products.
11.6. General initiatives	
Economy-Institution	PE-MIDAGRI

Title	Application of the continuous process improvement approach in agriculture.
Justification	Continuous improvement allows increasing efficiency, quality and competitiveness through incremental changes in the agricultural production process.
Actors involved	Agricultural producers as main actors and other actors from the supply chain, such as suppliers of inputs, storage, primary processing, transportation and trade.
General description	Best practices focus on refining existing processes through an incremental cycle of process improvement where the need for improvement is identified, the solution is implemented, the result is evaluated and the cycle is repeated.

References

A. Literature and citation sources

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*) The analysis of these policies was used to develop the structure and questions of the survey.