Webinar on Standards of Product Circularity Data Exchange among APEC Economies

Summary Report

APEC Sub-Committee on Standards and Conformance

May 2024

Contents

Glossary

AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
B2B	Business-to-Business
CE	Circular Economy
DIS	Draft International Standard
ISO	The International Organization for Standardization
LCA	Life Cycle Assessment
MSMEs	Micro, Small, and Medium-sized Enterprises
MTEC	National Metal and Materials Technology Center
NSTDA	National Science and Technology Development Agency
PC	Product Circularity
PCDS	Product Circularity Data Sheet
R&D	Research & Development
SMEs	Small-Medium Enterprises
Q&A	Question and Answer
IT	Information Technology
QR	Quick Response

Acknowledgments

We express our sincere gratitude to the experts who participated in the webinar for generously sharing their experiences and engaging in an insightful exchange. Special thanks to the participants for actively joining the meeting and posing relevant questions to the panel. Our appreciation extends to the technical support team, both during the online session and at the venue in Beijing, as well as to the individuals involved in transcribing the webinar. Furthermore, we want to extend our thanks to everyone who contributed to making the webinar a successful and open exchange of ideas.

1. Executive Summary

Ensuring the enhancement of product circularity performance is crucial in facilitating the transition towards a circular economy (CE). Standardisation and digitalization are both important tools for improving product circularity performance. However, reliable standardised and digitized data is scarce, and many circular economies have different exclusive formats across APEC economies, which impede product circularity data exchange, thus affecting trade in circular economy across APEC economies.

APEC economies, acknowledging this need, organized a two-day webinar dedicated to addressing challenges and deliberating practical measures for improving product circularity data exchange. The webinar centered on fostering a collaborative knowledge exchange among APEC member economies, focusing on the implementation of effective strategies to overcome these challenges. The 46 participants from eight economies, comprising a gender-diverse group of experts, policymakers, and researchers, aimed to contribute to a sustainable and circular future in global commerce.

The webinar began with opening remarks highlighting the importance of circular economy development and product circular data exchange for resource efficiency. Keynote speeches delved into advancements and challenges in Thailand's circular economy, Chile's municipal circularity challenges, the ISO/DIS 59040 standard, and complexities faced by SMEs in circularity data demands.

Panel discussions, led by experts and moderators, further explored challenges and potential solutions. Recommendations emerged, emphasizing policy support for SMEs, fostering open communication, leveraging AI tools, and aligning with international standards. The Q&A session underscored the importance of eco-design and post-webinar surveys, ensuring comprehensive understanding and follow-ups.

The Index of Problems and Challenges provided in this project summary report outlines issues such as SME engagement, lack of targeted initiatives, data collection challenges, and the need for government support. Practical measures included policy encouragement, highlighting economic benefits, leveraging AI tools, and refining standards.

2. Introduction

The transition to a circular economy (CE, defined in ISO as 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) is a critical global imperative, emphasizing the need to maximize resource efficiency and minimize waste. Central to this transition is the promotion of product circularity performance, which necessitates the development of standardized approaches and digitalization tools. However, a significant challenge arises from the scarcity of reliable standardized and digitized data. Across APEC economies, exclusive data formats and standards hinder the seamless exchange of product circularity data. This fragmentation adversely impacts trade in the circular economy within APEC economies.

To harmonize APEC economies' standards with upcoming international benchmarks, the Webinar on Sharing and Analyzing Standards for Facilitating Product Circularity Data Exchange across APEC Economies took place. This two-day webinar extensively explored prevailing practices, challenges, and solutions pertaining to product circularity data exchange within APEC economies. It specifically sought input from diverse stakeholders and gathered insights on global best practices, successful experiences, and potential support resources aimed at fostering the establishment of standardized and efficient product circularity data exchange standards.

2.1 Objectives

In the context of the two-day Webinar, the objectives revolved around elucidating the findings derived from a previously conducted survey and outlining a trajectory for augmenting the efficiency of product circularity data exchange. The aim was to utilize insights gleaned from the research to bolster the effectiveness of product circularity and further propel advancements within the circular economy. Throughout the sessions, the discourse centred on innovative solutions and strategies applicable for fostering sustainability, streamlining data sharing processes, and ultimately propelling global commerce towards a more circular and environmentally conscious future.

Ahead of the webinar, a survey was circulated among stakeholders to gather insights from participants across APEC economies. These collected insights were analysed, presented, and discussed during the webinar.

2.2 The Scope of The Webinar

The webinar showcased keynote speeches delivered by representatives from both APEC and non-APEC economies, highlighting pivotal facets of the existing product circularity data exchange standards. Its principal objective was to disseminate research and studies conducted across diverse settings, facilitating inclusive and open discussions. Additionally, comprehensive topics were explored during panel discussions guided by specific discussion points. Participants were actively encouraged to engage in these discussions and pose questions.

2.3 Target Group

The webinar aimed at different stakeholders from across APEC economies, experts, policymakers, and researchers involved or interested in the realm of product circularity, data exchange standards, sustainability, and circular economy initiatives across APEC economies and beyond.

2.4 Participants

The webinar saw a total of 46 participants, with 32 joining online via Zoom and 12 physically present at the venue in Beijing, China. Representation was from eight APEC economies, including Canada; Chile; China; Japan; Malaysia; Singapore; Thailand and the United States, along with attendees from France and Luxembourg. These participants encompassed researchers, representatives from economy's institutions, and professionals from various companies. The gender distribution was evenly split, with 24 female and 22 male attendees. The gender distribution goal was set at a ratio of 30%, which, in this case, was exceeded.

3. Opening Remarks

Ms Wang Yuhan and Ms Catherine Chevauché delivered the opening remarks. Ms Wang Yu-han, representing the Department of International Affairs of the State Administration for Market Regulation, welcomed attendees to the webinar. She highlighted the global shift towards circular economy development and stressed the importance of product circular data exchange for resource efficiency and sustainability. Ms Wang acknowledged APEC economies' efforts and China's commitment to supporting cooperation in the Asia-Pacific region. She expressed confidence that the meeting would enhance communication and cooperation in circular economy standardization.

Ms Catherine Chevauché, Chairperson of ISO's technical committee ISO/TC 323, provided insights into collaborative efforts involving representatives from 100 economies and international organizations. She emphasized the significance of ISO 59040, addressing terminology, principles, and guidance for circular economy practices. Ms Chevauché detailed the upcoming ISO 59040 standard on product circularity data sheets, focusing on data sharing's pivotal role in successful circular initiatives. In her capacity at Veolia, she highlighted the importance of data sharing along the value chain and invited feedback for ongoing standardization efforts, with ISO 59040 expected to be published by the end of the following year.

4. Keynote Speeches

The following sections summarize and point out the key points of the keynote speeches given by experts.

4.1 Keynote Speech 1

Title: Experience and Standards On Improving Product Circularity Data Exchange In Thailand.

Speakers:

Dr Witchuda Daud, Director of Advanced Polymer Research Group, National Metal and Materials Technology Center (MTEC), Thailand

Dr Nudjarin Ramungul, Research Specialist, National Metal and Materials Technology Center (NSTDA), Thailand

Dr Witchuda Daud shared insights on Thailand's advancements in circular economy and their utilization of standards for product quality and data exchange. As part of MTEC, they focus on material science R&D, collaborating heavily with SMEs. Thailand's circular economy model started in 2018, emphasizing eight sectors, including circular economy. MTEC plays a pivotal role in driving this transition, offering educational programs, aiding policy development, and supporting SMEs with CE solutions. They have been involved in creating circular economy standards and collaborate globally for initiatives like chemical communication platforms. Dr Daud highlighted ongoing efforts in developing identification techniques for substances of concern. She concluded by outlining MTEC's impactful partnerships and ongoing projects in Thailand and beyond.

Dr Nudjarin Ramungul discussed Thailand's journey towards a circular economy and the challenges faced in product circularity data exchange. Over 15 years, progress has been made, but varied understanding of circular economy concepts persists among organizations, emphasizing the need for clear ISO standards. Data exchange is driven by international regulations, resulting in specific tools and standards. Challenges remain in data availability, governance, and infrastructure. Managing data is reactive, conducted every six months, seen as burdensome, especially for SMEs lacking technical support. Key issues stem from a lack of integrated lifecycle management and inadequate systems for quality assurance, hindering effective data sharing. To advance, Thailand needs improved infrastructure, governance, and quality assurance systems to support SMEs and enhance resource recovery.

In conclusion, Thailand is actively embracing a Circular Economy (CE), guided by ISO standards to ensure consistency across sectors. While supply chain communication for chemical data has been established over nearly 15 years, the complexity grows with circularity data for products. Midstream suppliers, mainly SMEs, face obstacles in sharing product circularity data and require

support. Improvements in end-of-use resource recovery infrastructure are needed for efficiency and quality enhancement. Strengthening capabilities for data collection, governance, and sharing is essential for facilitating exchange. A robust system or framework is necessary to guarantee data quality, traceability, and continuity.

4.2 Keynote Speech 2

Title: How To Improve Circularity Of Municipalities In Chile? A Data Exchange Issue.

Speaker: Dr Jean Pierre Doussoulin, Head of the Master program in Human-Scale Development and Ecological Economics, Universidad Austral de Chile, Chile

Dr Jean Pierre Doussolin delved into Chile's municipal circularity challenges in a presentation titled "Improving Circularity in Chilean Municipalities." Highlighting the shift from linear to circular models, he stressed the need for standardized and accessible data exchange systems. Chile has initiated circular economy strategies and a Producer Civility Law, yet existing waste management databases lack standardization and public access, posing hurdles for efficient waste management. He detailed waste management in Chile, emphasizing the predominance of disposal over recovery and the challenges faced by municipalities in managing waste. This includes limitations in waste separation, reliance on landfilling, and informal recycling practices.

Dr Doussolin proposed a research framework focusing on municipal efficiency in waste collection, analyzing the impact of management types and regional variations. The study involves Stochastic models and identifies factors affecting municipal waste management efficiency, revealing regional disparities and management types of influence. Discussing influential variables such as finance, staffing, and administration, he highlighted their impact on municipal efficiency. Additionally, he observed spatial correlations, indicating clusters of municipalities with similar efficiency levels. Dr Doussolin emphasized the importance of improving municipal efficiency and data sharing for a successful transition to circular models in developing economies like Chile.

4.3 Keynote Speech 3

Title: The Introduction Of ISO/DIS 59040 Product Circularity Data Sheet.

Speaker: Jérôme Petry, Project Leader DG Industry, New Technologies and Research DG, Ministère de l'Économie, Luxembourg.

Mr Jérôme Petry presented the upcoming ISO/DIS 59040 Product Circularity Data Sheet. This new standard addresses challenges in sharing standardized product information vital for circular economy models. It aims to facilitate exchanges without disclosing sensitive business data. The standard involves creating and filling a Product Circularity Data Sheet (PCDS) with a structured approach in three levels. The PCDS relies on a binary structure for responses, protecting

confidential data while providing mechanisms for transparency. It emphasizes B2B interactions, particularly supporting SMEs, ensuring the flow of information across the supply chain. The document's content includes prerequisite guidelines, standardized templates, and optional statements. It also allows for additional free-form information, maintaining a balance between disclosure and confidentiality. The PCDS will foster a more transparent and traceable system, aiding circular economy practices. The standard emphasizes machine readability and interoperability, intending to benefit both businesses and consumers. The timeline aims for publication around August or September 2024, with ongoing feedback requested during the DIS ballot phase.

4.4 Keynote Speech 4

Title: Supporting Companies to Exchange Product Circularity Data Cost-Effectively.

Speaker: Douglas Mulhall, Associate researcher, EPEA, +ImpaKt, TUDelft Netherlands, TUMunich Germany, Canada.

Mr Douglas Mulhall's presentation emphasized the interconnectedness of circularity data within a larger context, indicating that circularity data overlaps with sustainability, safety, and technical performance standards. He highlighted the complexity SMEs face due to diverse data demands from various sectors and throughout the supply chain. Mr Mulhall discussed the challenges SMEs encounter in fulfilling these demands, mentioning that existing standards often overwhelm them due to lack of support and being tailored primarily for larger companies. He presented various ongoing initiatives and regulations worldwide, stressing the increased complexity SMEs must navigate.

Proposing solutions, Mr Mulhall suggested leveraging AI and machine learning tools to help SMEs cope with data complexity. He noted proprietary AI solutions available in the market but also highlighted the potential of open-source AI software. He pointed out global models like the Trust Over IP Foundation and the W3C as potential avenues for sustainable data exchange, emphasizing their open-source nature.

Mr Mulhall offered recommendations for APEC economies, suggesting supporting SMEs in accessing AI tools, guiding them on tool selection and data priorities, and providing services to track evolving data demands. He underscored the importance of focusing less on individual data demands and more on tools that can address diverse requirements.

In conclusion, he highlighted the potential business value of the circular economy for SMEs, specifically emphasizing the significance of healthy materials as a strong business case. Mr Mulhall referenced the growing pressures on companies to detoxify their products due to health concerns associated with toxic materials, presenting examples of improved productivity, reduced risks, and overall health cost reductions associated with adopting healthier materials.

Mr Mulhall ended by directing attention to his published work on the relationship between toxic materials and human health, suggesting it as a resource for those interested in exploring this aspect further.

4.5 Keynote Speech 5

Title: Presentation On Analysis of The Pre-Webinar Survey Results.

Speaker: Dr Ding Shuang, Associate professor, China National Institute of Standardization, China

Dr Ding Shuang presented an analysis of a survey conducted on product circularity data exchange among APEC economies. The goal was to understand the status, challenges, and potential solutions for this exchange. The survey, distributed from September to November, counted 15 participants from 9 different economies. In his presentation Dr Ding emphasized the importance of definitions to achieve common understanding, citing the need for unified standards due to varying definitions across economies.

The survey findings indicated a lack of existing wide-level standards related to product circularity data among APEC members, revealing a gap between policies and standardization. Factors crucial to product circularity standards included circular design, life cycle assessment, and recyclability rate. Data collection primarily relied on digital platforms and mobile applications, but participants expressed limited experience with these tools and concerns about data security when sharing with third parties.

Challenges highlighted were funding, technology access, and awareness and education deficiencies. Recommendations included establishing entities to share best practices, involving government bodies in setting standards, and enhancing technology access for wider implementation. Dr Ding acknowledged the need for a broader survey due to the limited responses received and considered conducting a post-webinar survey to gather more comprehensive input. The application of the survey in developing economies like Chile would depend on their existing standards, attitudes towards international standards like ISO, experiences, and challenges faced in data exchange.

During the presentation's Q&A session, attendees raised questions about the absence of eco-design in the survey and suggested the possibility of conducting another round of surveys post-webinar to gather more responses and ensure more accurate conclusions. Dr Ding acknowledged the importance of eco-design and agreed that a follow-up survey could provide a more comprehensive understanding. Additionally, a query regarding the application of the survey in developing economies like Chile emphasized the significance of understanding existing standards, attitudes towards international standards, experiences, and challenges faced in implementing data exchange practices.

5. Panel Discussions

Three panel discussions were conducted during the webinar, featuring keynote speakers as panelists and inviting active participation from the entire audience. The first panel discussion took place on the initial day of the webinar, while the second and third discussions were held on the subsequent day. The sections below provide a summary of the topics and conversations that transpired during these discussions.

5.1 Panel Discussion 1

The panel discussion, led by Ms Mo Zhang from Nankai University, delved into improving APEC economies' standards on product circularity data exchange and aligning them with future ISO standards. Key speakers included Ms Catherine Chevauché, Dr Witchuda Daud, Dr Nudjarin Ramungul, Dr Jean Pierre Doussoulin, Mr Douglas Mulhall and Mr Jerome Petry, alongside other active representatives.

The discussion highlighted critical elements, such as the challenges faced by SMEs in complying with data demands and the need to enable tools for SMEs to participate effectively. The importance of a common language and standardized frameworks for circular properties was emphasized, acknowledging the global supply chain's complexities. Collaboration, partnerships, and a new mindset were emphasized in transitioning to a circular economy. Key points were raised about the cost issues surrounding SME involvement and the need to address these costs collaboratively to encourage participation. Discussions touched upon the idea of a central database for standard materials and the challenges it may pose, favoring a decentralized IT system.

Questions arose about the practicality of QR-coded product data sheets for materials and how data exchange might facilitate reuse or recycling across borders. The focus expanded to address the data demand-supply balance, stressing the need for prioritizing data flows and conducting pilot studies to ascertain the demand, utility, and means of exchanging data effectively.

Overall, the discussions acknowledged the initial stages of progress in product circularity data exchange and stressed the importance of standards, collaboration, and a holistic approach to enable an effective transition to a circular economy.

5.2 Panel Discussion 2

The convened panel, moderated by Mr Douglas Mulhall, concentrated on facilitating Small and Medium Enterprises (SMEs) to aptly engage with data requisitions pertinent to circularity. Participants from Thailand and Chile, comprising Dr Witchuda Daud, Dr Nudjarin Ramungul, Dr Jean Pierre Doussoulin, and Prof Wen Zongguo, contributed insights into this discourse.

The deliberation underscored the imperative for SMEs to comprehend the intrinsic value of data

in augmenting circularity within their operations. Despite Thailand's initiatives bolstering SMEs across multiple sectors, there remains a notable absence of targeted initiatives for circular data.

In China, legislative measures such as the circular economy promotion law and extended producer responsibility systems accentuate data aggregation, yet grapple with the challenges of exorbitant data collection expenses and the essential need for subsequent support post-data submission. The discourse proposed the training of agencies and industrial enclaves to assimilate the tenets of circular economy criteria, aiming to provide enhanced support to SMEs. Dr Jean Pierre Doussoulin underscored the importance of educating not only private enterprises, but also governmental bodies and municipal employees tasked with managing circular economy data.

However, a substantive concern surfaced regarding the broad interpretation of circular economy standards, especially concerning specific industries like the food sector that necessitate nuanced considerations within these established standards. The panel arrived at a consensus highlighting the criticality of refining these standards to accommodate a spectrum of industries and ensuring comprehensive training for agencies. Mr Douglas Mulhall articulated the need for meticulous interpretation of circular economy principles to prevent dilution and emphasized integrating specific industry requisites within the standards.

In summary, the consensus emphasized the imperative for tailored training sessions targeting agencies and personnel involved, precise delineation of circular economy criteria across diverse industries, and the refinement of standards to accommodate specific industry requisites within the APEC region.

5.3 Panel Discussion 3

The panel discussion, organized by Prof Wen Zongguo, centered on the crucial theme of "Brainstorm and Recommendations on policymaking, standards developing, good practices, good tools for APEC economies to support the product circularity data exchange." The members, including Dr Witchuda Daud, Dr Nudjarin Ramungul, Dr Jean Pierre Doussoulin, and Mr Douglas Mulhall, contributed insightful perspectives during this two-day meeting. The dialogue began with Prof Wen emphasizing the importance of key stakeholders' involvement in enhancing the work on product relevance in APEC economies. He underscored the role of policymakers in reducing data collection difficulties and costs while improving its efficiency. Witchuda emphasized collaboration among stakeholders and the need for empowering SMEs with the authority to request and receive data. Dr Nudjarin stressed the integral connection between product quality and data, advocating for recognizing data as part of product value.

Mr Mulhall highlighted the need to motivate SMEs by integrating data quality into product quality assurance, underlining the importance of identifying specific circular economy value prop-

ositions. He suggested using tools like the Product Circularity Data Sheet to facilitate SMEs' understanding of relevant values. Prof Wen further addressed the implementation challenges, pointing out the necessity of standards and tools that are inclusive, cost-effective, and accessible to all economies. The discussion touched on AI tools' availability, with concerns expressed about accessibility in developing economies. The experts acknowledged the potential of AI but highlighted the need for further development and accessibility improvements.

Mr Doussoulin emphasized the need for government support in creating accessible platforms and training programs for SMEs. The conversation concluded with Dr Ding summarizing the key points for draft recommendations, focusing on stakeholder engagement, policy implementation, standardization, and the future direction of AI tools. The panel intends to circulate finalized recommendations based on the meeting minutes, aiming to drive progress in supporting product circularity data exchange across APEC economies.

6. Index of Problems and Challenges Encountered by APEC Economies

This section provides a summary of the problems and challenges discussed by APEC economies during the webinar. For different stakeholder groups, we categorized into:

6.1 Policy Makers Challenges

SMEs Engagement Challenges: APEC economies, such as Thailand and Chile, encounter hurdles in facilitating Small and Medium Enterprises (SMEs) to effectively engage with circularity-related data requisitions. A deficiency in collaboration among stakeholders within the economies is hindering the formulation of relevant policies.

Lack of Targeted Initiatives for Circular Data in SMEs: Despite some initiatives supporting SMEs across various sectors in certain economies, there is a notable absence of targeted programs specifically addressing circular data needs for SMEs.

Government Support for SMEs: SMEs are hindered by insufficient government support, particularly in the form of financial assistance, which is essential for fostering their motivation and enabling the establishment of accessible platforms and networks. This lack of support significantly impairs their capacity to comprehend and actively participate in circular economy practices and access relevant data crucial for their sustainable development.

6.2 Standard Makers Challenges

Standardization Challenges: The implementation of standards and tools encounters challenges regarding inclusivity, cost-effectiveness, and alignment with the diverse needs of APEC economies. The lack of refinement of circular economy standards on an international scale hinders their ability to accommodate various industries effectively.

Insufficient Collaboration with Industries: The failure to engage diverse industries results in unmet needs that remain unaddressed. Without a comprehensive understanding of these sector-specific requirements, standards risk being viewed as impractical or irrelevant by certain segments of the economy.

6.3 Enterprises Challenges

Data Collection Challenges and Expenses: APEC economies encounter notable challenges and expenses when it comes to gathering product circularity data. These difficulties underscore the critical need for implementing streamlined and cost-effective data collection processes across the region. Specifically, in China, legislative efforts aimed at data collection face hurdles primarily due to the expenses involved. These expenses often arise from various factors such as the exten-

sive scope of data required, the complexity of data collection methodologies, and the need for advanced technologies and infrastructure.

Lack of Technical Support and Knowledge: Enterprises, especially SMEs, face a significant challenge due to the lack of technical support and knowledge in effectively utilizing circular economy data to enhance their practices. This deficiency in understanding leading initiatives, such as PCDS and other tools, serves as a barrier. Thus, there is a pressing need for knowledge propagation, data sharing, and providing technical training to improve understanding of data application for fostering better circular economy practices.

Need for Practical Experimentation and Demonstration: Enterprises require access to pragmatic and efficient strategies that minimize risks and resource investments. The unaddressed challenge lies in enabling experimentation on a smaller scale to gather valuable insights, engage stakeholders, build capacity, and demonstrate the impact on SMEs.

6.4 Data Level Challenges

Lack of Data Accessibility: The challenges posed by limited data accessibility, including barriers such as restricted access and technological constraints, hinder the acknowledgment and development of the circular economy. Moreover, these barriers impede efforts to form the standardization, exacerbating the existing obstacles.

Data Quality Challenges: The reliability and integrity of analyses are heavily reliant on the quality and consistency of data. At the current stage, economies lack mechanisms to measure data accuracy, completeness, consistency, distribution, accessibility, and transparency to ensure reliable results. Moreover, data collection lacks uniformity and critical standards, diminishing the overall quality of the data.

6.5 Technical Capacity Challenges

Insufficient Investments in R&D and Key Technologies: Insufficient investments in key technologies like intelligent sensing, blockchain, AI, and IoT hinder progress in data collection and standardization efforts. Furthermore, inadequate security measures pose risks such as unauthorized access and data breaches. It is essential to address these gaps to safeguard circular economy initiatives and data integrity.

Absence of training professionals and skills gap: The lack of training and education among professionals in circular economy and standardization hinders their ability to understand and apply relevant concepts and frameworks. This results in a deficiency in proficiency with standardization processes needed to develop standards aligned with circular economy principles, including international standards and regulatory requirements. These professionals are critical in driving the transition to a more sustainable and circular economy.

7. Recommendations

The recommendations from the webinar present a strategy for effectively engaging stakeholders within APEC economies.

7.1 Policy Makers Engagement

Emphasize the Establishment of Cross-Sector Collaboration Mechanisms: Actively engage in cross-sector collaboration, working with industry organizations, academia, and non-governmental organizations to collectively formulate policies that promote the circular economy, ensuring the interests of all parties are fully considered.

Introduce Supportive Policies and Develop Targeted Initiatives: Encouraging policymakers to develop policies that consider the intricate market demands is crucial, particularly to foster the widespread adoption of emerging technologies. It is essential to promote innovative strategies within the policy design and to enable the use of digital technologies within economies. Furthermore, targeted initiatives that focus on the needs of SMEs, may not only enhance sustainability efforts within the SME, but also streamline data exchange across sectors more efficiently.

Allocate Adequate Government Funding: Recognize the importance allocating funds strategically to create an environment that enables circular economy practices. Provide more incentive measures to encourage voluntary participation of SMEs in circular economy practices, such as tax benefits, subsidies, or incentive programs.

7.2 Standard Makers Engagement

Promote Cross-Economy Collaboration and Advocate Standardization: Actively participate and continue to foster inter-economy cooperation. Sharing best practices with other economies can support the further development of standardization. It is recommended to advocate for the use of existing standard systems such as ISO, as this will promote the consistency and interoperability of global circular economy standards.

Deepen Collaboration with Industries: Broaden the collaboration among various industries considering the individual background of each economy to build a more in-depth understanding of each other's needs and challenges. This is crucial to ensure the practicality, relevance, and adaptability of standards across economies.

7.3 Enterprises Engagement

Maximizing Efficiency and Cost Savings: Recognize the importance of investing in advanced technologies and infrastructure to optimize data collection procedures and mitigate costs. This includes the development of digital platforms, data analytics tools, and automation technologies

that can reduce manual efforts and costs associated with data collection.

Increase Technical Support and Education on Circular Economy Tools: To enhance SMEs' involvement in circular economy practices, it is essential to introduce them to tools like the Product Circularity Data Sheet (PCDS). This facilitates their access to circularity-related data requisitions and standardization processes. Implementing educational programs focusing on the benefits of the circular economy for both the environment and the economy can significantly improve enterprises' comprehension and motivation to participate. Consequently, this increased understanding and willingness can lead to more effective utilization of tools and adoption of standards within SMEs.

Support Pilot Projects: Engage SME associations and institutions in pilot projects to demonstrate the benefits of circular economy practices. Reduce the entry barriers for small and medium-sized enterprises through subsidies or other economic support measures.

7.4 Data Level Solutions

Promote Open Data Platforms and Optimize Data Standardization: Proactively advocate for the development and enhancement of open data platforms and data collection procedures. A comprehensive and real-time open data platform dedicated to the circular economy can significantly aid policymakers in decision-making and empower businesses to make well-informed choices regarding the adoption of circular economy standards.

Enhance Data Collection Processes and Ensure Data Quality: Economies should collaborate in the development of unified data standards and guidelines, with a focus on enhancing data quality. Implementing control mechanisms across economies is essential to guarantee the accuracy, completeness, consistency, distribution, accessibility, and transparency of circular economy-related data.

7.5 Technical Capacity Solutions

Increase Investment in R&D and Key Technologies: Direct investments in research and development of technologies like intelligent sensing, blockchain, AI, and IoT are essential for improving data collection and standardizing implementation processes. Utilizing these innovations enables real-time monitoring of product status and life cycle information, facilitating precise tracking of materials and waste. This contributes to the advancement of recycling practices and sustainable supply chains, enhancing the exchange and utilization of circularity data. Simultaneously, addressing potential security vulnerabilities and risks linked to these technologies is paramount. This includes implementing robust security measures, conducting thorough risk assessments, and ensuring compliance with data privacy regulations are essential steps for safeguarding against unauthorized access, data breaches, and cyber threats.

Strengthen Professional Training: Investing in the training and education of professionals within the field of circular economy and standardization is crucial to enhance the understanding and application of relevant concepts and frameworks within economies. Professionals need to be well-versed in standardization processes and methodologies to effectively develop and implement standards that align with circular economy principles. This includes understanding international standards, regulatory requirements, and best practices in standardization. These professionals play a key role in driving the transition towards a more sustainable and circular economy.

8. About the Authors

Project Overseer: Dr Ding Shuang, an Associate Professor at the China National Institute of Standardization (CNIS), specializes in developing and enhancing standards across diverse sectors in China. In his role as Project Overseer, Dr DING Shuang played a pivotal role in directing the course of the webinar, significantly influencing its trajectory and execution.

Contractor: DSBP Consultants, an international consultancy firm specializing in sustainable growth projects and bilateral collaborations, contributed to this project. Mrs Daisy Zhang (MSc), serving as Project Manager, and Ms Julia Seidel (MA), acting as Project Advisor, supported the survey questionnaire design, managing the technical aspects of the online webinar, and contributed to the development of the webinar report, under the guidance of Dr Ding Shuang.

Appendix I Pre-Webinar Survey Questions

1. Contact Details

Name

Email Address

Job Title

Gender

☐ Female

☐ Non-binary/Non-conforming

☐ Male

☐ Transgender

☐ Prefer not to say

Ministry/Organization

☐ Government

☐ Research institution/Institute of Higher Learning

☐ Private institution

☐ International organization

☐ Industry association

☐ Others

Economy

☐ Australia

☐ Brunei Darussalam

☐ Canada

☐ Chile

☐ the People's Republic of China (China also acceptable)

☐ Hong Kong, China

☐ Indonesia

☐ Japan

☐ the Republic of Korea

☐ Malaysia

☐ Mexico

☐ New Zealand

☐ Papua New Guinea

☐ Peru

☐ the Republic of the Philippines (the Philippines also acceptable)

☐ the Russian Federation (Russia also acceptable)

☐ Singapore

☐ Chinese Taipei

☐ Thailand

☐ the United States of America (the USA, the US or the United States also acceptable)

☐ Viet Nam

Experience

From 1-5 with 1 being the most, rate your organization's experience working with "Product Circularity":

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

2. Current Practices

a. Is there an existing policy or initiative on an economy-wide level related to product circularity data in your economy?

☐ Yes

☐ No

☐ No, but we are in the midst of developing it

b. Is there an existing standard on an economy-wide level related to product circularity data in your economy?

☐ Yes

☐ No

☐ No, but we are in the midst of developing it

c. When dealing with standards for the exchange of product circularity data, what specific aspects should be taken into consideration? Please select all that apply and rank them, with 1 being the most significant and 5 being the least significant.

☐ Recyclability Rate During Production: Percentage of a product's components that can be recycled during production.

☐ Life Cycle Assessment (LCA): An evaluation of a product's environmental impact from creation to disposal

☐ Circular Design Score: Measure of product design's sustainability and circularity

☐ Post-consumption Recyclability Rate: Rate of recyclability after consumer use.

☐ Material Composition and Flow: Analysis of materials' composition and their movement.

☐ Closed-Loop Supply Chain: A system where products are recycled or reused within the production cycle. _____

☐ Others (please specify): _____

d. Do you apply standards related to product circularity within your organization, if applicable?

☐ Yes, please specify: _____

☐ No

☐ No, but we are considering applying them later

e. If your organization implements circular economy practices, how is product circularity data currently collected and shared in your organization? Please indicate if these practices are mandatory or voluntary.

☐ Through government-led initiatives

   o mandatory

   o voluntary

☐ Industry associations and collaborations

   o mandatory

   o voluntary

☐ Research institutions and academia

   o mandatory

   o voluntary

☐ Private sector partnerships

   o mandatory

   o voluntary

☐ Others (please specify): _____

   o mandatory

   o voluntary

f. If your organization implements circular economy practices, what types of applications or tools are currently utilized for standardising the product circularity data exchange in your organization? Please select all that apply and optionally share by name.

☐ Data management software: _____

☐ Digital platforms for data sharing: _____

☐ Blockchain technology for data verification: _____

☐ Internet of Things (IoT) devices for data collection: _____

☐ Mobile applications for data reporting: _____

☐ Others:_____

☐ Prefer not to share.

Feel free to share as much or as little detail as you are comfortable with.

g. Do you have any concerns that sharing the information in (f) will interfere with your company's competitive position?

☐ Yes, please specify: _____

☐ No

3. Challenges and Barriers

a. Please rank the following factors based on their influence to form an effective standard on product circularity data exchange in your organization, with 1 being the most significant and 9 being the least significant.

☐ Limited access to technology and innovations

☐ Lack of funding and resources

☐ Regulatory barriers

☐ Limited scalability, flexibility and adaptability

☐ Lack of collaboration and networking

☐ Lack of awareness and education

☐ Unable to balance diverse stakeholder interests

☐ Concerns about the data privacy and security

☐ Others (please specify): _____

☐ Not applicable

4. Support and Solutions

a. What type of support or resources would be beneficial for advancing formatting standards of product circularity data exchange efforts in your organization? Please select all that apply.

☐ Collaboration with partners for technology access and experience sharing

☐ Funding for data infrastructure development

☐ Compliance guidance and regulatory support to facilitate formatting standards

☐ Policy benefits or subsidy programs

☐ Open and inclusive dialogue among stakeholders

☐ Training and capacity building

☐ Access to data-sharing platforms and tools, for example, government-funded initiatives

☐ Access to robust data privacy measures and transparency practices

☐ Others (please specify): _____

b. In your opinion, what strategies could facilitate the formation of standards for product circularity data exchange, with 1 being the most significant and 6 being the least significant.

☐ Develop clear and standardized formats for different types of circularity data.

☐ Acquiring raw data from their own database or other databases7

☐ Establishing data protocols to specify how circularity data should be collected, recorded and reported.

☐ Providing financial incentives for data sharing.

☐ Developing data-sharing platforms.

☐ Enhancing technical capabilities through training.

☐ Describing circularity value of their product to customers.

☐ Others (please specify):_____

Please feel free to share any other comments.

5. Best Practices and Lessons Learned

a. Have you encountered any successful practices or experiences related to product circularity data exchange in your economy that you would like to share?

☐ Yes (Please provide details, or attach the relevant files behind): _____

_____

_____

☐ No

b. Have you heard of any initiatives worldwide, for example, the Product Circularity Data Sheet (ISO 59040 Product Circularity Data Sheet PCDS), Digital Passport or any other specific best practices?

☐ Yes (Please provide details, or attach the relevant files behind):_____

_____

_____

☐ No

6. Additional Comments

a. Is there anything else you would like to share regarding product circularity data exchange or related initiatives?

_____

_____

_____

Appendix II The Summary of the Survey Results

The survey on product circularity data exchange across APEC economies reveals a diverse landscape characterized by varying stages of development in implementing circular economy practices. While many economies are in the process of formulating policies and initiatives, there exists a notable gap between policy formulation and effective implementation, particularly in establishing standardized approaches. Industry associations, collaborations, and research institutions play crucial roles in data dissemination, but a comprehensive, overarching standard and protocol for facilitating collection are noticeably absent.

Appx II.I Key Findings

Developmental Diversity: APEC economies are at different stages in addressing product circularity, indicating a need for coordinated efforts to bridge existing gaps.

Policy-Implementation Gap: Despite ongoing policy formulation, there is a significant challenge in translating these policies into effective implementation, especially in establishing standardized approaches.

Role of Stakeholders: Industry associations, collaborations, and research institutions are instrumental in data dissemination, but a lack of a comprehensive standard and protocol hinders their effectiveness.

Technology and Regulatory Support: Access to technology, government support, and regulatory guidance are identified as critical factors for establishing robust product circularity standards.

Data Sharing Challenges: Sensitivity around data sharing poses a challenge, indicating constraints in disseminating information in the field.

Adoption Divide: There is a divide in the adoption of standards among organizations, with some considering their application at a later stage or not at all.

Practices within Organizations: Data sharing within organizations is primarily facilitated through voluntary practices, with digital platforms and mobile applications emerging as predominant tools for standardizing product circularity data exchange.

Challenges and Barriers: Funding limitations, technology constraints, and awareness deficiencies present obstacles that need to be addressed for effective product circularity data exchange.

Appx II.II Recommendations

Regulatory Support: Emphasize the need for regulatory support to facilitate the effective implementation of circular economy practices.

Government Engagement: Encourage active engagement with governments to align policies and initiatives with international benchmarks.

Incentivizing Adoption: Propose incentives for organizations to adopt standardized approaches and practices in product circularity.

Technology Access: Highlight the importance of providing technology access to overcome barriers in implementing circular economy standards.

Knowledge-Sharing Approach: Advocate for a collaborative, knowledge-sharing approach to encourage flexible implementation of standards, considering the diverse stages of development across organizations and economies.

In conclusion, the survey lays the foundation for informed decision-making and collaborative efforts to enhance product circularity data exchange practices within the APEC region. It provides valuable insights that emphasize the importance of regulatory support, collaboration, and knowledge-sharing in developing effective standards, serving as a guide for advancing product circularity goals in APEC economies.

Appendix III Webinar Agenda

Agenda of Day 1			
07:00-10:00 UTC on Dec 6, 2023(15:00-18:00 BJT on Dec 6, 2023)			
No	Time	Main activities	Keynote speaker
Session 1: Welcome and Opening Address			
1	15:00-15:10BJT 07:00-07:10UTC	Roll call and rules for webinar	Moderator, Dr Ding Shuang; Representatives
Session 2: Opening Remarks			
2	15:10-15:15BJT 07:10-07:15UTC	Opening Remarks by Deputy Director Multilateral Cooperation Division | International Cooperation Department, State Administration for Market Regulation (SAMR)	Ms Yuhan Wang (China)
3	15:15-15:20BJT 07:15-07:20UTC	Opening Remarks by Chairperson of ISO/TC323	Ms Catherine Chevauché (France)
Session 3: Keynote Speeches (Each speaker has 30 minutes for their presentation, including a 5-minute Q&A session.)			
4	15:20-15:50BJT 07:20-07:50UTC	Keynote speech 1: Experience and standards on improving product circularity data exchange in Thailand	Ms Witchuda Daud & Ms Nudjarin Ramungul (Thailand)
5	15:50-16:20BJT 07:50-08:20UTC	Keynote speech 2: How to improve circularity of municipalities in Chile? A data exchange issue.	Dr Jean Pierre Doussoulin (Chile)
6	16:20-16:50BJT 08:20-08:50 UTC	Keynote speech 3: The introduction of ISO/DIS 59040 Product Circularity Data Sheet	Mr Jerome Petry (Luxembourg)
16:50-17:00BJT 08:50-09:00UTC Tea Break			
Session 4: Panel Discussion 1			
8	17:00-17:50BTJ 09:00-09:50UTC	Topic 1: How to improve the APEC economies' standards on product circularity data exchange and align with the future ISO standard	Panel discussion organizer: Ms Mo Zhang (China) Members: Ms Catherine Chevauché Ms Witchuda Daud & Ms Nudjarin Ramungul Dr Jean Pierre Doussoulin Mr Jerome Petry Other active representatives in the meeting.
Session 5: Closing of the first Meeting Day			
9	17:50-18:00BTJ 09:50-10:00UTC	Summary by the organizer. Closing of the first meeting day	Dr Ding Shuang

No	Time	Main activities	Keynote speaker
**Agenda of Day 2**
**07:00-10:00 UTC on Dec 7,2023(15:00-18:00 BJT on Dec 7, 2023)**

Agenda of Day 2

07:00-10:00 UTC on Dec 7,2023(15:00-18:00 BJT on Dec 7, 2023)

No	Time	Main activities	Keynote speaker
Session 1: Welcome and Opening Address		
1	15:00-15:10BJT 07:00-07:10UTC	Roll call and rules for webinar	Moderator, Dr Ding Shuang; Representatives
Session 2: Keynote Speeches (Each speaker has 30 minutes for their presentation, including a 5-minute Q&A session.)		
2	15:10-15:40BJT 07:10-07:40UTC	Keynote speech 1: Supporting companies to exchange product circularity data cost-effectively	Mr Douglas Mulhall (Canada)
3	15:40-16:10BJT 07:40-08:10UTC	Keynote speech 2: Presentation on analysis of the pre-survey results	Dr Ding Shuang (China)
16:10-16:20BJT 08:10-08:20UTC Tea Break		
Session 3: Panel Discussion 2&3		
4	16:20-17:00BTJ 08:20-09:00UTC	Topic: How to support companies to exchange product circularity data cost-effectively in APEC region	Panel discussion organizer: Mr Douglas Mulhall (Canada) Members: Ms Witchuda Daud & Ms Nudjarin Ramungul Dr Jean Pierre Doussoulin Mr Zongguo Wen Other active representatives in the meeting
5	17:00-17:40BTJ 09:00-09:40UTC	Topic: Brainstorm and Recommendations on policymaking, standards developing, good practices, good tools for APEC economies to support the product circularity data exchange	Panel discussion organizer: Mr Zongguo Wen (China) Members: Ms Witchuda Daud & Ms Nudjarin Ramungul Dr Jean Pierre Doussoulin Mr Douglas Mulhall Other active representatives in the meeting
16:50-17:00BJT 08:50-09:00UTC Tea Break		
Session 4: Panel Discussion 1		
6	17:40-17:50 BTJ 09:40-09:50UTC	Draft of the recommendations	Draft teams
Session 5: Closing of the second Meeting Day		
7	17:50-18:00BTJ 09:50-10:00UTC	Summary by the organizer. Closing of the meeting	Dr Ding Shuang (China)