Reaction to COVID-19: Strengthening Quality Infrastructure for Energy Efficiency of Lighting Products in Buildings in the APEC Region

APEC Sub-Committee on Standards and Conformance

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APEC Project: SCSC 01 2022A

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APEC#224-CT-04.1

Background

Project Motivation and Description

This project stems from recognizing the pressing issues of economic growth, energy security, and climate change in the APEC region. In 2007, APEC leaders made a significant commitment through the Declaration of Sydney, acknowledging the close connection between these challenges. They emphasized the need for low-carbon energy solutions. In 2010, the APEC Ministers of Energy also agreed to boost energy efficiency and clean energy supply in the region.

This commitment continued with the APEC Connectivity Blueprint in 2014, followed by the Putrajaya Vision 2040 in 2020, which serves as a guide for APEC's future work. These efforts align with APEC's focus on climate change in 2022.

This project's goal is to make sure that we have the right quality standards for energy-efficient lighting in buildings. Currently, the standards for lighting products don't consider important aspects like energy use and CO_2 emissions. As a result, we're not taking full advantage of technology to reduce energy consumption and emissions in buildings. Having the right quality standards will not only help us recover from the COVID-19 pandemic but also ensure our energy sources are sustainable.

This project also ties in with APEC's commitment to innovation and sustainable growth, aiming to create a circular economy within building practices through better energy standards. In simple terms, the project supports the goals set in the Declaration of Sydney, the Ninth APEC Energy Ministers Meeting, and other APEC initiatives aimed at a more sustainable future.

Objectives

The main goal of the project was to conduct detailed discussions, share information, and analyze best practices related to quality infrastructure for energy-efficient lighting products in buildings. Standardization played a crucial role in establishing guidelines for the energy consumption and CO_2 emissions of these products. This was in line with the APEC "Low-Carbon Town" concept and guidelines.

Workshop Participants and Structure

All 21 APEC member economies were welcomed and invited to attend and actively participate in the Workshop.

Nominations for this event were sought from Sub-Committee on Standards and Conformance (SCSC)/technical committee/ Domestic Standardization Agency representatives.

APEC funded up to one active expert participant from each APEC travel-eligible economy. The APEC travel-eligible economies were Chile; China; Indonesia; Malaysia; Mexico; Papua New Guinea; the Philippines; Peru; Russia; Thailand; and Viet Nam. Representatives from

non-travel-eligible economies were very much encouraged to attend the Workshop on a self-funded basis.

One expert from the Association of Indonesian Integrated Lighting Manufacturing Industries (GAMATRINDO), one expert from The Testing Laboratory - PT Vertex Global Indonesia, and ten delegates representing five APEC economies attended the Workshop. Representatives from the National Standardization Body of Indonesia (BSN) provided opening remarks. The APEC economies represented China; Indonesia; Malaysia; Thailand; and Viet Nam.

BSN invited two experts from GAMATRINDO and PT Vertex to shed light on "Strengthening Quality Infrastructure for Energy Efficiency of Lighting Products in Buildings in the APEC region." The topics covered included:

1. Identification of Elements Affecting Energy Efficiency:
   The experts delved into the factors that influence energy efficiency within the context of building lighting products. They explored how various elements impact energy consumption and efficiency.
2. Estimation of Opportunities for Energy Efficiency Improvement:
   Furthermore, the experts provided insights into estimating opportunities for enhancing energy efficiency. They discussed methods and strategies for improving energy efficiency in lighting products used in buildings.

In addition to these presentations, BSN also welcomed a representative from PT Vertex to address the following areas:

1. Significance of Energy Efficiency in Building Lighting:
   The speaker highlighted the importance of energy efficiency in building lighting and its broader implications. They emphasized how energy-efficient lighting contributes to overall energy conservation and sustainability.
2. Existing Measurement Methods for Lighting Energy Efficiency (IEC Standard):
   The presentation delved into the existing measurement methods and standards, particularly those defined by the International Electrotechnical Commission (IEC). It provided an overview of standardized approaches to measuring lighting energy efficiency.
3. Inclusion of Energy Efficiency Aspects in Electrotechnical Publications:

Finally, the speaker discussed incorporating energy efficiency aspects into electrotechnical publications. This aspect emphasized integrating energy efficiency considerations into industry publications and guidelines.

Through these presentations, BSN aimed to enhance participants' understanding of energy efficiency in building lighting products and provide valuable insights into factors affecting efficiency, improvement opportunities, measurement standards, and the broader significance of energy-efficient lighting in the APEC region.

Workshop Summary

A two-day workshop held on 25-26 September 2023, in Bali, Indonesia, marked a significant milestone in enhancing energy efficiency in buildings. Improving energy efficiency is crucial to sustainable economic recovery after the COVID-19 pandemic. However, despite the recognized technical potential of quality infrastructure for energy efficiency in lighting products, the expected reductions in energy consumption and CO_2 emissions have not been achieved. Therefore, this project was initiated as a workshop to identify opportunities for improvement in quality infrastructure for energy efficiency in lighting products in buildings.

During this Workshop, participants aimed to identify the best improvement opportunities that can serve as input or reference for subsequent projects related to technical training. Improvements in this quality infrastructure are expected to contribute to sustainable energy security and a sustainable economic recovery after the COVID-19 pandemic. The Workshop served as a platform for sharing information and analyzing technical best practices to enhance technical capacity in quality infrastructure for energy efficiency in lighting products. This event was held in person in Bali, Indonesia, in July 2023, spanning two full days.

The project's objective was to facilitate a detailed and precise discussion by gathering or sharing information and analyzing technical best practices regarding quality infrastructure for energy efficiency in lighting products in buildings. Standardization played a crucial role in this project, particularly concerning requirements for energy consumption limits and CO_2 emission limits to support the APEC "Low-Carbon Town" (LCT) concept (Fifth edition) and APEC Low-Carbon Town Indicator System Guideline (First Edition). Thus, this Workshop served as a forum for technical discussions and a concrete step toward APEC's sustainable emissions reduction goals and enhanced energy efficiency in buildings.

Opening Remarks from BSN

Dr. Agustinus Praba Drijarkara, M.Eng, Director of Laboratory Accreditation at the National Standardization Agency (BSN), warmly welcomed the workshop participants. Mr. Praba explained BSN's organizational business processes and hoped participants would engage in productive discussions to achieve the Workshop's goals.

The National Standardization Agency (BSN) is closely related to the objectives of this project. The project aims to conduct a detailed and precise discussion by gathering and sharing information and analyzing technical best practices described for quality infrastructure for energy efficiency in lighting products in buildings. In this context, standardization plays a relevant role. BSN, as the domestic standardization body, is responsible for developing and implementing energy consumption limits and CO_2 emissions standards. These standards are essential guidelines in supporting the APEC "Low-Carbon Town (LCT)" concept, fifth edition, and the APEC Low-Carbon Town Indicator System Guideline, first edition. Thus, BSN plays a crucial role in ensuring these standards are consistently applied to achieve energy efficiency and reduce carbon emissions in the building lighting sector.

Workshop Objectives and Agenda Overview

Mr. Dhandy Arisaktiwardhana, a doctorate in innovation economics in standardization from Technische Universität Berlin (TU Berlin), Germany, served as a middle expert standardization analyst in the Directorate of Laboratory Accreditation. He was also the Project Overseer for this project. Mr. Arisaktiwardhana explained the Workshop's objectives and agenda and then requested participants to provide brief discussions.

Presentation 1: Challenges In Lighting Industry In Indonesia

The discussion focused on the challenges facing the lighting industry in Indonesia. It was part of the "Strengthening Quality Infrastructure for Energy Efficiency of Lighting Products in Buildings in the APEC region" workshop, held in Bali on 25 September 2023. Erri Krishnandi, ST., MBA, led the discussion, representing GAMATRINDO, the Indonesia Integrated-Lamp Manufacturing Association.

The first topic discussed was the history of the lighting industry in Indonesia, dating back to 1970 when Furnace and glass bulb Factories were founded for Incandescent Lamps. Over the years, the industry shifted its focus to LED lighting and diversified its product offerings related to LED lighting. GAMATRINDO, comprising nine member companies, was primarily located in Java.

The discussion also delved into GAMATRINDO's role in addressing the lighting market dynamics. The forum included efforts to modernize equipment and localize components, thereby rationalizing the industry. The conversation emphasized the need for new machinery and equipment to manufacture LED lamps and suggested partnerships with domestic or overseas electronics component companies.

Market penetration strategies, encompassing regular markets (domestic and export), brand recognition, and controlled markets involving government and state-owned projects, were discussed. The most significant users of lamps were households with a 450 VA power supply, while government use was comparatively minimal.

Policies and standardization were significant aspects of the discussion, focusing on the technical and non-technical elements affecting energy efficiency. Challenges emerged, such as the affordability of LED lamps compared to traditional HPS lamps used by the government and the need for LED lamps to meet energy efficiency standards.

The discussion touched upon the potential revisions of standards and regulations and the involvement of laboratories in testing safety and performance. Critical issues faced by LED lamp manufacturers included various lamp designs, semiconductor shortages, and the increasing demand for LED lamps with DC. The discussion also addressed standards, stability time, dimensions, and rated flux issues. Suggestions were made to enhance energy efficiency, such as improving the quality of components, utilizing clear glass LED filament lamps, and adopting DC voltage for building lighting.

In conclusion, the discussion highlighted the phased-out status of CFLs due to mercury content, while LED lamps were continuously evolving, presenting energy efficiency

opportunities. Recommendations included ongoing evaluation of standards, identifying required equipment for testing laboratories and initiating communication with relevant ministries for detailed HS codes for LED lamps in the market.

This comprehensive discussion provided insights into the challenges and opportunities in the Indonesian lighting industry, reflecting the ongoing efforts to enhance energy efficiency and product standards.

Presentation 2: Energy Efficiency of Lighting Products in Building

The presentation, delivered by Mr. Kasim from PT Vertex Indonesia, focused on "Energy Efficiency of Lighting Products in Building." The contents of the presentation were organized as follows:

1. Significance of energy efficiency of lighting in building: Mr. Kasim emphasized the importance of energy efficiency in lighting, pointing out that building operations accounted for a significant portion of global energy consumption and emissions. Lighting, in particular, could contribute to 25-40% of a building's energy consumption. The presentation highlighted the increasing adoption of LED lighting technologies and the employment of Minimum Energy Performance Standards (MEPS) globally, covering a substantial part of the world's lighting energy consumption.

2. Existing Lighting Energy Efficiency Measurement (IEC Standard): The presentation discussed the existing standards for measuring the energy efficiency of lighting. It mentioned IEC standards such as IEC 60969 for CFL (Compact Fluorescent Lamp) and IEC 62612 for LED. These standards included measurements for luminous flux and wattage, setting specific requirements for testing, and ensuring that lighting products met the defined efficiency standards.

3. Inclusion of energy efficiency aspects in electrotechnical publications (IEC Guide 118 as reference): The presentation introduced the concept of energy efficiency, which related the output of an activity (in this case, lighting measured in Lumens) to its energy input (electricity in wattage). It emphasized the importance of a systems approach to optimize energy efficiency and discussed the role of IEC publications in including energy efficiency aspects. It categorized aspects to consider, such as defining, measuring, assessing, improving, and enabling energy efficiency.

The presentation concluded by highlighting the impact of lighting energy consumption in buildings, the role of IEC standards, and the need for innovation in energy efficiency standardization. It encouraged the adoption of a structured and systems approach to address energy efficiency challenges in lighting products, which was crucial for reducing energy consumption and emissions.

Overall, the presentation provided a comprehensive overview of the significance of energy efficiency in lighting and the standards and considerations for measuring and improving energy efficiency in lighting products.

Presentation 3: Common Barriers and Best Practices of Energy Efficiency Testing Standards for Lighting

The presentation by Nandita Harmina and David Harmanditya from the National Standardization Body (Badan Standardisasi Nasional or BSN) in Indonesia focused on "Common Barriers and Best Practices of Energy Efficiency Testing Standards for Lighting." The presentation covered various aspects of standardization, energy-efficient lighting, and the challenges faced in implementing these standards.

Introduction and Brief History of BSN: The introduction outlined BSN's role as Indonesia's domestic standardization and conformity assessment body. It briefly touched on the organization's history, emphasizing the legal reinforcement through laws and regulations in recent years.

System of Standardization and Conformity Assessment: The presentation explained the standardization and conformity assessment system, highlighting the role of these processes and introducing the concept of the domestic standard of Indonesia (SNI). It emphasized SNI development principles, including openness, transparency, consensus, and effectiveness.

SNI Development Process: The presentation outlined the five-step process involved in developing SNIs, involving BSN and various stakeholders. It noted the adoption of ISO/IEC Guide 21-2 into BSN regulations.

SNI Related to Energy-Efficient Lighting: The presentation highlighted several SNIs related to energy-efficient lighting, including those for fluorescent lamp starters, ballasts, LED modules, and their safety and performance requirements.

Benefits of Energy-Efficiency Lighting: The benefits of energy-efficient lighting were discussed, encompassing reduced energy consumption, lower electricity bills, extended product lifespan, improved lighting quality, and environmental advantages, such as reduced heat emission.

Quality Infrastructure and Technical Regulation Related to Lighting Products: The presentation detailed the role of testing laboratories and certification bodies, listing several entities involved in quality infrastructure and technical regulation related to lighting products.

Implementation of Energy-Efficient Lighting Standards: The presentation discussed the implementation of energy-efficient lighting standards, focusing on product certification using the SNI mark for various lighting products.

Challenges to Standard Implementation: Several challenges to the effective implementation of energy-efficient lighting standards were identified, including a lack of awareness, consumer behavior and cost considerations, limited testing facilities, high testing, and certification costs, the need for harmonizing standards with government policies on energy efficiency, and enforcement and compliance issues.

Conclusion: The presentation reiterated the benefits of energy-efficient lighting while acknowledging the challenges in implementing these standards. It emphasized the need for awareness-raising, expanding testing facilities, cost mitigation, policy alignment, enforcement, periodic review, industry engagement, and public-private partnerships to address these challenges effectively.

The presentation provided a comprehensive overview of energy-efficient lighting standards, their importance, the standards development process, and the challenges and recommendations for their successful implementation in Indonesia.

Presentation 4: The Standardization System implemented in China (PRC)

Cui Yan's presentation from the China Association for Standardization (CAS) focused on the standardization system implemented in China (PRC). The Chinese Standard System comprises government-issued standards, which include local, sector, and domestic standards, as well as market-driven standards such as association and enterprise standards.

Within the voluntary standards category were local, sector, and domestic standards, while mandatory standards were primarily domestic.

The presentation highlighted several Chinese Domestic Standards (GB) related to energy efficiency, which were crucial in various sectors. GB standards are the China domestic standards, also called as Guobiao Standards, China GB standards are classified as two stages, Mandatory or Recommended. Mandatory standards have the force of law as do other technical regulations in China. They are enforced by laws and administrative regulations and concern the protection of human health, personal property and safety. All standards that fall outside of these characteristics are considered Recommended standards. China GB standards can be identified as Mandatory or Recommended by their prefix code, Prefix code GB are Mandatory standards, GB/T are Recommended standards (Quasi-Mandatory standards). The GB standards system in China is administered at the top by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) and headed primarily by the Standardization Administration of China (SAC). Other governmental and private sector organizations provide a significant amount of additional input and participate in the standards process, Main Organizations include: General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), Standardization Administration of China (SAC), China Association of Standardization (CAS), China National Institute of Standardization (CNIS) and Standards Press of China (SPC).

GB 29144-2012 is an energy efficiency standard that sets the minimum permissible energy efficiency values and levels for self-balancing electrodeless fluorescent lamps used in public lighting services. GB 30255-2019 specified similar criteria for LED products used in indoor lighting. GB 37478-2019 focused on LED luminaires for road and tunnel lighting, defining energy efficiency values and grades. Lastly, GB 31276-2014 addressed energy efficiency for tungsten halogen lamps.

Chinese domestic standards (GB/T) were also discussed. These standards encompassed technical specifications, requirements, and testing methods for energy efficiency and lighting.

For instance, GB/T 31960.9-2016 dealt with power energy efficiency monitoring systems, while GB/T 31348-2014 set technical requirements for measuring and verifying energy savings in lighting systems.

Additionally, GB/T 32038-2015 provided monitoring and testing methods for energy-saving illumination engineering, and GB/T 26186-2010 and GB/T 22706-2008 outlined performance requirements for cold cathode fluorescent lamps and self-ballasted cold cathode fluorescent lamps, respectively. GB/T 34498-2017 pertained to tungsten cathode materials for laser lamps.

Chinese sector standards (SN/T) were also introduced, specifically SN/T 3326. x, which covered technical requirements for inspecting lighting apparatus related to energy efficiency in import and export scenarios.

Lastly, the presentation mentioned Chinese Association Standards, exemplified by the T/JSIES 005-2021 standard from the Jiangsu Association of Lighting Industry, which focused on high-efficiency and energy-saving LED tunnel lighting luminaires designed for high-speed railways.

In summary, Cui Yan's presentation shed light on China's comprehensive standardization system, emphasizing the importance of domestic and sector-specific standards in regulating and promoting energy efficiency in various lighting products and systems. These standards played a crucial role in ensuring the quality and performance of lighting equipment in the Chinese market.

Summary Observation and Takeaways

The Workshop served as a platform for valuable insights and knowledge sharing among its diverse participants in the short term. Notable organizations like the China Association for Standardization (CAS), the Energy Commission of Malaysia (EC), the Thai Industrial Standards Institute (TISI) under the Ministry of Industry, the Directorate for Standards, Metrology and Quality of Viet Nam (STAMEQ), and the National Standardization Agency of Indonesia (BSN) actively participated. Their engagement increased the understanding of energy efficiency testing for lighting products.

Furthermore, the workshop effectively consolidated information regarding energy efficiency testing for two fundamental lighting technologies: Compact Fluorescent Lamps (CFLs) and Light Emitting Diodes (LEDs). By imparting comprehensive insights into the intricacies of testing procedures, it empowered participants with well-rounded knowledge in these critical areas.

The Workshop also shared practical case studies and best practices for implementing technical standards and regulations for energy efficiency in lighting products. This exchange of experiences spanned across Indonesia and China, enriching the participants' grasp of the subject matter.

Looking ahead to the medium and long term, the Workshop made a significant recommendation. It advised that the International Electrotechnical Commission Technical Committee 34 (IEC TC 34) consider leveraging IEC Guide 118 as a reference tool. IEC Guide 118 would help evaluate the readiness of IEC 60969 and IEC 62612 as performance testing standards for CFLs and LEDs. The primary objective is to ensure the sustainable implementation of these standards, resulting in reduced energy consumption and lower CO_2 emissions.

Another crucial long-term recommendation emphasized organizing training sessions for laboratory personnel and technical committees. These training initiatives would focus on testing energy efficiency for LED products, aligning with standards like IEC 62612, IEC 62722-1, and IEC 62722-2-1. The ultimate goal is to enhance the expertise of professionals in this field, thus ensuring high-quality standards are consistently upheld.

Addressing potential ambiguities, the Workshop sought clarification from IEC TC 34. Specifically, it aimed to determine the suitability of employing IEC 62612 for testing decorative LED lamps. The absence of a defined category for decorative LED lamps in IEC 62612 has raised questions, especially when these lamps share similarities with general lighting specifications. Clarification in this regard is seen as an essential step forward.

Next Steps

The workshop recommendations indicate several important points for consideration:

1. The Workshop recommended that the International Electrotechnical Commission Technical Committee 34 (IEC TC 34) use the IEC 118 Guide as a reference to assess the readiness of IEC 60969 and IEC 62612 as performance testing standards for CFLs and LEDs. The aim is to determine whether these standards are well prepared for sustainable use, thereby contributing to reducing energy consumption and CO_2 emissions.

   IEC Guide 118 considers energy efficiency aspects when preparing IEC publications. The objectives are to explain the contribution of IEC publications to energy efficiency, describe the concept of energy efficiency aspects, and provide categories of energy efficiency aspects and a list of energy efficiency aspects that need to be considered by the technical committee. Some of the benefits of the IEC 118 Guide are as follows:
   - Help align approaches to energy efficiency;
   - increase awareness that provisions in IEC publications can affect the energy performance of the product itself (individually) and the entire application (in which the product is embedded), both negatively and positively;
   - assist the technical committee in identifying energy efficiency aspects that contribute to improving the energy efficiency of the product itself and the overall application;
   - encourage the use of a systematic approach in dealing with energy efficiency in the context of standardization;

- Encourage using a systems approach when dealing with aspects of energy efficiency in the context of standardization.

2. Another recommendation from this Workshop is to hold training sessions for laboratory personnel and technical committees. This training will be designed to test the energy efficiency of LED products, explicitly focusing on standards such as IEC 62612, IEC 62722-1, and IEC 62722-2-1. This step is essential to ensure that accurate test methods are available to assess energy efficiency effectively. IEC 62612 is a performance testing standard for Swaballast LED lamps. IEC 62722-1 is the performance testing standard for luminaires. IEC 62722-2-1 is a performance testing standard for LED luminaires.

3. The Workshop also raised questions that need to be addressed by the International Electrotechnical Commission Technical Committee 34 (IEC TC 34). The question relates to the suitability of using IEC 62612 for testing decorative LED lamps. Even though IEC 62612 is the performance testing standard for Swaballast LED lamps. Concerns arise from the definition of general lighting in IEC 62612, which does not include specifications for decorative LED lighting.

Appendix 1: Workshop Agenda

Funded by the APEC Support Fund, specifically the ASF Energy Efficiency, Low Carbon, and Resiliency Measures (EELCER) sub-fund, this project aims to explore opportunities for enhancing the quality infrastructure associated with energy-efficient lighting products in buildings. The outcomes of this Workshop will provide valuable insights and references for future projects focused on technical training, ultimately contributing to a green recovery from the COVID-19 pandemic and promoting sustainable energy security.

The project's activities revolve around exchanging information and analyzing technical best practices, aiming to enhance the technological capabilities related to quality infrastructure for energy-efficient lighting products. The Workshop, scheduled for a two-day, in-person event in Bali, Indonesia, in July 2023, is expected to facilitate detailed and precise discussions. These discussions will encompass information sharing and examining technical best practices, notably concerning quality infrastructure in the context of energy-efficient lighting products in buildings.

The primary objective of this initiative is to foster in-depth and meticulous discussions that revolve around information sharing and the analysis of technical best practices concerning the quality infrastructure for energy-efficient lighting products in building applications. This endeavor is closely linked to standardization efforts, focusing on establishing requirements related to energy consumption and CO_2 emission limits. Such standards are designed to align with APEC's "Low-Carbon Town (LCT)" concept, as outlined in the Fifth edition, and the APEC Low-Carbon Town Indicator System Guideline, First Edition.

Workshop Agenda		
Time	Day 1	Day 2
0830 – 0900	Registration of Participants	
0900 – 0930	Welcome and Introductions 1. Director of Laboratory Accreditation - National Standardisation Agency of Indonesia (BSN)	Speaker 1 and 2: the Association of Indonesian Integrated Lighting Manufacturing Industries (GAMATRINDO) and the testing laboratory - PT Vertex Global Indonesia Erri Krishnadi Sukmana & Kasim 1) Discussion of previous Day's Results
0930 – 0945	Coffee Break	Coffee Break
0945 – 1200	Speaker 1 – the Association of Indonesian Integrated Lighting Manufacturing Industries (GAMATRINDO) Erri Krishnadi	1) Case study presentation by Speaker 3 regarding identification of common barriers and best practices of energy efficiency

	Sukmana 1) Identification of elements that affect energy efficiency 2) Estimation of opportunities for energy efficiency improvement 3) Qs and As	testing standards for lighting David Nicko Harmanditya & Nandita Harmina 2) Case study presentation by Speaker 4 regarding identification of common barriers and best practices of energy efficiency testing standards for lighting Joan C. Escalona 3) Qs and As.
1200 – 1330	Lunch	Lunch
1330 – 1500	Speaker 2: the testing laboratory - PT Vertex Global Indonesia Kasim 1) Evaluation of opportunities for energy efficiency improvement 2) Identification of energy efficiency improvement opportunities in testing standards for lighting products 3) Qs and As	Speaker 1 and 2: the Association of Indonesian Integrated Lighting Manufacturing Industries (GAMATRINDO) and the testing laboratory - PT Vertex Global Indonesia Erri Krishnadi Sukmana & Kasim 1) Recommendations Working Groups : Panel Discussion 2) Qs and As
1500 – 1515	Coffee Break	Coffee Break
1515 – 1600	Day 1 conclusion First day Survey	1) Recommendations 2) Closing Remarks 3) Second day Survey and 15-20 mins session to recap main learnings, recommendations and resources from the Workshop and facilitate discussion amongst participants on how they plan to apply them in their work, to achieve the medium to longer term goals.