Asia-Pacific
Economic Cooperation

Applying Digital Technology and Standards to Respond to the Impacts of Climate Change on Infrastructure

APEC Sub-Committee on Standards and Conformance

Recommendations Report

February 2020

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Executive Summary

The Recommendations Report for the 12th SCSC Conference is a summary of the findings of a project approved by the APEC Subcommittee on Standards and Conformance (SCSC). The project explored the topic of *Applying Digital Technology and Standards to Respond to the Impacts of Climate Change on Infrastructure.*

Climate change has the potential to cause extreme damage to the built environment, with research showing a distinct threat for the APEC region.[1] There is an opportunity to better utilise both digital technologies and international standards to help with climate change mitigation and adaptation.

This project brought together leading experts across the APEC region on digital technology, the built environment and climate change, with standards bodies and other key stakeholders. It facilitated knowledge sharing between member economies on standards for digital technologies, the built environment, and products and services that are within the context of climate change.

The project also highlighted areas in which APEC member economies can collectively focus efforts to increase the harmonisation of standards, reduce inefficiencies and improve the sustainability and maintenance of built environment investments over the short, medium and long term.

This Recommendations Report follows an APEC-wide Survey, Discussion Paper and Conference. It identifies specific recommendations that APEC member economies should consider to address the impacts of climate change on infrastructure.

1 http://news.trust.org/item/20171010030737-rqs41/

Key Recommendations

1

Consider the adoption and harmonisation of key climate change-related international standards

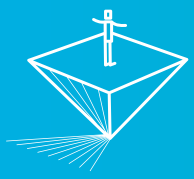
2

Develop case studies on successful standards and digital technology solutions from member economies

3

Share best practice on data use and management to assist in business case development

4



Consult the public and private sector to help raise awareness on standards for climate change resilience, identify future needs, and strengthen networks

5

Collaborate with the APEC Emergency Preparedness Working Group (EPWG) to develop a catalogue of climate change-related scenarios with recommended responses and prevention[1]

1 Read more about Key Recommendations on page 14

Introduction

Climate change has the potential to cause extreme weather conditions, damage natural resources, detrimentally affect the safety of communities and the security of nations, and adversely impact infrastructure, globally. The resulting damage and loss to transport, water resources, construction and telecommunications, especially in coastal environments, comes at a significant economic and social cost. It interrupts the movement of goods, services and people both within and between economies and prevents access to markets.

This is particularly important within the APEC region, where many member economies are exposed to the impacts of climate change. If you live in the Asia-Pacific region, the changes of being hit by a natural disaster are five times higher than any other region.[2]

APEC first committed to managing climate change in 1993. This pledge is captured in the APEC Economic Vision Statement:

> "Our environment is improved as we protect the quality of our air, water and green spaces and manage our energy resources and renewable resources to ensure sustainable growth and provide a more secure future for our people."[3]

Addressing the associated risks requires cooperation that traverses cross-cutting sectors and touches upon many economic, social, and environmental policy areas. The complexity of the risks can be felt when analysing the impacts of climate change on the built environment. The impacts of climate change on all forms of infrastructure are broad-reaching and have a variety of detrimental flow-on effects for APEC member economies.

Infrastructure is multifaceted and covers areas such as transportation, energy, water, digital, social and green infrastructure, and the built environment. Digital technologies and standards have both been identified as tools that can be used to respond to the impacts of climate change on the built environment.

This project brought together leading experts across the APEC region on digital technology, the built environment and climate change, with standards bodies and other key stakeholders. It facilitated knowledge and information sharing between member economies on digital and building standards, and products and services that aim to address climate change. In doing so, the project also highlighted areas in which APEC member economies can collectively focus efforts to increase the harmonisation of standards, reduce inefficiencies and improve the sustainability and maintenance of built environment investments over the short, medium and long term.

2 http://news.trust.org/item/20171010030737-rqs41/
3 https://www.apec.org/About-Us/About-APEC/Fact-Sheets/Climate-Change.aspx

Project Overview

As an APEC member economy at high risk of climate change events, this project was proposed and led by Papua New Guinea through their National Institute of Standards and Industrial Technology (NISIT). Standards Australia also assisted NISIT with the delivery of the project.

The project objective was to identify key areas of the built environment impacted by climate change, and help address these impacts through the proposed application of standards and digital technology. It looked at methodologies to improve the resilience of buildings and communities to respond to conditions such as rising water levels, extreme heat and wet weather, and an increased prevalence of climate related events including fires, floods and related disasters.

The project consisted of four key deliverables as per Figure 1 below.

Figure 1 – Deliverables

Survey

An APEC-wide survey was circulated to all APEC member economies from 4 April to 7 June 2019. The Survey was well supported by APEC with 88 responses from all 21 APEC member economies. Responses covered a broad mix of experts, including those from government and policy, National Standards Bodies, academia, building and construction, professional, scientific and technical services, electricity, gas, water and waste services, regulators, public administration, and education and training.

Key Findings

Figure 2 – Survey response

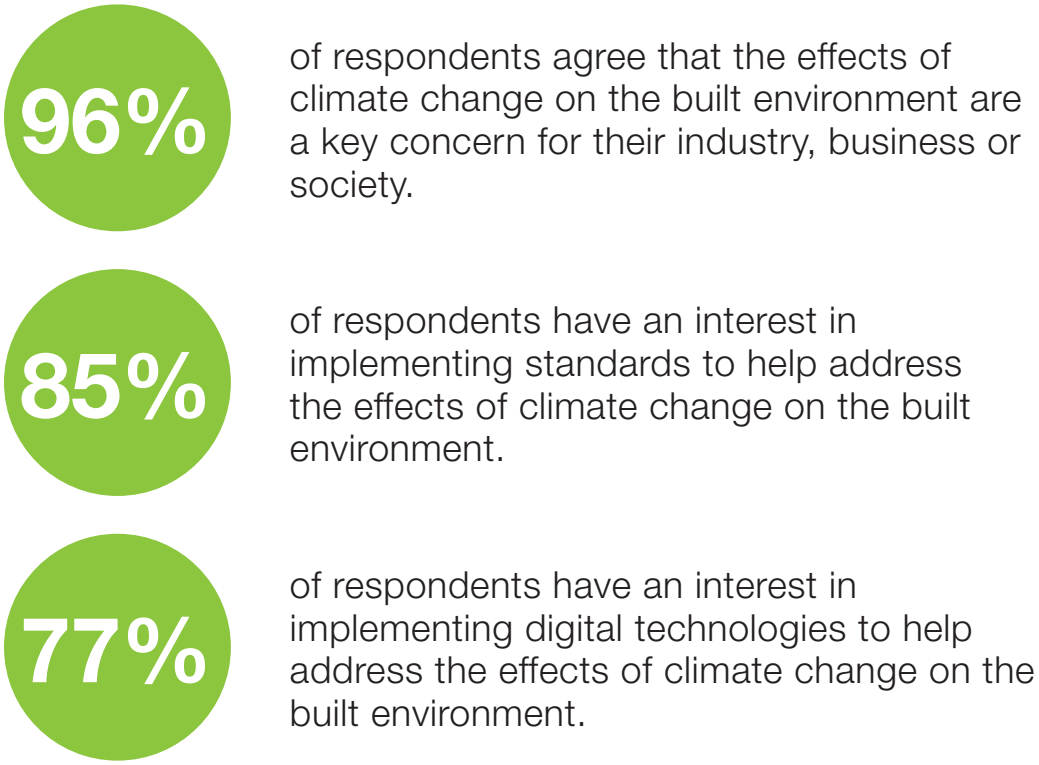


Figure 3 – Percentage of respondents concerned with the various risks of climate change

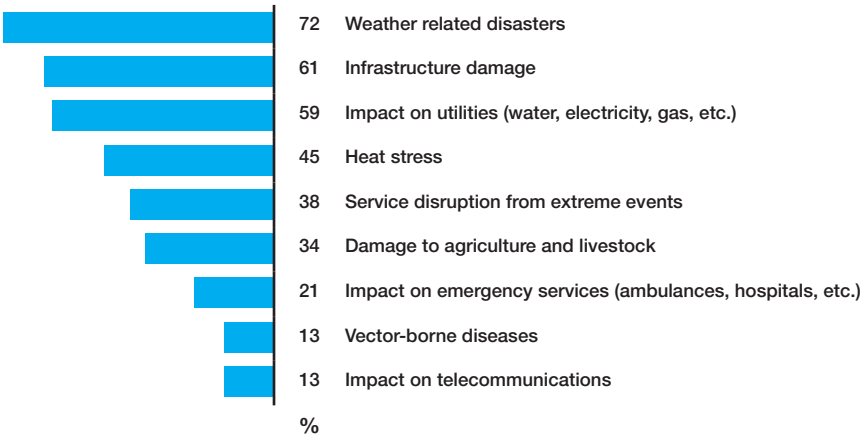


Figure 4 – Survey respondents' areas of concern

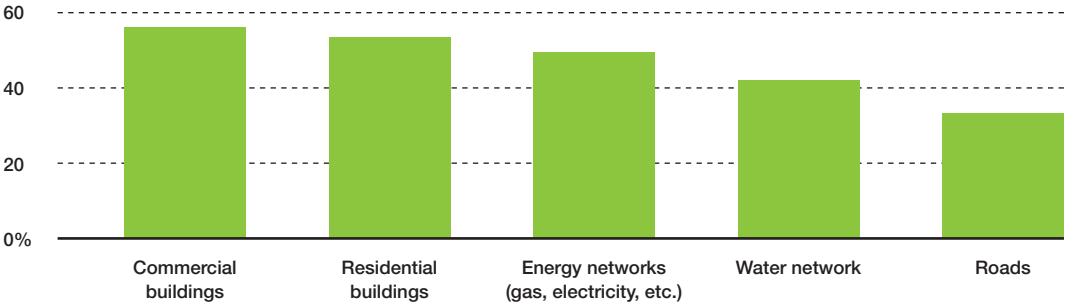
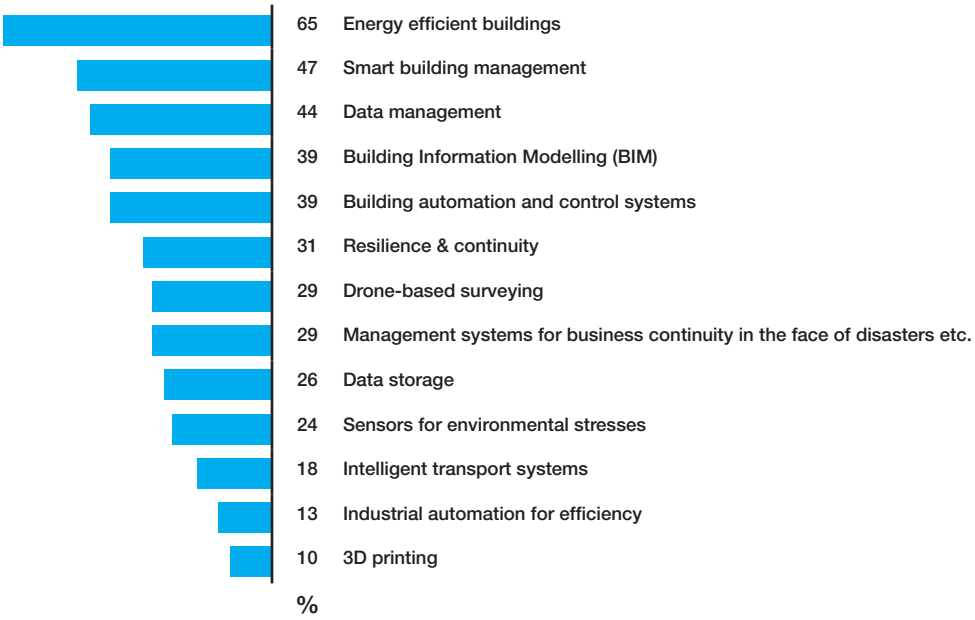


Figure 5 – Key digital technologies used to respond to the impacts of climate change on infrastructure



Discussion Paper

The Survey responses, along with independent research, helped inform the Discussion Paper. This paper was published in August 2019 prior to the Conference. The Discussion Paper:

- Examined the common issues, challenges and opportunities
- Explored the role both standards and digital technologies can play
- Provided background on APEC, APEC SCSC, and the project
- Shared key statistics and figures from the Survey
- Presented a table of the current international standards in use
- Presented a table of APEC participation on relevant technical committees

Key Findings

There is an important role for digital technologies and standards to play in preventing and responding to the impacts of climate change on infrastructure. International standards are globally recognised and developed through consensus by experts from a number of economies and backgrounds. They support interoperability between complex digital technologies, and they help ensure a return on investment.[4] International standards also help open global markets for clean energy and energy-efficient digital technologies, and support climate change adaptation and mitigation. They help industry take action in decreasing their impact, increasing energy efficiencies and establishing risk management processes.[5]

International standards are currently being adopted and implemented by APEC member economies, both related to the built environment and environmental management. Similarly, digital technologies of many forms are being used and explored by APEC member economies. However, many are not necessarily used with the intention of reducing the impacts of climate change, and many have not been successfully implemented. A number of challenges still remain.

Challenges with Digital Technologies

A major obstacle for implementing digital technologies related to climate change is cost and capacity. The procurement of digital technologies can be expensive to start with. Then, staff must be adequately trained or new staff must be hired with the correct technical expertise to operate and maintain these technologies over time.

The pace of change is another ongoing challenge. New technology can be slow to implement, yet fast to become obsolete. Equipment needs to be forward compatible to ensure interoperability and to avoid stranded infrastructure. However, systems are often added in an ad hoc manner over time and interoperability is an afterthought. At times businesses may find themselves locked into a single service provider. There is a need for greater coordination and change management to address these issues.

Lastly, awareness of digital technologies for climate change is low, from both a prevention and response perspective. Publicly available case studies and success stories are currently lacking but would be beneficial. For example, respondents noted that there is a lack of understanding on how data can be used for both climate change mitigation and adaptation to climate change.

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4 https://www.iso.org/files/live/sites/isoorg/files/developing_standards/docs/en/jtc1_mission_brochure_2014_final.pdf
5 https://www.iso.org/files/live/sites/isoorg//files/store/en/PUB100067.pdf

Challenges with Standards

Low participation levels in international standards development were identified as an obstacle to adopting and implementing related standards. Greater APEC member economy involvement and increased participation from industry and business in international standards development could help facilitate greater use of international standards related to environmental management and digital technologies.

Other challenges were identified in relation to the use of standards. The length of time for standards development was highlighted as an issue. As new research and knowledge emerges on climate change mitigation and adaptation, standards are not necessarily able to keep up with this pace. Similar to digital technologies, standards can also be slow to develop and implement, yet quick to become dated and in need of revision. Although efficiencies have been introduced to the development process, standards continue to be criticised for their time to market.

Lack of awareness and support for standards across government and industry was a common response. Training and promotion are needed to help raise the profile of standards. Many stakeholders are unaware of the availability of standards and lack the incentives to adopt standards. There is a gap in quantitative reporting on the benefits of standards, which makes it difficult to get buy-in.

It was also noted that standards writers find it challenging to address climate change in standards, whereas standards users find it challenging to apply new standards and consider climate change. This is an issue that has been identified directly by ISO and the international community, motivating the development of ISO Guide 84, *Guidelines for addressing climate change in standards.* This guide, which is still under development, will aim to:

- Enable standards committees to determine if the standard under consideration should take into account aspects, issues, risks and/or opportunities associated with climate change;
- Provide standards writers with a systematic approach to address climate change issues and opportunities in a coherent and consistent manner, with regard to both new and revised standards, and in a manner related to the objective and scope of the standard being developed;
- Promote consistency and compatibility to the extent practical among standards that directly or indirectly address climate change and their wider uptake in support of sustainability.[6]

Despite the challenges being faced by member economies, APEC SCSC will use the conference to consider this feedback and explore how the region can work together to tackle these challenges.

6 ISO Guide 84 draft

Conference

The Survey and Discussion Paper collectively shaped the agenda of the 12th SCSC Conference held on the margins of the 2019 APEC Senior Officials Meeting (SOM) 3 meeting in Puerto Varas, Chile on 18-19 August 2019.

Figure 6 – Conference attendance

Full Participants List included in **Annex A**.

Women represented 40% of the conference with 23 women in attendance. However, sourcing women to participate as speakers was a limitation of the conference, with only three females on the final agenda. The full agenda is included in this report in **Annex B**.

The conference also included cross-fora collaboration with the APEC Emergency Preparedness Working Group (EPWG) as well as participation from international organisations like ISO and IEC. Following the opening remarks, introduction and project overview, the conference was structured in three main sessions, along with two breakout sessions addressing challenges and solutions:

Session 1: Preventing the Onset of Climate Change

This session focused on international standards in use and under development for climate change adaptation and mitigation. This included standards that address the validation, verification and management of greenhouse gases, and featured examples from Australia, Japan and ISO.

The session also explored Japan's case study in developing a Voluntary Action Plan, which was highlighted as a good example of collaboration between government and industry to address climate change. Japan's example has led to a related APEC project titled *Capacity Building on the Development of Climate Actions for Sustainable Growth by use of ISO 14080.*

The accompanying breakout session focused on the key challenges that economies face. This included the challenges associated with addressing the impacts of climate change on the built environment, and the challenges associated with using digital technologies and standards to respond to climate change.

Session 2: Preparing the Built Environment for Climate Change

The second session of the conference explored what APEC member economies are doing to prepare their built environment for the impacts of climate change. Examples from Singapore, New Zealand and Russia showcased green building rating systems, sustainable drainage systems, building information modelling (BIM), and other efforts and successes.

With the extreme contrast between environments like Singapore and Russia, it was highlighted that standards provide a methodology that can be applied broadly to different climates and scenarios. It was also stressed that industry needs to be involved in government planning, and in the past this has not often been the case for many APEC member economies. Transportation was also flagged as a key area that should be considered when developing domestic building plans.

The accompanying breakout session focused on solutions. This included the potential digital technology solutions that could help economies address the impacts of climate change on the built environment. Participants also explored the existing areas of the standards that should be harmonised across APEC and any gaps in standardisation related to this topic.

Session 3: Responding to the Impacts of Climate Change

The third and final session broadly covered how a range of APEC member economies have responded to the impacts of climate change. Canada, Malaysia, Papua New Guinea, New Zealand, Indonesia, the United States, and EPWG all contributed to this session.

Presentations and discussions in this session emphasised the range of climate change events that APEC member economies face, and the importance of effective and resilient building codes. As mentioned in the presentation from the United States, “building codes are the foundation for resilient communities. A community cannot be resilient without up-to-date building codes.”

Speakers shared how they have conducted domestic consultation to identify future needs and priorities and build resilience in their communities. There were also discussions on the value of effective data management, and the lack of standardisation when it comes to measuring the impacts of climate change.

Opportunities and Challenges

In addition to the opportunities and challenges highlighted in the Survey and Discussion Paper, the following emerged during the Conference and were shared with APEC SCSC during their plenary meeting:

— Opportunities

Digital Technologies	Standards
• Energy efficient buildings • Smart building management • Data management • Building information modelling (BIM) • Building automation and control systems • Resilience and continuity • Drone-based surveying	• Environmental management systems • Organization and digitization of information about buildings and civil engineering works • Greenhouse gases • Sustainability in building construction • Energy performance of buildings • Building automation and control systems

— Challenges

Digital Technologies	Standards
• Cost of procurement • Lack of capacity and expertise • Interoperability and stranded infrastructure • Slow to implement, fast to become obsolete • Low awareness of technologies for climate change	• Low participation on international committees • Slow development process and implementation • Lack of government and industry awareness • Challenging to address climate change in standards

Recommendations Report

As the final deliverable of the project, this Recommendations Report outlines the key findings to assist in areas of potential future standards development, harmonisation and collaboration. The intent is that the recommendations from this report will assist APEC member economies to:

- Identify opportunities and methods for mainstreaming climate change adaptation actions through digital technology and standards development
- Identify opportunities for digital technology to be used to coordinate data sharing on building standards between member economies
- Establish the potential standards for climate change response for different components of the building life cycle

Recommendations

1. Consider the adoption and harmonisation of key climate change-related international standards

A lack of government and industry awareness of the international standards related to climate change was identified as an obstacle to APEC member economies. The project deliverables assisted in the drafting of a list of relevant international standards, with a particular emphasis on environmental management systems and greenhouse gases. These standards may assist APEC member economies with climate change mitigation and adaptation. APEC member economies are encouraged to consider the adoption of the international standards listed in **Annex C** based on their economy's unique environment and challenges.

Along with the adoption of these standards it is also recommended that National Standards Bodies, where relevant, share available guides with their committee members to help address climate change in standards. This includes:

- ISO Guide 82, *Guidelines for addressing sustainability in standards* (revised and published in November 2019)
- ISO Guide 84, *Guidelines for addressing climate change in standards* (currently under development with expected publication in early 2020)
- ISO Brochure Climate Change Mitigation (published in December 2019)

2. Develop case studies on successful standards and digital technology solutions from member economies

Building resilience and the procurement of new technologies can be viewed by industry and governments as too costly. However, in the long run having effective building codes and technologies in place can be more financially beneficial. However, this can be difficult to prove due to a lack of case studies across APEC on the impacts of climate change on the built environment.

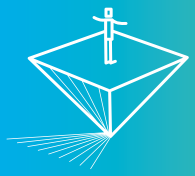
A set of strong case studies with reliable data would assist APEC member economies in adopting new digital technologies and international standards. In particular, stakeholders demonstrated an interest in case studies on the following technologies in relation to the built environment and climate change activities:

- Drones
- Digital mapping
- Monitoring sensors
- Internet of Things
- Big Data
- Blockchain
- Smart cities
- Artificial intelligence
- Digital twins
- Machine learning standards
- Town planning models

3. Share best practice on data use and management to assist in business case development

Effective data use and management was a frequent topic of discussion during the 12th SCSC Conference. Although international standards exist for the collection of weather data, measuring the impact of climate change in a standardised way across APEC can be challenging. An authoritative source of data is needed to help support decision making.

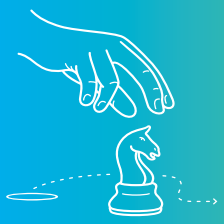
APEC member economies voiced an interest in sharing best practice on the use and management of weather-related data. If necessary, APEC member economies could also look to work with their National Standards Bodies to propose the development of a new international standard to cover this topic.



4. Consult the public and private sector to help raise awareness on standards for climate change resilience, identify future needs, and strengthen networks

The National Standards Body in each APEC member economy could assist in opening dialogue between stakeholders. This includes those that have traditionally not collaborated to build cooperation across a broad group of stakeholders. For example, cooperation between climate scientists and building professionals could help improve adaptive design to address risk across a building's life cycle.

To help achieve this some APEC member economies have undergone domestic consultation through activities like stakeholder surveys, webinars and workshops, and impact analyses. The purpose of these activities is to raise awareness on standards for climate change resilience, identify future needs, strengthen networks, and ultimately coordinate a domestic strategy on climate change.



5. Collaborate with the APEC Emergency Preparedness Working Group (EPWG) to develop a catalogue of climate change-related scenarios with recommended responses and prevention

The mandate of EPWG is:[7]

6. To build capacity in the region so that APEC member economies can better mitigate, prepare for, respond to and recover from emergencies and natural disasters, including by building business and community resilience and fostering private-public partnerships to protect business, trade and economic growth and communities from disruption.
7. To improve coordination and enhance intra-APEC cooperation and integration of best practice emergency and natural disaster preparedness efforts in APEC, including by fostering research and collaboration, sharing knowledge, lessons learnt and best practices in the field of emergency management to better protect business, trade and economic growth and communities in the Asia-Pacific region from disruptions related to emergencies and natural disasters.

Given the synergies between the mandate of EPWG and this project's objective, it is recommended that APEC SCSC collaborate with APEC EPWG to best coordinate an APEC response to the impacts of climate change on the built environment. In particular, stakeholders were interested in the development of a catalogue by APEC EPWG of climate change-related scenarios with recommended responses and prevention. The catalogue would help raise awareness on solutions available for lowering possible impacts by natural disasters. Through collaboration with APEC SCSC this catalogue could also include recommendations on the relevant standards to potentially implement.

7 https://www.apec-epwg.org/web_about/mandate

Conclusion

The 12th SCSC Conference: *Applying Digital Technology and Standards to Respond to the Impacts of Climate Change on Infrastructure* brought together stakeholders from across APEC to identify key areas of the built environment impacted by climate change, and help address these impacts through the proposed application of standards and digital technology. The project was a great success in sharing information across APEC economies and highlighting areas of shared concern relevant to this topic.

The outcomes of the project's deliverables (Survey, Discussion Paper, Conference and Recommendations Report) helped to formulate five key recommendations for APEC SCSC and APEC member economies to consider for the future to help respond to the impacts of climate change on infrastructure.

When it comes to preventing and responding to climate change, many obstacles still remain. APEC is an economic forum that has the opportunity to take the lead in sharing and mainstreaming the use of standards and digital technologies. By continuing this conversation, we can help contribute to a safer and more secure future for our infrastructure and our people.

Annex A – Participants List

Economy / Observer / Secretariat / Guest	Name	Designation	Organisation	Gender
APEC Secretariat	**Eva Nakamura**	Delegate	APEC Secretariat	F
Australia	**Karen Batt**	Delegate	Standards Australia	F
Australia	**Torrin Marquardt**	Speaker	Standards Australia	F
Australia	**Graeme Drake**	Speaker	Asia Pacific Accreditation Cooperation	M
Canada	**Jeannine Ritchot**	Delegate	Secretariat, Treasury Board Of Canada	F
Canada	**Gabrielle White**	Speaker	Standards Council Of Canada	F
Chile	**Monica Barriga**	Delegate	International Economic Relations Secretariat, Ministry Of External Relations	F
Chile	**Gabriela Natalia Parraguez**	Delegate	Ministry Of Public Works	F
Chile	**Valentina Romero**	Delegate	International Economic Relations Secretariat, Ministry Of External Relations	F
Chile	**Alex Chaparro**	Delegate	International Economic Relations Secretariat, Ministry Of External Relations	M
Chile	**Gaston Fernandez**	Delegate	International Economic Relations Secretariat, Ministry Of External Relations	M
Chile	**Vittorio Frazzoni**	Delegate	2019 APEC Chile Hoc Official	M
Chile	**Maximiliano Gonzalez**	Delegate	Ministry Of Public Works	M
China	**Huiming Chen**	Delegate	China Academy Of Inspection & Quarantine	M
China	**Heming Hu**	Delegate	National Institute Of Metrology	M
Chinese Taipei	**Chuan Hsiou Hung**	Delegate	Bureau Of Standards Metrology And Inspection, Ministry Of Economic Affairs	M
Chinese Taipei	**Lee Shun Chieh Lee**	Delegate	Bureau Of Standards Metrology And Inspection, Ministry Of Economic Affairs	M
Chinese Taipei	**Wen Chieh Liu**	Delegate	Bureau Of Foreign Trade, Ministry Of Economic Affairs	M
Indonesia	**Wahyu Wilopo**	Speaker	Universitas Gadjah Mada (Gama-Inatek)	M
Invited Guest	**Jose Alcorta**	Speaker	ISO	M
Invited Guest	**Dennis Chew**	Guest	IEC	M
Invited Guest	**Adrian Goh**	Guest	ISO	M
Invited Guest	**Amaury Santos**	Guest	IEC	M
Japan	**Kentaro Tsunozaki**	Speaker	International Standardization Office & Jisc Secretariat, Ministry Of Economy Trade And Industry	M
Malaysia	**Nur Afifah Ijap**	Delegate	Department Of Standards Malaysia	F

Economy / Observer / Secretariat / Guest	Name	Designation	Organisation	Gender
Malaysia	**Azlan Adnan**	Delegate	Universiti Teknologi Malaysia	M
Malaysia	**Shaharul Sadri Alwi**	Delegate	Department Of Standards Malaysia	M
Malaysia	**Mohd Hamzaini Hashim**	Delegate	Department Of Standards Malaysia	M
Malaysia	**Dzul Khaimi Khailani**	Speaker	Federal Department Of Town And Country Planning	M
New Zealand	**Asaad Shamseldin**	Speaker	Department Of Civil & Environmental Engineering, The University Of Auckland	M
New Zealand	**Adam Dubas**	Delegate	Ministry Of Business, Innovation & Employment	M
New Zealand	**Douglas Mzila**	Speaker	Greater Wellington Regional Council	M
Papua New Guinea	**Susan Kumo Artihulawa**	Delegate	National Institute Of Standards & Industrial Technology	F
Papua New Guinea	**Edna Kuve**	Delegate	National Institute Of Standards & Industrial Technology	F
Papua New Guinea	**Maryanne Oa**	Delegate	National Institute Of Standards & Industrial Technology	F
Papua New Guinea	**Noah Sapak**	Delegate	National Institute Of Standards & Industrial Technology	F
Papua New Guinea	**Noah Nerman Bogosia**	Delegate	National Institute Of Standards & Industrial Technology	M
Papua New Guinea	**Pyale Pati**	Delegate	Department Of Foreign Affairs & International Trade	M
Papua New Guinea	**Dan Yansom**	Speaker	National Institute Of Standards & Industrial Technology	M
Peru	**Maria Del Rosario Uria**	Delegate	The National Institute Of Quality	F
Peru	**Marcos Daizen Oda**	Delegate	The National Institute Of Quality	M
Russia	**Olga Trofimova**	Speaker	Federal Agency For Technical Regulation & Metrology	F
Russia	**Andrey Kharitonov**	Speaker	Federal Center For Regulation, Standardization And Technical Assessment In Construction	M
Russia	**Alexander Neklyudov**	Speaker	Federal Center For Regulation, Standardization And Technical Assessment In Construction	M
Singapore	**Kian Seng Ang**	Speaker	Enviromental Sustainability Group, Building & Construction Authority	M
Thailand	**Sanida Khoonpanich**	Delegate	Bureau Of Agricultural Commodity And Food Standards	F
Thailand	**Rassarin Noplerdphitak**	Delegate	Bureau Of Agricultural Commodity And Food Standards	F
Thailand	**Sitanun Poonpolsub**	Delegate	Food And Drug Administration	F
Thailand	**Witchar Pichainarong**	Delegate	Thai Industrial Standards Institute	F

Economy / Observer / Secretariat / Guest	Name	Designation	Organisation	Gender
Thailand	**Apawan Satantoranin**	Delegate	Thai Industrial Standards Institute	F
The Philippines	**Myra Magabilin**	Delegate	Bureau Of Product Standards, Department Of Trade & Industry	F
The Philippines	**Mario Gaudiano**	Delegate	Bureau Of Product Standards, Department Of Trade & Industry	M
United States	**Ebonique Padgett**	Delegate	Underwriters Laboratories	F
United States	**Ryan Colker**	Speaker	International Code Council (Icc)	M
United States	**Kent Shigetomi**	Delegate	Office Of The Us Trade Representative	M
Viet Nam	**Hoa Nguyen**	Delegate	Small And Medium Enterprises Development Support Centre	F
Viet Nam	**Minh Duong Ngo**	Delegate	Viet Nam Standards And Quality Institute	M

Annex B – Conference Agenda

Day 1	Sunday 18 August 2019
9:00am	**Arrival and Workshop Registration**
9:30am	**Welcome** • Gaston Fernandez Schiaffino APEC SCSC Chair
9:35am	**Introduction: ISO Standards and the Paris Agreement** • José-Ignacio Alcorta Head of Standards Development International Organization for Standardization (ISO)
9:50am	**Project Overview: *Applying Digital Technology and Standards to Respond to the Impacts of Climate Change on Infrastructure*** • Dan Yansom Executive Manager, Standards Development Division National Institute of Standards & Industrial Technology (NISIT) • Torrin Marquardt International Engagement Manager Standards Australia
Session 1: Preventing the Onset of Climate Change	
10:05am	**Validating and Verifying Greenhouse Gases (Australia)** • Graeme Drake Co-Convenor ISO/TC 207/SC 7/SC 2 ISO/CASCO/JWG 6
10:20am	**Group photo**
10:30am	**Morning Tea**
11:00am	**Taking Effective Climate Action with ISO 14080 (Japan)** • Kentaro Tsunozaki Assistant Director, International Standardization Office & JISC Secretariat Ministry of Economy, Trade and Industry (METI)
11:15am	**Q&A Session with Panel** • Jose Alcorta-Menendez • Graeme Drake • Kentaro Tsunozaki Moderated by: • Dennis Chew Regional Director IEC Asia-Pacific Regional Centre (APRC)
11:45am	**Breakout Session** • Facilitated by Standards Australia *This breakout session focuses on the **challenges** APEC economies face in responding to the impacts of climate change on the built environment through digital technologies and standards.*
12:30pm	**Lunch**
Session 2: Preparing the Built Environment for Climate Change	
2:30pm	**Green Building Masterplans and the Super Low Energy (SLE) Building Programme (Singapore)** • Ang Kian Seng Group Director, Environmental Sustainability Group Building and Construction Authority
2:45pm	**Stormwater Infrastructure and Climate Change Adaptation (New Zealand)** • Asaad Y. Shamseldin Associate Professor, Department of Civil and Environmental Engineering The University of Auckland

Day 1	Sunday 18 August 2019
3:00pm	**Safe infrastructure and its Impact on Human Life (Russia)** • Andrey Kharitonov Chair of ISO/TC 59/SC 2, Head of International Department Federal Center for Construction Norms and Standardization • Olga Trofimova Rosstandard Chief of International Division Rosstandard
3:15pm	**Q&A Session with Panel** • Ang Kian Seng • Asaad Y. Shamseldin • Andrey Kharitonov • Olga Trofimova Rosstandard Moderated by: • Kent Shigetomi • Director, Multilateral Non-Tariff Barriers • Office of US Trade Representative
3:45pm	Afternoon Tea
4:00pm	**Breakout Session** • Facilitated by Standards Australia *This breakout session focuses on the possible **solutions** for APEC economies in responding to the impacts of climate change on the built environment through digital technologies and standards.*
4:45pm	Finish

Day 2	Monday 19 August 2019
Session 3: Responding to the Impacts of Climate Change	
9:30am	**Welcome** NISIT
9:35am	**Responding to Climate Change through Standards: A Canadian Perspective (Canada)** • Gabrielle White Senior Policy Analyst, Trade and Regulatory Policy Standards Council of Canada (SCC)
9:50am	**Integrating Disaster Resilience and Management in Development Plans (Malaysia)** • Dr Dzul Khaimi Bin Khailani Senior Principal Assistant Director, Regional Planning Division PLANMalaysia (Department of Town and Country Planning)
10:05am	**Challenges for Pacific Island Nations (Papua New Guinea)** • Dan Yansom Executive Manager, Standards Development Division NISIT
10:20am	**Q&A Session with Panel** • Gabrielle White • Dr Dzul Khaimi Bin Khailani • Dan Yansom Moderated by: • TBC
10:35am	Morning Tea
10:55am	**Applying digital technology and modelling in response to sea level rise for the Wellington region (New Zealand)** • Dr Douglas Mzila Senior Environmental Scientist – Groundwater Greater Wellington Regional Council
11:10am	**Early Warning Systems for Natural Disasters (Indonesia)** • Dr Wahyu Wilopo Vice Director, Center for Disaster Mitigation and Technological Innovation Universitas Gadjah Mada (GAMA-InaTEK)
11:25am	**Achieving Community and Building Resilience in the Face of Changing Risks (United States)** • Ryan Colker Vice President, Innovation, Government Relations Department International Code Council (ICC)
11:40am	**Smart Disaster Risk Management and Emergency Preparedness under APEC** • Wei-Sen Li Co-Chair APEC Emergency Preparedness Working Group (EPWG)
11:55am	**Q&A Session with Panel** • Dr Douglas Mzila • Dr Wahyu Wilopo • Ryan Colker Moderated by: • Gabriela Parraguez UGIT Analyst Ministry of Public Works, Chile
12:10pm	**Closing Remarks and Next Steps** • NISIT and Standards Australia
12:15pm	Finish

Annex C – Recommended International Standards

Standards related to greenhouse gases:

- **ISO 14064-1**, Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
- **ISO 14064-2**, Greenhouse gases -- Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
- **ISO 14064-3**, Greenhouse gases -- Part 3: Specification with guidance for the verification and validation of greenhouse gas statements
- **ISO 14065**, Greenhouse gases -- Requirements for GHG validation and verification bodies for use in accreditation or other forms of recognition
- **ISO 14066**, Greenhouse gases -- Competence requirements for GHG validation teams and verification teams
- **ISO 14067**, Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification

Standards related to climate change adaptation:

- **ISO 14080**, Greenhouse gas management and related activities — Framework and principles for methodologies on climate actions
- **ISO 14090**, Adaptation to climate change -- Principles, requirements and guidelines
- Other greenhouse gas (GHG) quantification and validation standards:
- **ISO 14065**, Greenhouse gases — Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
- **ISO 14066**, Greenhouse gases — Competence requirements for greenhouse gas validation teams and verification teams
- Standards related to environmental management:
- **ISO 14001**, Environmental Management Systems – Requirements with guidelines for use
- **ISO 14040**, Environmental management -- Life cycle assessment -- Principles and framework
- **ISO 14046**, Environmental management -- Water footprint -- Principles, requirements and guidelines
- **ISO 14031**, Environmental management -- Environmental performance evaluation – Guidelines
- **ISO 20121**, Sustainable events
- **ISO 37101**, Sustainable development in communities -- Management system for sustainable development -- Requirements with guidance for use
- **ISO 14006**, Environmental management systems -- Guidelines for incorporating eco-design

- **ISO 14015**, Environmental management -- Environmental assessment of sites and organizations (EASO)
- **ISO 14034**, Environmental management -- Environmental technology verification (ETV)
- **ISO 14045**, Environmental management -- Eco-efficiency assessment of product systems -- Principles, requirements and guidelines
- **ISO 14008**, Monetary valuation of environmental impacts and related environmental aspects
- **ISO 46001**, Water efficiency management systems — Requirements with guidance for use

Standards related to the built environment:

- **ISO 19650 series**, Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling
- **ISO 15392**, Sustainability in building construction -- General principles
- **ISO 21931**, - Sustainability in building construction -- Framework for methods of assessment of the environmental performance of construction works
- **ISO 17772**, Energy performance of buildings
- **ISO 13315 Series** - Environmental management for concrete and concrete structures
- **ISO 52000-1**, Energy performance of buildings -- Overarching EPB assessment -- Part 1: General framework and procedures
- **ISO 16484**, Series - Building automation and control systems (BACS)
- **ISO 16818**, Building environment design – Energy Efficiency – Terminology
- **ISO 23045**, Building environment design -- Guidelines to assess energy efficiency of new buildings
- **ISO 13153:2012**, Framework of the design process for energy-saving single-family residential and small commercial buildings
- **ISO 13823**, General principles on the design of structures for durability
- **ISO 24518**, Activities relating to drinking water and wastewater services -- Crisis management of water utilities
- **ISO 17800**, Facility smart grid information model
- **ISO 37150**, Smart Community Infrastructures - Smart community infrastructures -- Review of existing activities relevant to metrics
- **ISO 37157**, Smart community infrastructures -- Smart transportation for compact cities
- **ISO 12006 Series** - Building construction -- Organization of information about construction works
- **ISO 2394**, General principles on reliability of structures

Relevant standards under development

- **ISO/DIS 14091**, Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment
- **ISO/CD TS 14092**, GHG Management & related activities: requirement & guidance of adaptation planning for organizations including local governments and communities
- **ISO/CD 14030-1**, Environmental performance evaluation — Green debt instruments — Part 1: Process for green bonds
- **ISO/CD 14030-2**, Environmental performance evaluation — Green debt instruments — Part 2: Process for green loans
- **ISO/CD 14030-3**, Environmental performance evaluation — Green debt instruments — Part 3: Taxonomy
- **ISO/CD 14030-4**, Environmental performance evaluation — Green debt instruments — Part 4: Verification

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