APEC Symposium: Disaster Resilience for a Sustainable Future: Exchanging Experiences in Geospatial Information Management in the Context of Forest Fires

Summary Report

APEC Emergency Preparedness Working Group

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Asia-Pacific
Economic Cooperation

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1. Introduction

Forest fires are among the most complex and rapidly evolving socio-environmental threats affecting the Asia-Pacific region. Across APEC member economies, their frequency, intensity, and geographic reach are being influenced by the interaction of climate-driven variability, prolonged dry periods, ecosystem degradation, and expanding exposure in wildland–urban interface areas. These dynamics generated cross-cutting impacts on human security, livelihoods, critical infrastructure, and economic stability, while increasing the operational demands placed on disaster risk management institutions. As fire regimes became more severe and less predictable, member economies faced a growing need to strengthen preparedness, improve decision-making under uncertainty, and accelerate coordination across sectors and levels of government.

In this context, geospatial information had emerged as a strategic asset for strengthening disaster resilience. Satellite imagery, thematic cartography, meteorological datasets, and GIS-based platforms provided an integrated understanding of risk, enabling decision-makers to anticipate threats, monitor evolving situations, and communicate effectively with communities. However, discussions across APEC member economies also confirmed that the effectiveness of geospatial information depended not only on the availability of data and tools, but on the institutional arrangements that enabled interoperability, data sharing, and sustained operational use. Common challenges—including fragmented data management responsibilities, limitations in standardization, capacity gaps at local and regional levels, and difficulties in translating scientific information into operational actions—continued to constrain the full potential of geospatial information for forest fire risk management.

The APEC Symposium: *Disaster Resilience for a Sustainable Future – Exchanging Experiences in Geospatial Information Management in the Context of Forest Fires* was convened to respond to these challenges through regional cooperation and technical exchange. Held in Santiago, Chile on 21–22 August 2025, the Symposium brought together representatives of disaster risk management authorities, geospatial institutions, meteorological agencies, academia, and technical experts from a range of APEC member economies, including the APEC member economies of Chile; Indonesia; Malaysia; and Peru. The event was designed as a platform to share practical experiences, examine

institutional and technological approaches, and identify transferable lessons that could support improved disaster resilience across the Asia-Pacific region.

This Summary Report consolidated the key outcomes of the Symposium, providing an organized account of the regional context, the event's structure and participation, and the main thematic findings derived from technical presentations and discussion sessions. It also highlighted best practices and case studies identified as relevant across APEC member economies, reflecting converging priorities such as strengthening geospatial governance, embedding geospatial workflows into emergency management systems, integrating multi-source geospatial data for operational decision-making, advancing early warning and risk forecasting, enhancing post-fire damage assessment, supporting multi-level disaster management, and investing in capacity building and knowledge transfer. By capturing these shared insights, the Report aims to contribute to ongoing APEC efforts to strengthen disaster resilience, promote innovation, and support sustainable development in line with APEC regional priorities.

1.1. About this Summary Report

This Summary Report documented the key outcomes of the APEC Symposium: Disaster Resilience for a Sustainable Future – Exchanging Experiences in Geospatial Information Management in the Context of Forest Fires, held in Santiago, Chile on 21–22 August 2025. The Report consolidated the main messages, lessons learned, and transferable insights shared by participants from a range of APEC member economies and institutions engaged in disaster risk management and geospatial information management. It was intended to support continued regional learning under the APEC framework by capturing practical approaches that could strengthen forest fire risk management and broader disaster resilience across diverse territorial and institutional contexts.

Purpose and scope. The purpose of this Summary Report was to provide a structured and policy-relevant synthesis of (i) the regional context and shared challenges faced by APEC member economies in forest fire risk management; (ii) the main themes addressed through technical presentations and case studies; (iii) best practices identified as particularly transferable; and (iv) the key institutional and operational reflections emerging from discussion sessions. The Report focused on the strategic use of geospatial information across the disaster risk management cycle, including prevention, preparedness, emergency response, post-disaster

assessment, and recovery planning. It does not aim to reproduce complete presentation materials, provide exhaustive technical specifications, or serve as a comprehensive inventory of all systems or datasets currently used by each economy. Instead, it prioritized cross-cutting insights and practical takeaways that could inform institutional strengthening, operational integration, and capacity development.

Methodology. The Report was based on a structured synthesis of content delivered during the Symposium, including technical presentations, case studies, and facilitated discussion sessions. Rather than documenting individual interventions verbatim, contributions were consolidated into topic-based summaries and organized by thematic areas to identify converging priorities and shared challenges. Best practices were derived from recurrent patterns and validated lessons highlighted across presentations and discussions, with attention to their relevance and transferability to other APEC member economies. In addition, the project incorporated a preliminary international consultation conducted prior to the Symposium to collect written inputs from additional APEC member economies with relevant experience in the use of geospatial information for forest fire management. These consultation inputs were analyzed and integrated to broaden the evidence base of the Report and complemented the insights shared directly during the event.

This Summary Report includes:

- A concise overview of the regional APEC context for forest fire risk management and the shared challenges affecting member economies.
- A summary of the Symposium format and thematic focus, reflecting the diversity of institutional and hazard contexts represented.
- Topic-based summaries that synthesized technical content and highlighted converging approaches across economies.
- Seven best practices identified as relevant and transferable across APEC member economies.
- Insights from the preliminary international consultation, incorporated as complementary evidence to the Symposium discussions.
- A synthesis of discussion outcomes, highlighting institutional, operational, and capacity-related priorities.
- Conclusions that consolidated the main findings and reinforced the value of geospatial information for disaster resilience within the APEC region.

2. Regional APEC Context

APEC member economies faced a set of increasingly complex and interrelated challenges associated with forest fires, although the nature and manifestation of these challenges vary significantly across territorial, climatic, and institutional contexts. Across the Asia-Pacific region, climate variability, prolonged dry seasons, land-use change, and expanding exposure in fire-prone areas were contributing to heightened wildfire risk, placing growing pressure on disaster risk management systems and public institutions.

In Southeast Asia, several APEC member economies, including the APEC member economies of Indonesia; Malaysia; Thailand; and Viet Nam, experienced recurrent forest and land fires closely linked to extended dry periods, peatland degradation, and regional climatic phenomena. These fires often generated transboundary haze events with far-reaching impacts on public health, transportation, and economic activity, highlighting the regional dimension of wildfire risk and the need for coordinated approaches across borders.

In contrast, APEC member economies in Latin America, such as the APEC member economies of Chile and Peru, faced high-severity wildfires that increasingly affected wildland–urban interface areas and territories characterized by complex topography and diverse ecosystems. In these contexts, fires tend to spread rapidly under extreme weather conditions, posing significant risks to populated areas, critical infrastructure, and productive landscapes. The increasing severity and frequency of these events had underscored the importance of timely information, coordinated response, and evidence-based recovery planning.

Despite these diverse risk profiles, discussions during the Symposium identified a number of shared structural challenges across APEC member economies. These included institutional fragmentation in the management and ownership of geospatial data, which often limited coordination among agencies and reduced the effectiveness of information sharing during emergency situations. Participants also highlighted persistent limitations in interoperability and data standardization, which constrained the integration of datasets from different sources and hindered the development of a common operational picture.

Capacity gaps at local and regional levels were identified as a further cross-cutting challenge, particularly in relation to technical expertise, access to geospatial tools, and institutional experience in applying spatial information to disaster risk management. In addition, participants noted ongoing difficulties in integrating scientific and geospatial information into operational decision-making processes, especially under time-sensitive and high-uncertainty conditions typical of large-scale wildfire events.

Within this regional context, geospatial information—including satellite imagery, thematic cartography, meteorological data, and GIS-based platforms—was widely recognized as a critical enabler for addressing these challenges. By providing an integrated and spatially explicit view of the territory, geospatial information supported risk anticipation, enhanced inter-agency coordination, and facilitated effective communication with decision-makers and communities. Strengthening the strategic and institutional use of geospatial information was therefore a key priority for enhancing disaster resilience across APEC member economies in the face of escalating wildfire risk.

3. Symposium Overview

The Symposium was conducted over two full days and brought together representatives from disaster risk management authorities, geospatial services, meteorological agencies, academic institutions, and technical experts from a range of APEC member economies, including Chile; Indonesia; Malaysia; and Peru. This diverse participation enabled a multidisciplinary exchange of perspectives and fostered dialogue across policy, operational, and technical domains.

The programme was structured to include:

- Specialized technical presentations addressing policy, institutional, and operational aspects of geospatial information management.
- Case studies illustrating real-world applications and lessons learned.
- Dedicated discussion sessions focused on identifying key challenges, opportunities, and lessons learned.
- Exchanges on institutional frameworks, governance models, and technological approaches adopted by different member economies.

The overall approach of the event emphasized the practical application of geospatial information, highlighting concrete experiences of its use in the context of forest fires and related disasters. Particular attention was given to how geospatial data and tools supported decision-making processes, inter-agency coordination, and situational awareness across the disaster risk management cycle.

3.1. Objectives and Expected Outputs

The primary objective of the Symposium was to facilitate the exchange of experiences, lessons learned, and good practices among APEC member economies on the use of geospatial information for forest fire management, in line with the objectives defined in Project EPWG 101 2024A. By convening policymakers, technical specialists, academic experts, and practitioners, the Symposium aimed to strengthen collective understanding of how geospatial information could enhance disaster preparedness, emergency response, recovery, and long-term resilience.

In particular, the Symposium sought to:

- Promoted mutual learning on institutional, technical, and operational approaches to geospatial information management in the context of forest fires;
- Identified transferable practices and enabling conditions that supported the effective integration of geospatial information into disaster risk management systems;
- Fostered dialogue between policy-level and operational actors to bridge gaps between technical capability and decision-making needs;
- Supported capacity building and regional cooperation consistent with the priorities of the Emergency Preparedness Working Group (EPWG) and APEC's Putrajaya Vision 2040.

The expected outputs of the Symposium are fully aligned with those established in the approved Project Proposal and included:

- The successful delivery of the APEC International Symposium as a platform for knowledge exchange and regional dialogue; and
- The preparation of this Project Summary Report, including Symposium Proceedings, which consolidated key presentations, discussions, best practices, and insights generated through the event, serving as a reference document for policymakers, disaster management agencies, and technical institutions across APEC member economies.

3.2. Participation Profile and Multi-Actor Engagement

The Symposium brought together a diverse group of participants representing different institutional roles within disaster risk management and geospatial information ecosystems. Institutions represented included disaster risk management authorities, geospatial agencies, meteorological and climate services, academic and research institutions, and technical experts involved in geospatial data analysis and platform development.

This multi-actor participation was deliberately designed to reflect the cross-sectoral nature of forest fire risk management and the multiple institutional interfaces through which geospatial information was produced, shared, and applied. Disaster risk management agencies contributed operational perspectives on emergency response, preparedness planning, and recovery coordination. Geospatial authorities and mapping agencies shared experiences related to data governance, standardization, and the provision of authoritative spatial datasets. Meteorological services contributed insights on climate-driven risk, early warning systems, and the integration of weather and environmental data into geospatial analyses. Academic and research institutions complemented these perspectives by presenting applied research, analytical methods, and emerging technologies relevant to wildfire risk assessment and resilience planning.

Participants highlighted that this diversity of institutional perspectives added significant value to the discussions, as it enabled examination of geospatial information not only as a technical resource, but as a component embedded within broader governance, policy, and operational systems. The multi-actor approach facilitated dialogue across different professional languages and decision-making

cultures, helping to identify points of alignment as well as gaps between data producers, analysts, and end users.

The participation profile also reinforced the importance of collaboration across levels of government. Contributions from central, provincial, and local perspectives underscored that effective wildfire risk management depended on coherent interaction between economy-level frameworks and local/regional implementation. Discussions emphasized that geospatial information could serve as a shared reference across governance levels, provided that institutional roles, access mechanisms, and responsibilities are clearly defined.

Overall, the participation profile of the Symposium strengthened its relevance as a regional learning platform. By bringing together a broad range of actors involved in disaster risk management and geospatial information, the event enabled a more holistic examination of challenges and solutions, and supported the identification of practices that were not only technically sound but also institutionally feasible and operationally meaningful across APEC member economies.

4. Topic-Based Summaries of Presentations

This section presented a structured synthesis of the technical content delivered during the APEC Symposium, consolidating key messages, lessons learned, and practical insights emerging from the presentations and discussions. Rather than documenting individual interventions, the section organized contributions around common thematic areas and identified best practices and case studies that illustrated how geospatial information was being applied to strengthen disaster resilience across APEC member economies. The analysis reflected the diversity of institutional arrangements, hazard contexts, and levels of technical maturity represented at the Symposium, while highlighting shared challenges and converging approaches. Together, the thematic overview and the identification of best practices provided an integrated understanding of how geospatial information supported prevention, preparedness, emergency response, post-disaster assessment, and recovery planning, offering transferable insights relevant to a wide range of APEC member economies.

4.1. Thematic Overview of Presentations

The technical sessions of the APEC Symposium highlighted the central role of geospatial information in strengthening disaster resilience, with a particular focus on forest fire risk management across diverse territorial and institutional contexts within APEC member economies. Presentations were organized around complementary thematic areas covering prevention, preparedness, emergency response, post-disaster assessment, and recovery planning.

Several presentations emphasized the importance of **institutional coordination frameworks and geospatial governance mechanisms**. Indonesia presented its experience through the One Map Policy, illustrating how harmonized authoritative base maps and standardized thematic geospatial information supported forest and land fire prevention, spatial planning, and disaster risk reduction at both economy and local/regional levels. The presentation demonstrated how legal and policy instruments enabled interoperability, data sharing, and consistent decision-making across ministries and local governments.

From Southeast Asia, Viet Nam shared an overview of its **disaster management system**, highlighting the integration of geospatial data within a multi-level

governance structure that spanned central, provincial, and communal levels. The presentation underscored the use of spatial information to support early warning, preparedness planning, and coordinated response, particularly in the context of climate-driven hazards such as storms, floods, and forest fires.

Latin American experiences focused strongly on operational use of geospatial information during large-scale wildfire emergencies. Chile presented multiple case studies related to the February 2024 mega wildfires in the Valparaíso Region, demonstrating how satellite imagery, drone data, spatial analysis, and spatial data infrastructure (SDI) platforms were mobilized to support emergency response, inter-institutional coordination, and public information. These presentations illustrated the value of rapid data integration, standardized geospatial services, and collaborative workflows during crisis situations.

Academic contributions complemented institutional perspectives by presenting **advanced analytical methods and applied research**. A case study from Chile showcased the use of high-resolution drone imagery, satellite data, and machine-learning techniques to assess vulnerability in wildland–urban interface areas and to analyze post-disaster reconstruction processes. These approaches demonstrated how geospatial analytics could inform both immediate response and longer-term risk mitigation and urban planning strategies.

Across all sessions, a recurring theme was the transition from reactive emergency mapping toward **proactive, prevention-oriented geospatial systems**, supported by interoperable platforms, clear governance arrangements, and sustained capacity development.

4.2. Best Practices Identified Across APEC Member Economies

Based on the presentations and discussions held during the Symposium, seven best practices and associated case studies were identified as particularly relevant and transferable across APEC member economies. These practices reflected diverse institutional contexts and hazard profiles, while demonstrating common principles for strengthening disaster resilience through the effective use of geospatial information.

Best Practice 1: Institutionalized Geospatial Governance for Disaster Risk Management

The experience shared by the APEC member economy of Indonesia, through the implementation of the *One Map Policy*, demonstrated how institutionalized geospatial governance provides a foundational framework for effective disaster risk management, including forest and land fire prevention, emergency response, and recovery. This policy established a legally mandated, authoritative geospatial reference system that ensured consistency, reliability, and accountability in the production and use of spatial data across government sectors and levels.

A central element of this approach was the formal alignment of geospatial data standards, institutional mandates, and coordination mechanisms under a unified economy-level framework. By designating authoritative datasets and clarifying institutional responsibilities, the One Map Policy reduced ambiguity regarding data ownership and validity, which was particularly critical during emergency situations where timely and trusted information was required. This governance structure also supported long-term risk reduction by embedding geospatial considerations into land-use planning, environmental management, and disaster risk policies.

The experience of the APEC member economy of Indonesia experience further illustrated how legally anchored geospatial governance enhanced interoperability not only at the technical level, but also at the organizational and policy levels. Clear governance arrangements facilitated sustained inter-agency collaboration, enabled consistent data maintenance, and supported continuity across political and administrative cycles. As such, this best practice was highly relevant and

transferable to other APEC member economies seeking to strengthen disaster risk management through authoritative geospatial governance frameworks that underpin, rather than depend solely on, specific technologies or operational tools.

Best Practice 2: Integration of Geospatial Information into Emergency Management Systems

Presentations delivered by the APEC member economy of Chile highlighted the value of integrating geospatial information directly into formal emergency management systems as an operational and institutional practice. Rather than functioning as a parallel or standalone technical capability, geospatial information was embedded within established emergency procedures, enabling it to support real-time coordination, decision-making, and communication during large-scale wildfire events.

The experience of the APEC member economy of Chile demonstrated how centralized emergency management platforms, supported by standardized geospatial services, facilitated a shared operational picture among response agencies. By aligning geospatial workflows with emergency protocols and decision-support processes, authorities were able to enhance situational awareness and ensured that spatial information was delivered in formats tailored to the needs of incident commanders and policy-level decision-makers.

A key element of this practice was the integration of geospatial information across different phases of emergency management, including preparedness, response, and initial recovery, without requiring ad hoc data collection or system reconfiguration during crises. This institutional integration reduced response time, minimized duplication of efforts, and strengthened coordination among agencies with distinct mandates.

This best practice was particularly transferable to other APEC member economies seeking to improve the effectiveness of their emergency management systems by ensuring that geospatial information was operationally embedded, procedurally recognized, and consistently used as part of routine emergency decision-making, rather than activated only during exceptional circumstances.

Best Practice 3: Use of Multi-Source Geospatial Data for Operational Decision-Making

Case studies presented by the APEC member economies of Chile and Malaysia demonstrated the operational value of integrating multiple geospatial data sources to support decision-making during forest fire events. These experiences highlighted how the combined use of satellite imagery, aerial surveys, meteorological data, and thematic cartography provided a more comprehensive and dynamic understanding of fire behavior and its spatial impacts.

A key aspect of this best practice was the complementary use of different data sources, each contributing distinct temporal, spatial, and thematic attributes. Satellite imagery supported broad-area monitoring and temporal change detection, while aerial and drone-based surveys provided higher-resolution information for priority areas. Meteorological data and fire-related indices added contextual information that supported interpretation of fire dynamics and potential evolution. The integration of these datasets enabled operational teams to move beyond single-source analyses and develop a more accurate and timely operational picture.

The presentations illustrated how multi-source geospatial integration supported critical operational functions such as identifying active fire fronts, prioritizing intervention areas, optimizing resource deployment, and supporting rapid damage assessment. By enabling cross-validation between data sources, this approach also increased confidence in operational decisions made under time-sensitive and high-uncertainty conditions.

Importantly, this best practice was scalable and adaptable to different institutional and technical contexts within APEC member economies. It did not depend on a single technology or platform, but rather on the ability to combine available geospatial data sources in a coherent and operationally meaningful manner. As such, it offered a practical and transferable approach for enhancing operational decision-making capacity during forest fire emergencies across the region.

Best Practice 4: Geospatially Enabled Early Warning and Fire Risk Forecasting

The experience shared by the APEC member economy of Malaysia, particularly through regional fire danger rating and fire risk forecasting systems, highlighted the critical role of geospatially enabled early warning mechanisms in forest fire prevention. These systems demonstrated how the systematic integration of meteorological forecasts, vegetation conditions, historical fire occurrence, and spatial analysis could support proactive risk identification and preparedness planning.

A defining feature of this best practice was the use of geospatial modelling to translate complex environmental and climatic data into actionable risk information. By producing spatially explicit fire danger indices and forecast maps, these systems enabled authorities to anticipate periods of elevated fire risk, prioritize prevention measures, and allocated preparedness resources in advance of fire outbreaks. This anticipatory approach supported a shift from reactive response to risk-informed decision-making.

The experience of the APEC member economy of Malaysia also underscored the importance of clear risk communication enabled by geospatial visualization. Spatially explicit fire danger maps and forecast products facilitated communication with decision-makers, emergency agencies, and other stakeholders by providing a shared and easily interpretable understanding of evolving risk conditions. This supported timely decision-making and coordinated preparedness actions across institutional boundaries.

This best practice was particularly relevant and transferable to APEC member economies exposed to recurrent droughts, seasonal fire regimes, and climate-driven variability. By leveraging geospatially enabled early warning and forecasting systems, economies could strengthen preventive capacities, reduced the likelihood of large-scale fire events, and enhanced overall disaster resilience without relying solely on response-oriented measures.

Best Practice 5: Post-Fire Damage Assessment Using Remote Sensing and GIS

Presentations related to the 2024 mega wildfire events in the APEC member economy of Chile demonstrated the value of remote sensing and GIS-based analysis for post-fire damage assessment and recovery planning. These experiences highlighted how satellite imagery and unmanned aerial systems could be systematically applied to evaluate burn severity, delineate affected areas, and generate spatially explicit evidence to support post-disaster decision-making.

A key element of this best practice was the ability to rapidly generate consistent and objective assessments over large and complex territories. By combining multi-temporal satellite imagery with high-resolution aerial data, authorities were able to identify spatial patterns of damage, differentiate levels of burn severity, and detect areas exposed to secondary hazards such as landslides, soil erosion, and flooding. This geospatial evidence provided a robust basis for prioritizing recovery actions and allocating resources effectively.

The use of GIS-based analysis also supported transparency and accountability in post-disaster processes. Spatial datasets and maps derived from remote sensing could be shared across institutions and, where appropriate, with the public, enabling a common understanding of impacts and supporting traceable decision-making. This contributed to improved coordination among agencies responsible for environmental management, housing, infrastructure, and land-use planning during recovery and reconstruction phases.

This best practice was highly transferable to other APEC member economies facing large-scale wildfire impacts. By institutionalizing post-fire geospatial assessment workflows, economies could enhance the speed, consistency, and credibility of recovery planning, while reducing uncertainty and supporting resilient reconstruction strategies.

Best Practice 6: Multi-Level Disaster Management Supported by Geospatial Information

The case study presented by the APEC member economy of Viet Nam illustrated how geospatial information effectively supported a multi-level disaster management system involving central, provincial, and local authorities. The experience demonstrated that aligning geospatial capabilities with decentralized governance structures enhanced coordination and coherence across administrative levels, particularly in hazard-prone areas.

A defining feature of this best practice was the use of geospatial information as a shared reference framework across levels of government. Central authorities generated standardized spatial products that were subsequently adapted and operationalized by local and regional authorities according to local needs and conditions. This approach reduced information asymmetries, promoted consistency in risk understanding, and supported coordinated preparedness and response planning.

The experience of the APEC member economy of Viet Nam also highlighted how geospatial information facilitated the dissemination of risk information and preparedness guidance from central institutions to provincial and local authorities. Spatially explicit maps and geospatial decision-support tools were used to communicate hazard exposure, vulnerability patterns, and priority areas, thereby supporting timely and informed preparedness actions.

This best practice demonstrated that the effectiveness of geospatial information was closely linked to its alignment with multi-level governance arrangements. For APEC member economies with decentralized administrative structures, integrating geospatial information across governance levels strengthened institutional coherence, enhanced preparedness, and supported more effective disaster risk management outcomes.

Best Practice 7: Capacity Building and Knowledge Transfer through Geospatial Platforms

Several presentations emphasized capacity building as a critical enabler for the effective and sustained use of geospatial information in disaster risk management. Experiences shared by the APEC member economies of Chile and Indonesia highlighted how structured training programmes, shared geospatial platforms, and user-oriented tools contributed to strengthening technical and institutional capacities, particularly at local and regional levels.

A central aspect of this best practice was the focus on usability and accessibility of geospatial information. Rather than relying solely on specialized technical teams, the initiatives presented demonstrated the value of designing platforms and tools that were aligned with the operational needs and skill levels of end users, including emergency managers, local authorities, and sectoral agencies. This user-centered approach supported broader adoption of geospatial information and reduced dependency on ad hoc technical support during emergency situations.

The experiences also underscored the importance of institutionalizing capacity-building efforts through continuous training, knowledge exchange mechanisms, and integration of geospatial competencies into organizational processes. By combining training activities with shared platforms and standardized workflows, these initiatives help ensured continuity of expertise, reduced staff turnover risks, and supported consistent application of geospatial information over time.

This best practice was highly relevant for APEC member economies seeking to enhance disaster resilience through long-term investment in human and institutional capacity. Strengthening geospatial skills and knowledge transfer mechanisms enabled economies to maximize the value of existing data and systems, supported evidence-based decision-making, and sustained the effective use of geospatial information across the full disaster risk management cycle.

In addition to these practices identified through direct presentations, further insights were obtained through a complementary international consultation, as described in the following section.

4.3. Insights from the Preliminary International Consultation

In addition to the experiences shared during the APEC Symposium, the project incorporated a preliminary international consultation aimed at collecting written inputs from APEC member economies with relevant experience in the use of geospatial information for forest fire management. This consultation was conducted as a complementary study prior to the Symposium and sought to broaden the evidence base of the project by capturing diverse institutional and technical perspectives across the region. While these economies were not able to participate as speakers in the Symposium, their contributions provided valuable contextual and comparative insights that reinforced and expanded the themes discussed during the event.

Written inputs were received from the APEC member economies of Australia; Canada; Mexico; the Philippines; the Russian Federation; and the United States. Together, these contributions reflected a wide spectrum of institutional maturity, technological capacity, and hazard contexts, ranging from highly advanced wildfire intelligence systems to emerging applications of geospatial tools in forest fire monitoring and preparedness. The consultation confirmed that, despite differing geographic and institutional settings, many economies faced similar challenges related to data integration, interoperability, operational use, and capacity development.

Several contributions illustrated the role of **large-scale geospatial systems** in supporting wildfire risk monitoring and decision-making. Inputs from Australia and Canada highlighted the use of integrated fire danger rating systems, **fire intelligence platforms**, and operational dashboards that combined satellite imagery, meteorological data, and historical fire records to support early warning, situational awareness, and strategic planning. These experiences reinforced the importance of authoritative data sources, standardized methodologies, and sustained institutional coordination to enable proactive fire management at scale.

Other submissions emphasized the operational application of geospatial information during emergency situations. Contributions from the Russian Federation and the United States described systems that supported near real-time monitoring of active fires through satellite-based detection, thermal anomaly mapping, and geospatial visualization tools tailored to emergency response agencies. These experiences aligned closely with the Symposium discussions on

the value of multi-source geospatial integration and the need to embed spatial information within operational workflows to support timely and informed decision-making.

Inputs from Mexico and the Philippines provided perspectives from economies strengthening their institutional and technical capacities in forest fire management. These contributions highlighted efforts to develop or enhance fire danger assessment systems, improved access to geospatial data, and built technical expertise within responsible agencies. The experiences underscored the importance of capacity building, user-oriented tools, and incremental institutional development to ensure that geospatial information could be effectively applied in operational contexts, particularly at local and regional levels.

Overall, the preliminary international consultation complemented the Symposium outcomes by validating the relevance and transferability of the best practices identified during the event. The contributions demonstrated that the strategic use of geospatial information—supported by clear governance arrangements, interoperable systems, and sustained capacity development—is a shared priority across APEC member economies. By integrating insights from both the Symposium and the broader consultation, the Summary Report presented a more comprehensive regional perspective on how geospatial information can strengthen forest fire management and disaster resilience across the Asia-Pacific region.

5. Discussions

The discussion sessions of the APEC Symposium provided a structured space for participants to reflect on the practical and institutional conditions required to strengthen disaster resilience through geospatial information, with a specific emphasis on forest fire risk management. Building on the technical presentations, case studies, and best practices, participants engaged in dialogue that moved beyond individual tools and datasets to focus on governance arrangements, operational integration, and long-term sustainability. Across diverse institutional contexts, the discussions highlighted a shared recognition that wildfire risk was increasingly shaped by compound drivers—such as climate variability, land-use change, and expanding exposure—requiring decision-making processes that were faster, more coordinated, and more evidence-based. In this setting, geospatial information was consistently framed as an enabling capability that supported situational awareness and planning, but whose full value depends on how effectively it was embedded into institutions, workflows, and cross-sectoral coordination mechanisms.

A central theme emerging from discussions was the need to strengthen institutional alignment and reduced fragmentation in geospatial information management for disaster risk management. Participants observed that geospatial datasets relevant to forest fire prevention, preparedness, response, and recovery were often distributed across multiple agencies with different mandates and technical standards. This distribution, while sometimes justified by sectoral specialization, could create barriers to timely data discovery, integration, and authoritative use during emergencies. Participants emphasized that fragmentation was not only a technical issue but also an institutional one, requiring clearer governance arrangements, agreed roles for authoritative datasets, and procedures that enabled agencies to share information efficiently. Discussions underscored that institutional clarity became particularly critical during large-scale wildfire events, when the speed of decisions and the need for a shared operational picture increased sharply. Participants therefore highlighted the value of establishing pre-defined coordination mechanisms and data governance arrangements that function under both routine conditions and crisis scenarios.

Participants also reflected on the practical meaning of interoperability and standardization in emergency contexts. While technical standards and

interoperable services were widely recognized as essential, discussions indicated that interoperability must be operationally "fit for purpose" rather than implemented as an abstract technical goal. Participants noted that during emergency response, decision-makers required spatial information that was consistent, comparable, and rapidly usable, often under time pressure and high uncertainty. As such, attention was given to the need for common baseline datasets, shared symbology conventions where feasible, and standardized approaches to key operational layers (e.g., hazard perimeters, critical infrastructure, evacuation-related layers, exposure and vulnerability indicators). Discussions suggested that economies seeking to strengthen interoperability should prioritize a limited set of operationally critical datasets and products, rather than attempting to standardize all available information at once. This incremental approach was perceived as more feasible and more likely to generate measurable improvements in emergency coordination.

A recurring point of discussion concerned the relationship between data availability and operational decision-making. Participants acknowledged that many APEC member economies now have increasing access to satellite imagery, meteorological datasets, and near real-time fire detection products, but that the availability of data did not automatically translate into better decisions. Several participants emphasized that the key challenge lies in converting data into decision-ready information—through analytics, workflows, and communication products aligned with operational needs. Discussions highlighted that decision-ready information depended on the relevance of spatial products to operational questions, the timeliness of updates, and the ability of response agencies to interpret and trust the information. Participants noted that information products that were too complex, too technical, or not aligned with established decision protocols may remain underused, even if technically advanced. Consequently, discussions emphasized the value of user-oriented products and simplified decision-support outputs that communicated essential information clearly, while remaining traceable to underlying data sources.

The discussions also addressed the importance of integrating geospatial information into formal emergency management systems and procedures. Participants observed that geospatial capabilities were most effective when they are not treated as an auxiliary technical function activated only during crises, but rather as an institutionalized component of routine preparedness and emergency operations. This included having designated roles and responsibilities for geospatial information within incident management structures, ensuring that

geospatial services were available through established platforms, and maintaining continuity of workflows through training and exercises. Participants highlighted that when geospatial workflows were institutionalized—through standard operating procedures, routine coordination mechanisms, and operational dashboards—agencies were better prepared to scale up their use of spatial information during complex wildfire events. Discussions therefore reinforced that institutional integration was a core determinant of effectiveness, complementing investments in technology and data acquisition.

Capacity development was discussed as a cross-cutting enabling factor for all other priorities. Participants recognized that technical capacity gaps remained significant, particularly at local and regional levels where operational response often took place. Discussions highlighted that capacity constraints were not limited to technical skills; they also related to staffing continuity, institutional memory, and the ability to maintain and update geospatial datasets over time. Participants emphasized the value of sustained training programmes, practical guidance tailored to non-specialist users, and the development of shared platforms that reduced barriers to access. In this context, the discussions reinforced that capacity building should be seen as a long-term institutional investment rather than a one-time activity. Participants also noted that capacity building was closely linked to usability: systems that were difficult to access or require specialized knowledge may deepened capacity gaps rather than reduce them. Accordingly, discussions underscored the importance of designing tools and platforms with end-user needs in mind, including emergency managers and local authorities who require intuitive access to spatial information.

Another theme explored during discussions was the need to strengthen preparedness and prevention-oriented geospatial approaches, particularly under conditions of climate-driven uncertainty. Participants noted that as fire regimes became more severe and less predictable, economies required stronger anticipatory capacities, including risk forecasting, scenario planning, and spatially explicit preparedness measures. Discussions emphasized that geospatial information supported this shift by enabling early identification of risk patterns, monitoring of changing environmental conditions, and prioritization of prevention and mitigation actions. Participants reflected that prevention-oriented geospatial systems required sustained data maintenance, reliable baselines, and ongoing coordination among agencies responsible for land management, environmental monitoring, and emergency preparedness. The discussions also suggested that prevention-oriented approaches require careful integration into policy and planning processes,

including land-use planning and the management of the wildland–urban interface, in order to address exposure drivers and reduced disaster impacts over time.

Participants further reflected on post-event assessment, recovery planning, and the need for continuity across the disaster risk management cycle. Discussions highlighted that geospatial information was critical not only during response but also in supporting evidence-based recovery decisions, prioritization of interventions, and monitoring of reconstruction progress. Participants emphasized the importance of consistent methodologies for assessing impacts and communicating results, particularly when decisions involve multiple sectors such as housing, infrastructure, environmental restoration, and land management. Discussions also noted that post-event geospatial assessments could generate lessons that informed future preparedness and mitigation strategies, reinforcing the value of feedback loops that connected recovery analysis to prevention planning.

The discussion sessions also highlighted the importance of multi-level governance and coordination across administrative levels. Participants observed that wildfire risk management often involved central authorities, local and regional governments, and local response units, each with different capacities and information needs. Discussions emphasized that geospatial information could act as a shared reference framework that supported coherence across levels, but only when information products and responsibilities were aligned with governance structures. Participants noted that coordination mechanisms should ensured that local and regional authorities could access authoritative datasets and adapt them to local contexts, while maintaining consistency in key operational layers and reporting. This multi-level alignment was considered essential for effective preparedness planning, early warning dissemination, and coordinated response.

Finally, participants emphasized the value of APEC as a platform for sustained regional learning and cooperation. Discussions highlighted that, despite differences in geography and institutional arrangements, economies face shared challenges that could be addressed more effectively through exchange of practical experience, peer learning, and collaborative development of approaches. Participants noted that the Symposium created opportunities to identify converging priorities—such as strengthening governance arrangements, improving operational integration, and investing in capacity development—that could inform future initiatives within the APEC framework. The preliminary international consultation undertaken as part of the project was also viewed as a valuable mechanism for

broadening the evidence base and ensuring that economies unable to participate as speakers could still contribute knowledge and experience. Overall, participants recognized that regional dialogue was increasingly important given the cross-border dimensions of wildfire risk and the growing need to accelerate innovation and institutional learning.

In conclusion, the discussion sessions reinforced that strengthening disaster resilience through geospatial information required a balanced focus on technology, institutionalization, and human capacity. Participants emphasized that the greatest gains were achieved when geospatial information was governed through clear institutional arrangements, made interoperable through practical standards and authoritative baselines, integrated into operational decision-making systems, and sustained through capacity development and user-oriented platforms. These shared insights provided a strong foundation for continued collaboration among APEC member economies and for future work that advanced the strategic use of geospatial information to address escalating forest fire risk in the Asia-Pacific region.

6. Conclusions

The APEC Symposium on Disaster Resilience and Geospatial Information Management confirmed the critical and increasingly strategic role of geospatial information in addressing forest fire risks and strengthening disaster resilience across APEC member economies. Against a backdrop of escalating wildfire frequency, intensity, and complexity, the Symposium demonstrated that geospatial information had moved beyond a purely technical function to become a core enabler of risk-informed governance, operational coordination, and evidence-based decision-making. Despite significant diversity in geographic, climatic, and institutional contexts, the discussions and case studies revealed a set of shared challenges and converging priorities that underscored the growing importance of geospatial information as a foundational component of effective disaster risk management.

A central conclusion emerging from the Symposium was that the value of geospatial information did not reside solely in the availability of data, technologies, or analytical tools, but in their institutionalization within governance frameworks, operational systems, and routine decision-making processes. Experiences shared by APEC member economies demonstrated that authoritative geospatial governance arrangements—supported by clear institutional mandates, defined responsibilities, and agreed standards—were essential to ensuring the reliability, consistency, and trustworthiness of spatial information. This institutional dimension was particularly critical during emergency situations, when time constraints, uncertainty, and high-stakes decisions demanded information that was authoritative, interoperable, and widely trusted across agencies and levels of government.

The Symposium also reinforced the importance of embedding geospatial information across the full disaster risk management cycle. From prevention and preparedness to emergency response, post-disaster assessment, and recovery planning, geospatial data and tools were shown to enhance situational awareness, supported coordinated action, and enabled more transparent and accountable decision-making. Case studies illustrated that economies which integrated geospatial workflows into routine emergency management practices—rather than activating them only during crises—were better positioned to respond effectively to large-scale and complex wildfire events. This integration supported continuity

of operations, reduced duplication of effort, and strengthened coordination among institutions with different mandates and technical capacities.

Another key conclusion concerns the persistent gap between technical capability and operational use. While many APEC member economies had access to advanced geospatial data sources, including satellite imagery, fire detection products, and modelling tools, challenges remained in translating this information into decision-ready outputs for emergency managers and policy authorities. The Symposium highlighted that technical sophistication alone did not guarantee operational value. Instead, effectiveness depended on the alignment of geospatial products with operational needs, decision timelines, and institutional procedures. User-oriented platforms, standardized and interpretable products, and clear communication mechanisms were identified as essential for ensuring that geospatial information informed decisions at different governance levels, particularly under time-sensitive and high-uncertainty conditions.

Capacity development emerged as a cross-cutting and long-term priority for sustaining the effective use of geospatial information. Participants recognized that technical and institutional capacities vary significantly across and within APEC member economies, with local and regional levels often facing the greatest constraints. The Symposium underscored that capacity building must extend beyond short-term training to include continuous learning, knowledge transfer, and the institutionalization of geospatial competencies within organizations. Investment in human capital, combined with accessible and user-oriented platforms, was critical to ensuring continuity, reducing reliance on ad hoc expertise, and enabling consistent application of geospatial information over time. Without such sustained investment, the benefits of technological advances risk remaining unevenly distributed and operationally underutilized.

The discussions also highlighted the growing importance of anticipatory and prevention-oriented geospatial approaches in the context of climate-driven wildfire risk. Early warning systems, fire risk forecasting, and spatial planning tools were widely recognized as essential components of a shift from reactive response toward proactive risk management. Geospatial information supported this transition by enabling the identification of evolving risk patterns, prioritization of prevention measures, and integration of disaster risk considerations into land-use planning and environmental management. The Symposium emphasized that strengthening prevention-oriented capacities requires sustained data maintenance,

institutional coordination, and policy alignment, as well as the ability to link scientific and geospatial analysis with practical decision-making processes.

Multi-level governance and coordination across administrative levels also emerged as a critical conclusion. The Symposium demonstrated that effective wildfire risk management depended on coherent interaction between central authorities, local and regional governments, and local response entities. Geospatial information could act as a shared reference framework across these levels, but only when roles, responsibilities, and data flows were clearly defined. Aligning geospatial capabilities with decentralized governance structures enhanced preparedness, improved information dissemination, and supported coordinated response and recovery. This alignment was particularly important in economies where wildfire impacts were highly localized but required economy-level coordination and resource allocation.

Finally, the Symposium reaffirmed the strategic value of regional cooperation and knowledge exchange under the APEC framework. Despite differences in hazard profiles, institutional arrangements, and levels of technical maturity, APEC member economies faced common challenges that benefitted from shared learning and collaboration. The exchange of experiences, best practices, and lessons learned—both through the Symposium and the complementary international consultation—demonstrated the potential for transferable approaches that could be adapted to local contexts. Participants recognized that regional dialogue accelerated innovation, reduced duplication of effort, and supported more coherent responses to transboundary and climate-related risks.

In conclusion, the outcomes of the APEC Symposium highlighted that strengthening disaster resilience through geospatial information required a balanced and integrated approach that combined technology, governance, operational integration, and capacity development. Geospatial information was most effective when it was authoritative, interoperable, embedded in routine decision-making, and supported by sustained institutional investment. The Summary Report provided a solid foundation for continued collaboration among APEC member economies and offered strategic insights that could inform future initiatives aimed at enhancing wildfire risk management and broader disaster resilience. By advancing the strategic use of geospatial information, APEC member economies could strengthen their collective capacity to anticipate,

manage, and recover from forest fires and other climate-related hazards, contributing to a more resilient and sustainable Asia-Pacific region.