Project Report:
Recovery and Resilience:
Risk-smart Business for SMEs in the Post COVID-19 Era

APEC Emergency Preparedness Working Group

May 2023
# TABLE OF CONTENTS

Executive Summary .................................................................................................................. 1  
Introduction .............................................................................................................................. 3  

Project Outcome I: Workshop on Risk-smart Business for SMEs in the Post COVID-19 .......... 5  
   I. Overview............................................................................................................................ 5  
   II. Panel Discussion Points ................................................................................................. 6  
   III. Key Takeaways................................................................................................................ 6  

Project Outcome II: Risk-informed Decision-making Framework for Resilience ............... 9  
   I. Overview............................................................................................................................ 9  
   II. Risk-informed Decision-making Framework for Resilience (RIDMFR) ....................... 10  

Project Outcome III: Capacity Building of Disaster Prevention and Mitigation: Supply Chain Resilience of SMEs ................................................................................................. 12  

Project Outcome IV: Risk-informed Decision-making Framework for Resilience .......... 14  
   I. Overview............................................................................................................................ 14  
   II. Principles and Objectives .............................................................................................. 14  
   III. Key Actions.................................................................................................................. 15  
   IV. Possible Tools List ......................................................................................................... 15
EXECUTIVE SUMMARY

As the backbone of APEC economy, the business community, especially small and medium enterprises (SMEs), contributed enormously to the COVID-19 prevention and control and economic development of the region, but also suffered from the continued adverse impacts of the pandemic. For SMEs to build resilience against the impacts of such risks as natural hazards and public health contingency, and achieve sustainability in the post pandemic era, government departments, technical support agencies and SMEs themselves should all make due efforts.

That said, China proposed and implemented this APEC-funded project under Emergency Preparedness Working Group (EPWG), aiming to raise awareness of policy makers, practitioners, SME leaders and staff about risk-informed decision making, emergency preparedness and risk-smart business, and discuss possible and applicable suggestions for government departments, technical agencies and SMEs to not only build back better from such risks as the COVID-19, but also achieve sustainability against future major disasters and public health contingency.

Through this APEC-funded project, we found that:

First, risk-informed decision making towards resilience should be facilitated. Making risk-informed decisions are actually an investment in risk reduction, resilience-building and sustainable development, especially for high-value decisions with the greatest impact. Risk-informed decision makers integrate the disaster risk management process into their decision-making process and by doing so, the risk-informed decision making at government level can support SMEs and the wider community to build resilience against future risks and promote their sustainability in the post-pandemic era.

Second, risk-informed preparedness towards anticipatory action should be supported. Risk identification, monitoring and assessment tools or methodology can provide evidence-based emergency preparedness recommendations for the society and the industry, including SMEs, so that they can take early action and make risk-informed preparedness. APEC economies are different in their development stages and basic conditions. Hence it is challenging and not at all easy to develop a commonly-used and standardized risk monitoring and assessment models or tools to support their emergency preparedness. However, under this project, we hope to integrate such a risk-informed mindset and paradigm into the whole process of investment, planning, preparedness, response, relief and recovery.

Third, risk-smart and sustainable business models towards resilience should be encouraged. For enterprises, especially SMEs, understanding both the risk itself and the constraints of themselves is the prerequisite for resilient and sustainable development. The event hopes so see panelists discussing from the strategic level, the operational level, and the enabling environment level and making recommendations on how the government and technical agencies can provide more effective help to SMEs in the post-COVID-19 era and during future risks.

Mounting systemic risk has become a new normal in the Asia-Pacific region, but more multi-dimensional and more concerted efforts made by the region are also forming a better normal. It is the high time and it is only right that we ask hard question on what we can do and how we should act. Through discussion on and research into the above-mentioned points,
outcomes of this project will provide reference to APEC economies on improved understanding of risk and emergency preparedness, and raised awareness of policy makers, practitioners, SME leaders and staff about risk-informed decision making, emergency preparedness and risk-smart business.
INTRODUCTION

According to UNDRR, if the global community is to improve the lives and livelihoods of people in emerging and developing economies, risk in small and medium enterprises (SMEs) must be tackled (UNDRR, 2020). As the bedrock of global, economy-level and local markets, the business community is hit harder, suffer longer and is slower to recover than other communities especially when disasters strike. Lessons learned in these trying times show that decades of development gains may be wiped out in an instant unless the development is made resilient, risk-informed and climate-smart.

During the COVID-19 prevention and control, the business community, especially SMEs, contributed enormously but also suffered from the continued adverse impacts of the pandemic. For SMEs to build resilience against the impacts of such risks as natural hazards and public health contingency, and achieve sustainability in the post pandemic era, government departments, technical support agencies and SMEs themselves should all make due efforts. That said, National Disaster Reduction Center of Ministry of Emergency Management of China (NDRCC) implemented this APEC-funded project (EPWG 06 2021A) and discussed:

- The importance of raising risk awareness and enhancing risk knowledge of government authorities so as to make risk-informed decision and investment;
- Risk-resilience capacity building of SMEs in the post COVID-19 era;
- Science, technology and innovation (STI) applied to promote resilient and risk-smart business recovery.

With these three highlighted points, this project invited a group of internal and external experts and benefited from discussions with and inputs from them. Great appreciation goes to the advisory group and the project team listed below for their valuable information and contribution:

- Dr. Fengmin Kan, Senior Independent Consultant and former Chief of the Asia-Pacific Office of United Nations Office for Disaster Risk Reduction (UNDRR)
- Mr. Ken Bai, Vice President of Lenovo Data Intelligence Business Group
- Mr. Sanny Ramos Jegillos, Senior Advisor at Bangkok Regional Hub of United Nations Development Programme (UNDP)
- Dr. Takako Izumi from International Research Institute of Disaster Science of Japan
- Ms. Hang Thi Thanh Pham from the Asia-Pacific Regional Office of Food and Agriculture Organization of the United Nations (FAO)
- Mr. Manny M. de Guzman who is former Commissioner for Climate Change of the Philippines
- Ms. Ana Christina Thorlund from United Nations Project Office on Governance of United Nations Department of Economic and Social Affairs (UN DESA)
- Advisors from Southern University of Science and Technology
- Mr. Xiaoning ZHANG, Ms. Yan GUAN and Ms. Mier TA from National Disaster Reduction Center of Ministry of Emergency Management of China (NDRCC)

Thanks to the joint efforts of the advisory group and the project team, the project achieves the following four outcomes:
- Developing a Risk-Informed Decision-Making Framework for Resilience (RIDMFR) to support the ongoing effort to reduce the risks and impact of disasters on people and economic development in APEC member economies;
- Developing a Report on Capacity building of Disaster Prevention and Mitigation: Supply Chain Resilience of SMEs to assess the constraints of SMEs’ resilience building in most APEC member economies and put forward recommendations from both internal and external ecology for SMEs’ supply chain resilience building;
- Hosting a two-day virtual workshop on Risk-smart Business for SMEs in the Post COVID-19;
- Making suggestions on the potential of developing a commonly-used and standardized risk monitoring and assessment models or tools in the Asia-Pacific to support their emergency preparedness.

To summarize and present these outcomes, the project team developed this Project Report which will give detailed information on the outputs and open a platform for further discussion and mutual learning among APEC members.
Project Outcome I: Workshop on Risk-smart Business for SMEs in the Post COVID-19

I. Overview


A total of 36 participants and speakers from EPWG member economies, international/regional development agencies registered for the Workshop (18 (50 %) female and 18 (50%) male). The workshop has created a virtual platform for participants to share and discuss on disaster preparedness, risk-informed decision making, resilience building centering on SMEs, paving the way for future programming and intervention re-modelling among APEC economies.

The workshop invited one of the EPWG Co-chairs, Ms. Yan GUAN, to deliver welcoming remarks, in which she stressed that EPWG, mandated by APEC as a sub-fora to help member economies prepare for, mitigate, respond to, and recover from natural hazards and other risks, has always been contributing to regional efforts on dealing with systemic risk and post-COVID-19 recovery, and engaging in APEC efforts to help micro, small and medium enterprises (MSMEs) build their resilience. She shared that in the 2022 APEC Economic Leaders’ Meeting, APEC Leaders also reaffirmed collaboration to improve opportunities for MSMEs to be competitive, specialized and innovative. Hence the theme and panel of this Workshop - Risk-informed decision making, Risk-Smart Business for SMEs in the Post COVID-19, and Risk-informed Preparedness towards resilience - highlighted the priority work of EPWG but also respond to APEC commitment, and they are highly relevant.

Mr. Li Shengli, Deputy Director General, International Cooperation and Rescue Department, Ministry of Emergency Management of China, then addressed the opening session and shared China’s emergency preparedness policy paradigm. He said that In it’s modernization drive of emergency management system and capacity, China has been pursuing “prevention first, with integrated development of prevention, relief and rescue”. It is now shifting policy mindset from post-disaster relief to pre-disaster prevention, from single hazard to comprehensive risk management, and from reducing losses to mitigating risks. That said, on one hand, we attach great importance to better risk monitoring, early warning and assessment, improved integrated monitoring of multi-hazards and disaster chains, as well as enhanced capacity of risk identification and early warning. On the other hand, it extends global, regional and sub-regional partnership networks, join or build multilateral and bilateral cooperation mechanisms on emergency management, and make positive contribution to global sustainable development agenda.
Mr. Xiaoning ZHANG also elaborated on the background, objectives, main activities and discussion points of this event as Project Overseer. He called for enhanced dialogue between APEC member economies and the private sector to together contribute to the resilient recovery of our region.

II. Panel Discussion Points

As planned, the workshop facilitated relevant and useful panel discussions on the above-mentioned three highlighted topics, supported by the following key questions:

First, on risk-informed decision making towards resilience:
- How is disaster risk-information considered in the decisions related to development projects in your organization?
- What are the major successes, challenges and limitations in your risk-informed decision-making, especially in its implementation?
- What are your recommendations in order to further promote risk-informed decision-making practice for resilience in socio-economic development?

Second, on risk-smart business for SMEs in the post COVID-19:
- What is risk-smart business and how it can be achieved? What are the priority areas and interventions for your organization/enterprise to support SMEs to build resilience? How to promote a broad, increased, active and sufficient participation of the business community in resilient APEC recovery?
- Suggestions to formulate business continuity plan adaptive to the post COVID-19 landscape;
- Suggestions to implement risk-informed and climate-resilient business models and practices;
- Suggestions to apply science, technology and innovation (STI) to promote resilient and risk-smart business recovery;
- Suggestions to use economic incentives, disaster risk financing and risk transfer tools to help SMEs prevent, prepare for, respond to and recover from risks;
- Suggestions to promote public-private partnership for DRR and resilience building, in particular complementarity and co-financing

Third, on risk-informed Preparedness towards resilience:
- What are the risk monitoring and assessment tools or methodology used by your organization? Please briefly explain the major factors and steps, successful applications, challenges and limitations.
- What is your opinion on developing standard risk monitoring and assessment tool or methodology in the Asia-Pacific region to facilitate risk-informed preparedness? Please briefly share your recommendations or challenges and way forward
- How to improve the user-friendliness of risk monitoring and assessment tool for the SMEs to help them make better preparation?

III. Key Takeaways

The workshop presented the following selected key recommendations:

First, on risk-informed decision making towards resilience:
- Improved coherence both in terms of delivery and reporting between Sendai Framework implementation and the implementation of SDGS, Paris agreement and the new urban agenda;
- Inclusive risk assessment and stakeholder representation for better critical outcomes, in order that action plans and programming are responsive and effective. Building back better and leaving no one behind cannot be achieved without an inclusive, risk-informed decision making;
- Moving from disaster risk reduction concept to the risk of disasters in overall sustainable development. We need to see the decision making of disaster risk reduction be transformed and translated into a specific term of risk governance and the responsibility of different levels. For local and central government, the overall accountability and responsibility of disaster risk reduction must be in the main agenda of the sustainable development, not as a marginal issue or ad hoc issue, but is a development objective;
- Governments act as regulators and facilitators to enhance enabling environments for businesses to establish informed operations; business associations act as catalysts and advocate risk-informed decisions and practices among their members, as well as acting as a mediator between the private sector and the government and other stakeholders; business enterprises themselves, since they would be the key agents for change, must revisit their business strategies and transform their business models;
- For SMEs employees and customers: engaging in awareness raising and training, research and innovation, as well as technological development for disaster management; sharing and disseminating knowledge practices and data on economic losses and disaster statistics; participating in the development of normative framework and technical standards that incorporate disaster risk management, including active participation in the development of government and local strategies for disaster risk reduction. The Sendai Framework spells out the role of the private sector businesses are to integrate disaster risk management, including business community into business models and practices through the risk informed investments;
- Creating or fully utilizing platforms or fora which bring together different stakeholders to promote the utilization of tangible tools and the risk-informed decision making such as business continuity planning. This would be a role such as APEC, ADPC and other partners who are involved in this Workshop can play.

Second, on risk-smart business for SMEs in the post COVID-19:
- More public private partnerships and international corporation is needed. The government and NGOs and enterprises need to work together to support SMEs to achieve the risk smart business through leading practice sharing, technology application guidance and global and regional supply chain echo system construction;
- To develop a risk-smart business model, SMEs could make improvements in the following four areas. First, risk management-awareness-raising training for employees, relevant performance evaluation and incentive mechanism. Second, considering risk as a factor into decision making, setting up risk prevention model, carrying out risk scenario analysis and making decision based on the analysis result. Third, capturing new opportunity in the changing business environment and meeting new market/customer demands through innovation. Fourth, digital technology application;
- Supporting business continuity plans could offer a relatively low-cost way of implementing risk prevention measures;
- The government should find effective ways to connect financial institutions and SMEs so that before or during emergencies, SMEs can have access to financial or insurance resources and channels to resolve problems;
- SMEs could engage in the development of normative frameworks and technical standards;
- Stakeholders could guide enterprises to change their business mindset and models towards risk-informed and risk-smart ones.

Third, on risk-informed preparedness towards resilience:
- Building towards risk-informed preparedness needs to utilize models and tools to collect, analyze and apply risk information in the whole process of land planning, urban layout, building construction, infrastructure maintenance, emergency rescue and post-disaster recovery;
- Reinforce cooperation on disaster risk monitoring and early warning;
- A possible way for developing a commonly-used, widely-applied and user-friendly risk assessment tool/ methodology may be APEC organizing a technical committee to make a priority list of tools and develop a set of databases and software related to risk information and then apply them when necessary and favourable. But it still needs to take into consideration basic conditions and needs of APEC member economies and requires further discussion and exploration on the feasibility.
Project Outcome II: Risk-informed Decision-making Framework for Resilience

I. Introduction

The rationale to develop a Risk-Informed Decision-Making Framework for Resilience (RIDMFR) is to support the ongoing effort to reduce the risks and impact of disasters on people and economic development in APEC member economies. Its overarching goal is to contribute to realization of the APEC Putrajaya Vision 2040 (PV 2040) - for an open, dynamic, resilient and peaceful Asia-Pacific community by 2040 for the prosperity of all its people and future generations. This is very much in line with the relevant global frameworks including the Sendai Framework for Disaster Risk Reduction, the Paris Agreement on Climate Change and the 2030 Sustainable Development Agenda.

Dr. Fengmin Kan, Senior Independent Consultant and former Chief of the Asia-Pacific Office of United Nations Office for Disaster Risk Reduction (UNDRR), prepared this RIDMFR and made great effort on analyzing data in a scientific way and developing feasible recommendations.

RIDMFR first provides a brief overview of global shifts in addressing disaster and risk issues since 1990s. The implementation of the “Yokohama Strategy and Plan of Action for a Safer World” (1994-2004), contributed to improved understanding on disaster and risk issues, informing the formulation of the “Hyogo Framework for Action: Building resilience of nations and communities to disasters” (2005-2015). The Hyogo Framework for Action highlighted that disaster risk reduction is a shared responsibility of all stakeholders. Its implementation enabled engagement of those who are not, by profession, disaster managers, including politicians, policy makers, entrepreneurs, educators, developers and community leaders. Such extensive engagement of stakeholders is accompanied by wide acceptance that, while disaster management is a humanitarian issue, disaster risk reduction is more of a development issue. The progress and challenges in the implementation of the Hyogo Framework for Action informed the formulation of the “Sendai Framework for Disaster Risk Reduction” (2015-2030), and made it possible for it to become a comprehensive international accord together with other main elements of the global development agenda 2030, including the Paris Agreement on Climate Change and the 2030 Sustainable Development Agenda (SDGs), among others.

Second, it elaborates on disaster and risk issues in APEC. It begins with a brief review of disasters and their impact on APEC member economies and then of APEC leaders’ political will and desire to steer towards more resilient and sustainable economies. The brief review shows that most APEC economies are very prone to the impact of natural hazards, with socio-economic recovery sometimes lasting years in areas hit by disasters. Disasters pose not only a serious threat to the peoples of APEC member economies, but also a great challenge to the achievement of the PV 2040. To address the challenges imposed by disasters and climate risks, APEC leaders have demonstrated consistent political commitment which has enabled development of its strategy, framework and work plan for addressing disaster and climate risks. APEC, as a dynamic platform for economic development and investment, is shifting towards resilient and sustainable economies.
So RIDMFR believes that both the global background and APEC’s context underline the need for increasing effort to reduce disaster and climate risks and making future development risk-informed, to increase the desired resilience and sustainability of its economic development.

Third, it presents a Risk-Informed Decision-Making Framework for Resilience (RIDMFR), as an alternative approach to decision-making for supporting APEC on-going efforts to achieve its PV 2040, including: goals and objectives, hazards concerned and targeted groups, and steps towards risk-informed decision-making in APEC projects. To make the approach simple and easy for the target group to use, the RIDMFR starts with steps widely used in decision-making processes and then suggests how to integrate steps that have been used in disaster risk management processes, so as to make each step in decision-making risk-informed. The RIDMFR should be considered as a “living approach” - which needs to be reviewed, improved and updated periodically in various development sectors, based on knowledge and experience obtained in its implementation. Therefore, it also includes implementation, monitoring and evaluation, and documentation.

Fourth, it focuses on the enabling environment for the implementation of the RIDMFR. It describes seven enablers, including public understanding, government policy, legislation, risk governance, accountability, stakeholder engagement and community participation. These enablers can mutually reinforce each other in the process of change. Together, they can become a powerful force to progressively transform decision makers into a driving force towards achieving the PV 2040.

At the end, a summary emphasizes that disasters will continue to be frequent, posing great threats to sustainable development. The risk of disasters continues to rise in both the Asia-Pacific region and the rest of the world. It is high time for the APEC member economies to invest more in action on the ground to curb the stubborn uptrend of disasters and risks under the clear guidance of APEC Putrajaya Vision 2040, in which APEC leaders committed to “promote economic policies, cooperation and growth which support global efforts to comprehensively address all environmental challenges, including climate change, extreme weather and natural disasters, for a sustainable planet.” While APEC member economies continue to coordinate implementation of the APEC framework and its EPWG strategic planning for disaster risk reduction, in line with the Sendai Framework, decision-makers, in both public and private sectors, should start promoting a shift from “risk-ignored” to “risk-informed” decision-making for socio-economic development projects. Testing, implementing and updating this RIDMFR will be a good start - heading in the right direction - towards the achievement of the PV 2040.

II. Risk-Informed Decision-Making Framework for Resilience (RIDMFR)

First, what is the goal of developing RIDMFR?

The overarching goal of the RIDMFR is to contribute to the realization of the APEC Putrajaya Vision 2040 - for an open, dynamic, resilient and peaceful Asia-Pacific community by 2040 for the prosperity of all its people and future generations, in line with relevant global frameworks including the Sendai Framework for Disaster Risk Reduction, Paris Agreement on Climate Change and the 2030 Sustainable Development Agenda.

Second, what are the specific objectives and values of RIDMFR?
- Supporting the implementation of the APEC Disaster Risk Reduction Framework, Aotearoa Action Plan and 2021-2024 Strategic Plan Towards Adaptive and Disaster-resilient APEC Economies;
- Promote risk-informed decision-making in development planning, project design and implementation, starting with pilot projects related to the areas of priority in APEC such as agriculture, health, finance, energy, infrastructure and ecology;
- Support coherent implementation of the Sendai Framework for Disaster Risk Reduction, the 2030 Sustainable Development Goals and the Paris Statement on Climate Change

Third, what are the hazards concerned in RIDMFR?

Being aware of international promotion of multi-hazards, and multi-dimensional and systemic approaches to disaster risk reduction, this RIDMFR will focus, as a starting point, on risks triggered by natural hazards such as earthquakes, floods, drought, cyclones, volcanic eruptions and tsunamis, in line with the current mandate of the EPWG of the APEC.

Fourth, what are the targeted groups?

The primary target group will be decision-makers in both the public and private sectors for disaster management, investment and development projects in the APEC priority areas. The second target group includes project managers, local government officials and community leaders.

Fifth, what is the definition of a risk-informed decision making?

Making risk-informed decisions is an investment in resilience-building and sustainable development, especially for high-value decisions with the greatest impact. In this document, risk-informed decision-making is defined as a decision made based on comprehensive understanding of disaster risks as well as their potential impacts. It requires decision-makers to integrate risk management into their decision-making, step by step, so that disaster risks are systematically identified, assessed, analyzed and considered, together with other competing factors in an integrated manner. In doing so, decision makers will be able to play an important role in building resilience to disaster risks.

Sixth, what are the steps towards RIDMFR?

- Identifying the needs and context for a risk-informed decision
- Collecting and assessing information for a risk-informed decision
- Analysing alternative options for a risk-informed decision
- Evaluating evidence for a risk-informed decision
- Taking a risk-informed decision
- Implementing a risk-informed decision
- Monitoring and Evaluating implementation of a risk-informed decision
- Documenting the implementation of risk-informed decisions for the future

Seventh, how to foster an enabling environment for the implementation of RIDMFR?

There are seven main enablers of an enabling environment for risk-informed decision-making, including 1) public understanding, 2) government policy, 3) legislation, 4) risk governance, 5) accountability, 6) stakeholder engagement, and 7) community participation.
Project Outcome III: Capacity building of Disaster Prevention and Mitigation: 
Supply Chain Resilience of SMEs

Small and medium-sized enterprises (SMEs) are an integral part of the world economy, accounting for 90% of the total global enterprises. Particularly, in developing economies, SMEs are an important driving force for economic development, contributing over 50% of GDP growth and providing over 70% of jobs, which generate income for vulnerable groups and promote economic growth and social stability. However, due to the lack of mature disaster management mechanism, sufficient cash reserves and sound supply network, SMEs are more vulnerable to risks and hazards than large enterprises, with longer duration of damage and slower recovery speed. Therefore, SMEs with better disaster prevention and mitigation capacity is of significant importance to better livelihoods of people in emerging economies.

Mr. Ken BAI, Vice President of Lenovo Data Intelligence Business Group, prepared this report and made great effort on analyzing data in a scientific way and developing feasible recommendations.

This report first analyzes the constraints of resilience building for SMEs and discusses the definition of SMEs and its resilience. The constraints may include resources, awareness, finance, technology, strategy and challenges presented by globalization.

Second, it proposes a framework for SMEs’ Disaster Resilience Building:

- At strategy level, disaster risk management should be stressed and improved. Raising risk awareness and strengthening risk management can help minimize the impact on fixed assets and normalize operating income of enterprises after uncertain events. Business continuity management is a supplement and extension of enterprise risk management. It is a management process that enables enterprises to become aware of potential crises and related impacts, develop emergency preparedness, response and business recovery plans, and thus enhance the enterprises’ ability to respond to risk events and resume operations. (UN Women, 2022);

- At operation level, supply chain end-to-end operation needs to be optimized. End-to-end operation refers to the process from accepting or inspiring users' needs, through demand communication and internal collaboration, to finally feeding back products or services to users. At this level, enterprise resilience is reflected in the maintenance of business continuity and the normal satisfaction of customer demand during disasters, which requires enterprises to optimize all key nodes of the supply chain under the guidance of risk management strategies, so as to ensure stable demand and improve supply during disasters;

- At enabler level, all-round support should be provided to SMEs. SMEs resilience building requires not only the improvement of risk management mechanism and the optimization of supply network, but also the all-round capacity enhancement in technology application, financial investment, human resources and low-carbon and sustainable development.

Third, it proposes key recommendations on SMEs’ disaster resilience building. On one hand, internally, efforts could be made in:
- Enhancing risk awareness and strengthen risk management: Pre-disaster investment can effectively reduce disaster risks and reduce losses caused by disasters to a large extent, therefore it could be more profitable than post-disaster rescue and reconstruction investment. To strengthen resilience capacity, SMEs should change their passive emergency strategy to active preparedness, and post-disaster treatment mindset to pre-disaster and anticipatory preparedness. SME managers should first enhance their risk awareness, attach importance to enterprise risk management, actively prepare for disaster prevention, develop business continuity plans and proactively cope with disaster risks;

- Optimizing supply networks and encouraging innovation: In planning stage, demand forecasting and innovation in product and marketing should be stressed. In procurement stage, various methods such as multi-sourcing and near-shoring could be taken. In manufacturing stage, redundancy should be avoided and industrial alliance could help. In delivery stage, facilities allocation and logistics networking really matter;

- Emphasizing green development: For enterprises, when the operating pressure is facing the goal of sustainable development, the implementation of a green supply chain is particularly important. On the premise of ensuring economic benefits, enterprises can work together through upstream and downstream enterprises in the supply chain and within all departments of the enterprise, from raw materials, production and processing all the way to end-of-life recycling, so as to minimize the impact of all links in the supply chain on the natural environment, and optimize the economic, social and environmental benefits of the supply chain;

- Encouraging the application of digital technology: At the same time, accelerating the digital transformation of enterprises can not only guarantee their business continuity during the epidemic, but also even seize new growth opportunities in the future. Considering the constraints of SMEs in terms of manpower, financial and material resources, digital transformation needs to actively seek the help of technology enterprises to achieve technology-enabled disaster resilience by applying low-cost, low-threshold technology tools provided by technological enterprises.

On the other hand, externally, steps could be taken in:

- Improving disaster risk management in APEC member economies: Optimizing/formulating emergency management laws and action plans, encouraging enterprises to establish risk management system, raising risk awareness, promoting positive risk culture, etc.;

- Building a resilient external environment: Strengthening critical infrastructure, facilitating the development of emergency industry, focusing on early warning and emergency preparedness, establishing a professional emergency response system, etc.;

- Public-private-partnerships (PPP) for all-round support: SMEs’ disaster resilience building requires the empowerment of digital technology, financial investment and human resource, which can be achieved through joint participation of the government, social organizations, communities and enterprises. It entails joint efforts to integrate the resources of all parties, form synergy of the whole society's collaborative governance, and promote multi-sectoral collaboration to improve the resilience of disaster risks.
Project Outcome IV: Suggestions on the Potential of Developing a Commonly-used and Standardized Risk Monitoring and Assessment Models/tools in the Asia-Pacific

I. Overview

Advisors from Southern University of Science and Technology, with Prof. Xiaofei CHEN as the head, made great effort on analyzing data in a scientific way and developing feasible recommendations.

This document first presented that the Asia-Pacific region is one of those with the densest population in the world. The region has a population of about 2.9 billion, accounting for nearly 40% of the world. The GDP and trade of the region both account for nearly half of the world. Most APEC economies are located along the Pacific Rim volcanic-seismic belt and prone to extreme weather events. Floods, storms, epidemics, earthquakes and landslides are among the most devastating and frequent hazards in APEC economies. With the intensification of climate change, further economic growth and a new round of capital concentration, the hazard risk in the Asia-Pacific region is on the rise, and this trend will not slow down in the foreseeable future. Particularly, the hazard risk in the region may be potentially amplified by the dense industrial and supply chains, posing a global threat to sustainable development.

The problem is how to cope with the constant threat from hazards and effectively reduce disaster losses in APEC economies. In recent years, the view of emergency preparedness focusing on post-disaster has been widely discussed. The emphasis on general preparedness in the whole process of risk prevention and resilience building has become an international consensus, including economies in the Asia-Pacific region. Risk-informed preparedness not only includes understanding the risk formation mechanism but more importantly, utilizing models and tools to collect, analyze and apply risk information in the whole process of land planning, urban layout, building construction, infrastructure maintenance, emergency rescue and post-disaster recovery, so as to cover as many elements as possible to minimize hazards risks and strengthen resilience building.

It briefly reviewed existing risk assessment models and tools in the region: The regional technical standards and guidance frameworks are still incomplete and non-unified; Developing economies are lack of relevant technical forces to fully apply the existing models/tools and adapt to future ones; The sharing, communication and cooperation of existing models/tools/database among economies can be further enhanced.

II. Principles and Objectives

It elaborated that the objective of making suggestions on the potential of developing a commonly-used and standardized risk monitoring and assessment models/tools in the Asia-Pacific is to encourage APEC economies to develop relevant models/tools towards risk-informed emergency preparedness and further map and understand risks. It suggested the following principles in promoting risk-informed emergency preparedness:

First, technical system. Dynamic risk assessment models should be developed to understand disaster risks and their trends. Models and tools development should consider the situation of certain economy and relevant technical frameworks should be improved and effectively utilized.
Specialized training and demonstration projects on risk-informed disaster preparedness could be developed and promoted.

Second, whole-process preparedness. Risk information should be applied to the entire disaster preparedness process, including land planning, urban layout, building construction, infrastructure maintenance, emergency response and post-disaster recovery to minimize risks and enhance resilience building.

Third, science-based approaches and accuracy. The development of risk assessment models and tools should follow a scientific and systematic framework, comprehensively considering hazards, exposure, vulnerability and disaster preparedness capacity in certain economy.

III. Key Actions

According to the four components of risk, namely hazards, vulnerability, exposure and capacity for prevention, response and recovery, it then proposed ten key actions towards risk-informed emergency preparedness:

\[
Risk = \frac{\text{Hazard} \times \text{Vulnerability} \times \text{Exposure}}{\text{Capacity of Response and Recovery}}
\]

First, compiling hazard zoning maps. (Hazard)

Second, setting codes for newly-built buildings and infrastructures. (Vulnerability)

Third, promoting safety appraisal and reinforcement measures for existing buildings and infrastructures. (Vulnerability)

Fourth, applying risk information to planning and decision making. (Exposure)

Fifth, highlighting the role of risk information in investment planning. (Exposure)

Sixth, strengthening risk monitoring and early warning at different spatial-temporal scales. (Exposure)

Seventh, enhancing capacity of emergency relief and secondary disaster prevention. (Capacity of response and recovery)

Eighth, preparing for the needs of temporary and rapid re-settlement of disaster-affected people (especially for million-level and above). (Capacity of response and recovery)

Ninth, preparing for rapid recovery of lifelines and infrastructure functions. (Capacity of response and recovery)

Tenth, developing catastrophe insurance and other risk transfer tools. (Capacity of response and recovery)

IV. Possible Tools List
In the end, it suggested a few tools/methods that can be considered/developed/implemented to support risk-informed emergency preparedness.

First, software for compiling comprehensive risk zoning maps. (Hazard)

Second, database of hazards. (Hazard)

Third, database/dynamic updating system of population, transportation and exposure. (Vulnerability)

Fourth, safety appraisal and assessment tools for existing and newly-built buildings and critical infrastructures. (Vulnerability)

Fifth, different qualitative models/tools for hazards to be used in land planning. (Exposure)

Sixth, tools for assessing socio-economic impact of natural hazards and risks. (Exposure)

Seventh, scientific and digital management system of emergency relief resources. (Capacity of response and recovery)

Eighth, dynamic monitoring and early warning system. (Capacity of response and recovery)

Ninth, intelligent decision-making system. (Capacity of response and recovery)

Tenth, contingency plans for emergency preparedness, response and relief. (policy and training)

Eleventh, knowledge hub for major disaster information and joint response. (policy and training)

Twelfth, guiding opinions/standards on establishing and managing emergency shelters. (policy and training)

Thirteenth, emergency response training for communities. (policy and training)