



**Asia-Pacific  
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# **Best Practices Guideline: Risk-informed Decision Making and SMEs Capacity Building**

**APEC Emergency Preparedness Working Group**

July 2023





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Economic Cooperation**

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**July 2023**

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Produced by

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# INTRODUCTION

This document is produced by National Disaster Reduction Center of Ministry of Emergency Management of China (NDRCC) in the context of APEC-funded Project “EPWG 06 2021A - Resilience and Recovery: Risk Smart Business for SMEs in the Post COVID-19”, with an aim to provide guidance and reference on supporting small and medium enterprises (SMEs) resilience building and risk-smart business at government, technical and business community level, especially in the post-pandemic era.

As the backbone of APEC economy, the business community, especially SMEs, contributed enormously to the COVID-19 prevention and control 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. With an overarching goal of providing guidance and suggestions for decision makers, practitioners and SMEs in APEC community about adaptation to post-pandemic landscape, risk-informed decision making, and integrating a risk-smart and climate-resilient philosophy into the post-COVID-19 business models and practices, this document discusses resilience building from the following two levels:

First, risk-informed decision making at government/ strategic/ decision makers level to support industries including SMEs build resilience against future risks and promote their sustainability in the post-pandemic era.

Second, resilience capacity building at SME level to strengthen supply chain, improve risk management, and raise awareness for risk-smart business.

Specifically, in the first part of the document, the study focuses on risk-informed decision making for resilience and answers a few questions around the topic: What? Why? Who? How? The study finally develops a Risk-Informed Decision-Making Framework for Resilience (RIDMFR) aiming to provide reference to a risk-informed and risk-smart policy paradigm/mindset in APEC economies. It 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 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.”

The primary target group of this part will be decision makers at strategic level in both the public and private sectors for disaster management, investment and development projects in the APEC priority areas. The second target group of this part then includes project managers, local practitioners, local government officials and community leaders.

The second part, based on the risk-informed decision-making framework and paradigm, also proposes a framework for SMEs to enhance resilience capacity building especially when facing disasters or future risks in the midst of today’s mounting systemic risk. Considering the current situation in most APEC developing economies, it is far from enough for SMEs to build a high level of disaster resilience on their own. Crafting a resilient ecosystem requires the participation of the government and the civil society. Hence the study puts forward



recommendations from both internal and external ecology of enterprises, hoping to, on one hand, provide reference to disaster-related and industry-related government departments in APEC member economies on building resilient enterprises with absorptive, adaptive, and restorative capabilities, and on the other hand, provide direction to SMEs themselves on shifting to a risk-smart and climate-resilient business model.

The primary target group of this part will be SMEs lack of or working towards more systematic and strategic risk management, those heading towards resilient post-pandemic recovery, and those in the face of adverse impact of natural hazards, climate events or the COVID-19. The second target group includes disaster-related and industry-related government departments, development organizations and SMEs stakeholders/counterparts in APEC member economies or beyond.

# ACKNOWLEDGMENT

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, and Dr. Peter Schmiedtchen, Member of the Future Forum of Public Safety, Think Tank of German Federal Parliament and Personal Member of the German Committee for Disaster Reduction prepared this document and made great efforts on analyzing data in a scientific way and developing feasible recommendations.

The document has also benefited from discussions with and inputs from a group of Asia-Pacific regional experts and the expertise of NDRCC. Together, this group represented a great deal of knowledge and experience in disaster management, disaster risk reduction, climate change adaption, community risk management, sustainable and resilient development, and policy, programming and decision-making processes.

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# 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.<sup>1</sup>

Part One 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. Eight years after the adoption of these global frameworks, disaster and climate risk is unfortunately still on the rise. While the United Nations Office for Disaster Risk Reduction (UNDRR) is facilitating the Mid-term Review of the Sendai Framework through multi-level consultations and different studies in various parts of the world, the United Nations Development Programme (UNDP) in March 2022 released its new publication on “The UNDP Approach to Risk-informed Development,” providing much-needed technical reference for achieving resilient and sustainable development.

Part Two is 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 disaster risks, APEC

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<sup>1</sup> APEC Putrajaya Vision 2040 provides an inspiring forward-looking policy guidance. The original document can be found on the APEC website.

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.

Both the global background and APEC's context underline the need for increasing effort to reduce disaster risks and making future development risk-informed, to increase the desired resilience and sustainability of its economic development.

Part Three 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: goal 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, Part Three also includes implementation, monitoring and evaluation, and documentation.

Part Four 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, 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. Global Shift in Addressing Disaster and Risk Issues**

Since the UN-launched "International Decade for Natural Disaster Reduction" in 1990, disaster and risk reduction issues have become a common agenda and shared responsibility of all member states of the United Nations. Since then, members of the international community have adopted and implemented three global strategies/frameworks to guide national and international action to address disaster and risk issues:

- Yokohama Strategy and Plan of Action for a Safer World (1994-2004)

- Hyogo Framework for Action: building resilience of nations and communities to disasters (2005-2015)

- Sendai Framework for Disaster Risk Reduction (2015-2030)

The above international frameworks have been instrumental in guiding and advancing public understanding and commitment to disaster and risk reduction. Collective efforts of the international community have made some progress in various areas and at different levels, and are well-documented by UN agencies as well as research and development institutions. This document will highlight a few points that were important in pushing disaster and risk reduction process forward.

#### **i. Improved Understanding on the Issues of Disasters and Risks**

The implementation of the “Yokohama Strategy and Plan of Action for a Safer World” (1994-2004), enabled disaster and risk issues to become a common agenda of the international community, helping to establish institutions, develop policy frameworks, raise awareness and build capacity. All of these inevitably contributed to the decline of death toll caused by disasters, despite the increasing number and scale of disasters triggered by multi-hazards, based on the information available from United Nations International Strategy for Disaster Reduction (UNISDR, known as United Nations Office for Disaster Risk Reduction, UNDRR, since 2015).

During this decade, scientific research and studies reached the conclusion that the term “natural disaster” is not a scientifically correct concept or term. Research proves that earthquakes and floods are natural hazards, but cannot by themselves turn into disasters. A disaster requires the additional combination of three man-made factors: exposure, vulnerability and incapability. The level of exposure and vulnerability of people and assets to such a natural hazard determines the level of disaster risk. Moreover, human ability or inability to address and mitigate such risks then determines the level of impact of natural hazards.

The global review of the implementation of the Yokohama Strategy and Plan of Action for a Safer World, also known as Living with Risk (2004), revealed that there was better understanding about the interrelationship between disasters, risks and development, despite being on a relatively small scale and among professionals and academic circles. The review pointed to the fact that choices made in development policies, along with other decisions and practices, can either decrease or increase exposure and vulnerability of people and assets to both traditional and emerging disaster risks. In this case, disasters are the undesired by-products caused in risk-insensitive development processes. Thus, disasters are actually more of a development issue than merely a humanitarian concern. According to the improved understanding, small disasters can be prevented and the socio-economic impact of large disasters can be reduced if the exposure and vulnerability of humans and their assets to natural hazards can be sufficiently addressed with resilience building.

During the preparations for the Second World Conference on Disaster Reduction, UNISDR held different consultations with governments and stakeholders (2002-2004). The thematic and regional consultations made it clear that disasters continued to erode progress in socio-economic development around the world. Development practices continued to ignore risks and thus accumulate exposure and vulnerability to the potential impact of natural hazards. UNISDR-led extensive consultations revealed that improved understanding,

knowledge and technical abilities and methods were largely limited to a relatively small group of professionals, not enough to achieve a paradigm shift on risk reduction in the context of development. Collective action was therefore required to widen the engagement of stakeholders with different professional backgrounds and further increase public and institutional understanding of the roots of disasters and risks. Adequate cognition on the subject would lead to the comprehensive action desired in disaster and risk reduction.

In 2004, UNDP, launched its first Global Report on “Reducing Disaster Risk - A Challenge for Development.” The report further clarified the inter-relationship between development and disaster risks. It pointed out that “ ‘Natural’ disaster risk is intimately connected to processes of human development. Disasters put development at risk. At the same time, the development choices made by individuals, communities and economies can generate new disaster risk. But this need not be the case. Human development can also contribute to a serious reduction in disaster risk.” The Report also underlined the point that disaster risk is not inevitable, by sharing good practices about how disaster risk reduction can be built into ongoing development planning policy.

The two UN publications, *Living with Risk*, published by UNISDR and *Reducing Disaster Risk - A Challenge for Development* by UNDP, provide much-needed understanding and knowledge in disaster and risk reduction in addition to other relevant publications by academic researchers. Together, they played a significant role in informing the global agenda on disaster risk reduction before and after the World Conference on Disaster Reduction in 2005.

## **ii. Creating an Enabling Environment for Integrating Risk Concerns into Development**

The above-mentioned cognitive breakthrough provided the much-needed foundation and guidance for further addressing disaster and risk issues. In 2005, the Hyogo Framework for Action (HFA), was officially adopted by the international community, based on the progress made and challenges encountered in the implementation of the Yokohama Strategy and Plan of Action for a Safer World (1994-2004). The HFA set out five priority areas with the overarching goal to build resilience to disasters:

- Governance: organizational, legal and policy frameworks (policy process);
- Risk identification, assessment, monitoring and early warning (technical process);
- Knowledge management and education (social process);
- Reducing underlying risk factors (development process); and
- Preparedness for effective response and recovery (humanitarian process).

As indicated above, the five priority areas corresponded well to policy, technical, social, economic, and humanitarian processes at different levels, making it clear that reducing disaster and risks is a complex process with multiple dimensions in human development. Implementing the HFA needed going beyond the traditional approach in disaster management, taking instead an integrated approach: policy makers, legislators, physical and social scientists, development practitioners and disaster managers are all required to play important and complementary roles in disaster and risk reduction. Jointly, they can help shift the paradigm from managing disasters to managing risks, through a blend of policy, technical, social and economic development actions. Effective partnership with key stakeholders can make a difference in reducing risk and building resilience, directly or indirectly. In addition,

UNISDR developed 22 core indicators<sup>2</sup> for voluntary reporting on-line of progress in disaster risk reduction, every two years, to facilitate and monitor HFA implementation.

At that time, according to UNISDR, progress in disaster risk reduction had been made in each of the five priority areas, but the achievements were moderate, insufficient to curb the upward trend in disaster risk. However, the implementation of the HFA not only deepened public and institutional awareness that reducing disaster risk is more of a development issue, but also secured wider public understanding on - and commitment to - disaster risk reduction. This has inspired a good deal of action, especially at local level, to pilot the integration of disaster risk concerns into projects related to the Millennium Development Goals (MDGs). Good practices were well documented and published by UNISDR and other multilateral organizations.

Further-improved understanding on disaster and risk issues and effective engagement of a wider range of stakeholders through policy, technical, social, developmental and humanitarian processes contributed to creating an enabling environment for linking the new global framework for disaster risk reduction with other global instruments for climate change and sustainable development beyond 2015.

### **iii. Reducing Disaster Risks for Sustainable Development**

The year 2015 was a unique year when several global policy documents were discussed and adopted to guide action to achieve the sustainable development goals. They included the Sendai Framework for Disaster Risk Reduction (2015-2030), Paris Agreement on Climate Change, and Transforming Our World: The 2030 Agenda for Sustainable Development, the Financing for Development Agenda for Humanity and the New Urban Agenda. These documents greatly complement each other and together set out a comprehensive and ambitious blueprint for the world to achieve inclusive, resilient and sustainable development by 2030.

The Sendai Framework for Disaster Risk Reduction (SFDRR), as the first global instrument agreed by international community, aims to further increase disaster risk understanding, prevent new disaster risks, reduce existing disaster risks and continue to increase preparedness for response and recovery, thus strengthening resilience. The SFDRR made a further shift in focus from disasters to disaster risks, which requires cooperation and partnership with a wide range of stakeholders in society. In a nutshell, the SFDRR called for integration of disaster risk prevention and reduction into development processes, creating a coherent approach among climate change mitigation and adaptation efforts, and risk reduction and sustainable development work in order to achieve the resilience and sustainability of economies and communities.

Encouragingly, reducing risk and enhancing resilience became a shared concern that was highlighted in the major global development agendas for 2030. The 2030 Agenda for Sustainable Development set 17 ambitious goals and 169 targets to be achieved by 2030. It highlighted that by 2030 it should substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards mitigation and adaptation to climate change and resilience to disasters, using resources efficiently and inclusively. This is closely in line with the Sendai Framework.

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<sup>2</sup> For the details of the 22 indicators for the HFA implementation, check UNDRR's website.

The Paris Agreement on Climate Change emphasized the intrinsic relationship that climate change actions, responses and impacts have with equitable access to sustainable development and the eradication of poverty. Article 8 mentioned that comprehensive risk assessment and management, risk insurance facilities, climate risk-pooling and other insurance solutions are needed to achieve greater community resilience, and protect livelihoods and ecosystems.

These global development agendas mutually reinforce and depend on each other for achieving their goals set for 2030. Undoubtedly, successful implementation of the Sendai Framework for Disaster Risk Reduction and the Paris Agreement on Climate Change will advance progress towards the 2030 Sustainable Development Goals and vice versa. They have also provided comprehensive policy and action guidance for international community to invest in more risk-informed development paths, to achieve disaster resilient and thus sustainable development.

Since the adoption of the Sendai Framework in 2015, governments and stakeholders have taken action to honor their commitment to implementation of the Sendai Framework, pushing forward and adding to the momentum gathered at Sendai, in line with the set of 38 indicators<sup>3</sup> which was recommended by an Open-ended Intergovernmental Expert Working Group, to track progress in implementing the seven targets of the Sendai Framework as well as its related dimensions reflected in Sustainable Development Goals 1, 11 and 13. The indicators help measure progress in achieving the global targets of the Sendai Framework and determine global trends in the reduction of risk and losses due to disasters.

Seven years after the implementation of the Sendai Framework, UN global and regional reports in 2021 and 2022 revealed that disasters, especially those related to climate change, had become more frequent with more severe impacts. The efforts made by the international community have not yet reversed the uptrend in disaster and climate risk, thus posing a great challenge to achieving the 2030 Sustainable Development Goals. The UN General Assembly decided to hold a midterm review of the implementation of the Sendai Framework in 2023 to “assess progress on integrating disaster risk reduction into policies, programmes and investments at all levels, identify good practices, gaps, and challenges and accelerate the path to achieving the goal of the Sendai Framework and its seven global targets by 2030”.

UNDP released its new publication, “The UNDP Approach to Risk-informed Development” in March 2022, highlighting that “the development process itself can be a major driver of risk. The relationship between risk and development works in both ways and forms the core rationale for integrating risk reduction into development policy, planning and budgeting. Decisions on development trajectories and investment can contribute to the creation of risks”. It concluded that “risk is a normal and inseparable part of economic activities and development”. UNDP’s Approach to Risk-Informed Development provides fresh guidance and an environment for the international community, governments in particular, to pursue risk-informed decision-making for resilient and sustainable development.

### **III. Review of Disaster and Risk Issues in APEC**

APEC was transformed into a permanent organization in 1992, after a decade of informal discussions and consultations. Since then, APEC has primarily focused on promoting cooperation and collaboration in economic development, trade and investment in both the

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<sup>3</sup> Details for the 38 indicators are available on UNDRR website.



public and private sectors. Its governing body has been well-supported by its Secretariat and 10 thematic working groups listed as development areas of priority. At this point of time, disaster and risk reduction was not yet one of the thematic working groups and was therefore not yet on the official agenda.

However, there has been great concern about the impact of disasters among APEC member economies. Both political and professional interest in addressing disaster and risk issues have been growing steadily stronger, especially after the unprecedented disaster caused by the Indian Ocean Tsunami in December 2004. The tsunami's devastating impact, together with the adoption of the Hyogo Framework for Action at the World Conference on Disaster Reduction in January 2005, highlighted the importance of disaster risk reduction and resilience building in the APEC economies.

#### **i. Disasters and Their Impact on APEC Member Economies**

The Asia Pacific region is prone to disasters caused by multiple hazards. According to the Asia-Pacific Disaster Report 2021 by United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), "disaster impacts are likely to intensify because variability and the increase in extreme temperature fluctuations can affect the frequency and intensity of disasters and make certain places and population groups more vulnerable. Climate change is thus not only a hazard, but also exacerbates interactions between biological and other natural hazards, which in turn affects the underlying risk drivers of poverty and inequality, in a vicious circle." Although it included more than just APEC member economies, its analysis also reflected the situation encountered by APEC members. According to the public information available, most APEC member economies experienced the devastating impact of disasters triggered by earthquakes, floods, cyclones and wildfires. In addition, half of its member economies were listed among the world's top ten disaster-prone economies, including China, the United States, Japan, the Philippines, Indonesia, Mexico and Thailand.

Past experience has shown that the threat of disasters to APEC's economic development and investment is real and large. The unprecedented Indian Ocean Tsunami affected eleven APEC member economies, who bore the great majority of deaths and economic losses. The Tsunami served as a devastating wake-up call that a single powerful disaster can take lives and destroy livelihoods on a huge scale, washing away accumulated development gains in minutes, yet, taking many years to recover.

In recent years, disaster profiles of APEC member economies underline the fact that most APEC members are highly prone to the impact of multiple hazards. Multiple hazards have been frequent, and their impact is on the rise, not only undermining economic development and investment, but also interrupting its process towards the APEC Putrajaya Vision 2040.

#### **ii. APEC Political Will for Disaster and Risk Reduction**

APEC leaders have played a significant role in creating an enabling policy environment to curb the uptrend of disaster risks and impacts. As early as 1997, APEC leaders acknowledged the high impact of disasters on APEC economies, realizing that a disaster which strikes one APEC economy also affects the rest. Since then, political commitment on the issue among APEC leaders has been growing steadily, especially in the aftermath of the Indian Ocean Tsunami in 2004. APEC leaders:

- Committed in 2005 to protecting our economies by taking action to lessen the impact of future disasters and improve our collective response capability.

- Urged in 2006 that member economies further intensify cooperation, including with the private sector, to maximize regional available resources to better prepare the region for disasters and post-disaster rehabilitation and reconstruction.
- Reiterated in 2007 their recognition of the region's vulnerability to disasters by highlighting the nexus among economic growth, energy security and climate change.
- Articulated in 2008 the importance of promoting disaster risk reduction through the adoption of the APEC Principles on Disaster Response and Cooperation.
- Reaffirmed in 2009 the importance of enhancing human security and reducing the threat of disruptions to business and trade in the Asia-Pacific region.
- Bolstered investors' confidence by reiterating after 2010 their commitment to take strong and action-oriented measures to address the threat of global climate change and commitment to developing practical disaster risk management mechanisms, as well as increasing preparedness and strengthening the ability of APEC economies to manage emergencies.
- Pledged in 2011 to involve the private sector and civil society in APEC emergency preparedness efforts.
- Expressed in 2012 support for further steps such as facilitating business continuity and resilience planning, especially among small and medium enterprises, establishing common standards for emergency early-warning systems in cross-border transportation, and for promoting the integration of disaster-risk financing.
- Articulated in 2013 the need to undertake urgent action to prevent the grave economic consequences of natural and human-induced disasters.
- Agreed in 2015 to encourage further enhancement of cooperation on such issues, including more robust networking among disaster management agencies, improving supply chain resilience, reducing barriers to the movement of emergency responders and humanitarian relief across borders, increasing data sharing and better applying science and technology to the challenges.
- Remained committed in 2016 to the implementation of the 2030 Agenda for Sustainable Development as it represents a balanced and comprehensive multilateral framework for international cooperation, as well as welcoming the recent entry into force of the Paris Agreement, committing to its transparent and effective implementation to transition to a low carbon, climate-resilient economy.
- Committed in 2017 to strengthen cooperation, including with the private sector, to enhance resilience to disasters through effective mitigation, preparedness, disaster risk reduction, response and recovery efforts, and underlined the importance of financial instruments and policies against disaster risks.
- Promoted in 2020 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.

Clearly, APEC leaders are well informed on the impact of disasters and the risks they are facing related to multi-hazards. Their political commitment to address disaster and risk issues

has been consistent and sustainable since 2005. It has steadily moved from general recognition to concrete policy guidance on issues related to disasters, hazards, vulnerability, risks and integrating risk concerns into APEC development, investment and economic growth. The challenge is how to continue to transform the political commitment into practical action on the ground to make its development, investment and trade resilient to natural hazards.

### **iii. APEC Frameworks for Action Towards Resilient and Sustainable Economies**

To translate political will into practical action, APEC established its Task Force for Emergency Preparedness (TFEP) in 2005. APEC member economies, with their Task Force, were active to address disaster issues in their respective economy and beyond. The TFEP, with support and in consultation with experts from APEC member economies, developed its Strategy for Disaster Risk Reduction and Emergency Preparedness and Response (2009-2015), providing needed guidance for cooperation and collaboration among APEC members to curve the upward trend of disasters and risks in the Asia Pacific region. The Strategy helped to increase understanding of disaster and risk issues among different stakeholders in APEC economies.

Subsequently, the TFEP's work was further recognized and appreciated, and it was, therefore, elevated to become Emergency Preparedness Working Group (EPWG) in 2010 - a new and cross-cutting thematic sub-fora of APEC. It was given the clear goal of promoting and enhancing preparedness for response and recovery, as well as the resilience of economies and societies in the Asia Pacific region. It was also encouraged to foster cooperation among APEC member economies and fora/sub-fora to strengthen capacity-building for a proactive approach on disaster risk reduction and resilience-building. The TFEP attaches great importance to reducing new and existing disaster risks in order to enhance APEC's social and economic resilience to disasters, while also strengthening priorities consistent with the Sendai Framework and the 2030 Agenda for Sustainable Development.

Issues on disasters and risks have been on the APEC agenda with a different focus each year, as demonstrated in the APEC Leaders' Declarations (listed above). The EPWG, in close cooperation with technical experts, developed APEC Disaster Risk Reduction Framework in 2015, with four pillars: 1) Prevention and mitigation, 2) preparedness, 3) response and 4) rehabilitation and building back better. The framework also highlighted the importance of seven elements, including community participation, disaster risk governance, disaster risk financing, science and technology, critical infrastructure resilience, ecological integrity and inclusiveness of women and vulnerable sectors in disaster risk reduction. The framework was officially adopted by APEC leaders with a call to develop an action plan.

In 2016, APEC Disaster Risk Reduction Action Plan was developed in line with the four pillars. Its goal is to contribute to adaptive and disaster-resilient economies and support inclusive and sustainable development among APEC member economies. The four pillars of the framework identified areas for cooperation, including disaster vulnerability and risk assessment and the integration of disaster risk reduction concerns in the APEC multi-year infrastructure development plan. This included ecosystem-based activities and improving readiness for response to and recovery from the impact of disasters. The Action Plan provided clear and consistent guidance in terms of areas of collaboration, illustrative activities, partners, timeframe and indicators, and this has served as one of the foundations for dynamic and sustainable growth in APEC economies.

Building on progress made and challenges encountered with implementation of the APEC Risk Reduction Action Plan, the EPWG - in consultation with technical experts – developed a Strategic Plan 2021-2024. The overarching objective is to contribute to achieving APEC’s Vision 2040, particularly in promoting economic policy cooperation, along with growth that supports global efforts to comprehensively address all environmental challenges, including climate change, extreme weather and disasters. The Strategic Plan highlighted agreed priorities, objectives and key performance indicators.

The Strategic Plan, aims to foster more proactivity, consolidating efforts on disaster preparedness and response. It underlines support for strengthening policy efforts to shift the balance to investing in risk prevention and reduction. It also aims to reinforce cross-sectoral collaboration in multi-hazard surveillance, collaboration on community-based disaster risk management. It therefore includes public-private partnerships that are open to flexible and innovative ways of working together to building disaster-resilient business and livelihoods in communities. Attention is also paid to early warning, impact assessments and comprehensive disaster risk reduction, these as performance indicators of the strategic plan.

In summary, APEC political will to address disaster and risk issues has been consistent. An APEC framework to address disaster and risk issues was developed and a strategic work plan then put in place, in line with the strategic focus areas of APEC. To facilitate the process to translate political will, the disaster risk reduction framework and the strategic work plan into solid action on the ground will now require prioritization of the needed tools and capacity building within APEC.

#### **IV. A Risk-Informed Decision-Making Framework for Resilience (RIDMFR)**

The practice of making risk-informed decisions cannot be considered as a fresh approach. Publications available reveal that risk-informed planning did already exist in a limited number of sectors due to their high levels of public safety concerns. Designers of hydro dams, for instance, have been trying for decades to estimate the probability that an unusually large earthquake would crack their constructions, causing sudden, huge and deadly floods downstream.

Such “safety-concerned” or “risk-informed” thinking is however limited to what are considered such “obvious” risks and far too little - often nothing - is done to extend such thinking to general public infrastructure such as schools and hospitals. Ironically hospitals, which are key installations in a public emergency caused by disasters, are often among those facilities most vulnerable to a hazard and are thus flooded, destroyed or crippled just when they are needed most.

The good news is that recent years has seen some encouraging efforts to further integrate risk concerns into the project planning in more development sectors, especially in health, critical infrastructure, agriculture, finance and space technology. Good practices available point to the fact that reflecting disaster risk concerns in decisions on development or investment projects enables decision-makers to proactively reduce risk, prevent disasters and build resilience. More importantly, it is an investment in sustainable development in the long-term.

This initiative to develop a RIDMFR represents the continuation of APEC’s efforts in disaster risk prevention and reduction, consolidating progress to date. The RIDMFR will be one of the approaches to facilitate efforts in transforming political will into practical actions on the

ground and among the communities. The RIDMFR, as an approach to risk reduction and resilience building, can be used to support APEC's ongoing resilient, inclusive and sustainable development processes because it goes beyond the disaster management sector and can be used in various other development sectors for achieving resilience to disasters. Moreover, it can also support investments in economic recovery, embedding risk concerns into planning and capacity building, and curbing growth in disaster risks.

### **i. Goal**

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.

### **ii. Specific Objectives**

- Support implementation of the APEC Disaster Risk Reduction Framework, Aotearoa Action Plan and EPWG 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.

### **iii. Hazards Concerned**

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.

Decision-making, by definition, is the selection of a course of action among a set of alternatives in order to best achieve goals set. Traditionally, decision-makers responsible for development work started with identifying the needs or issues of concern, followed by clarification of the objective, nature, conditions and even variables relating to the needs or issue of concern. Once the key elements for a decision are clarified, the focus then will likely be on cost, time frame and expected results, which also reflected the case in post disaster recovery. Decision makers responsible for disaster recovery may as well overlook risk issues.

A good way to clarify a wider set of parameters for decision-making, from the outset, is to brainstorm with a range of stakeholders and partners who may be involved or affected, early in the decision-making process. Decisions on development projects can either increase or decrease the level of risk to people and assets, even to the very investment being made in the decision. However, the risk of disaster is not necessarily always considered to be an issue of concern in decision-making and continues to be marginalized in decision-making processes. This may explain why some bridges, roads, railways, schools, hospitals and residential houses are completely or partially destroyed during disasters, sometime even with big loss of life and livelihoods.

Moreover, if a school is destroyed in an earthquake, then the school was located in an earthquake prone area. The decision, design and construction to build the school there failed to adequately consider the exposure and vulnerability of the students, teachers and investment itself to reduce that seismic risk. The overlooking or ignorance of seismic risk in making a decision might also contribute to the failure to put in place the measures necessary

for seismic risk reduction afterwards, resulting in severely damaged or collapsed buildings and possibly loss of life. There is a popular saying: “Earthquakes don’t kill people; un-safe buildings kill people.” The financial resources needed to replace such destroyed or damaged schools are usually far greater than what preventive measures would have cost. In this context, risk-informed decision-making is of great importance to start with.

#### **iv. Targeted Groups**

The primary target group will be decision makers at strategic level 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 practitioners, local government officials and community leaders.

#### **v. Definition and Steps for Making Risk-Informed Decisions**

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.

##### **(i) Identify the Needs and Context for A Risk-Informed Decision**

A risk-informed decision requires decision makers - whenever they begin to identify an issue for making a decision on - to consider disaster risk factors together with their other traditional factors that they are used to considering, so that they can obtain good knowledge of the impacts of past disasters, existing hazards and potential risks.

For example, when decision makers begin identifying factors that address the public needs for a new hospital, they will naturally go through issues including population dynamics, existing hospitals and their major capacities and deficits. Once the public need for a new hospital has been confirmed, decision makers may look into the possible size and capacity of the new hospital needed, together with such issues that include possible locations, budget needed and funding, and the timeframe for completion.

To make this decision risk-informed, decision makers need to consider risk and resilience factors throughout, so that the new hospital once opened will be able to function in spite of natural hazards such as earthquakes, floods or cyclones. To this end, decision makers need to establish the risk context at an early stage and look into external human and natural factors that may have an impact on objectives they set out, and the results they want. This may include the values and perceptions of external stakeholders and needs to define potential hazards, threats and vulnerabilities and likelihood of damage in a disaster.

Information on the frequency and impact of past disasters is critically valuable, but is not always a complete indication of future risks. For example, flood risk in many economies might be found to be greater than in the past due to climate change or erosion. Seismic risk cannot be estimated from only recent history, but must take into account a long timeframe as well as accumulated geological data. Therefore, it is important to apply a multi-hazard approach to identify all natural hazards that exist in a location and its surroundings where the decision will

have an impact. To do so will help establish the overall risk context, which in turn helps decide on an action plan on how to analyse and address the risks. Therefore, decision makers can identify needs for decision-making and establish the disaster risk context simultaneously, making needs identification risk-informed.

#### (ii) Collect and Assess Information for A Risk-Informed Decision

Unlike development policies, decisions for socio-economic development are likely to be concrete and specific in nature. Normally, decision makers focus on information collection after identifying the needs or issues of concern, objectives and expected results. Information collection is an important part of the decision-making process because the level, source, quality and quantity of information will directly affect the quality and accuracy of the decision. Therefore, decision makers need to reach out to stakeholders or partners related to the decision, both inside and outside their own departments or organization, for information-gathering.

If the location for the project decision, for example, is in a disaster-prone area, resilience to natural hazards should be a major concern. Information related to past disaster impacts and existing disaster risks should be collected. This includes types of natural hazards, the frequency of disasters, level of risk management competence and their impact on people and assets, as well as direct and indirect economic losses.

Normally, such information can be obtained from the department or organization responsible for disaster issues. If not due to lack of capacity in data management, governments then need to take action and enhance their capacity to consolidate data collection, and process data to make them available for risk-informed decisions on development. Risk assessment is not only a process in which potential risks can be identified, but, more importantly, a useful tool to guide decisions on resource allocation for resilience and sustainability.

Information gathered may be processed, based on the decision's needs, through one of the established risk assessment approaches such as a risk management approach, a resilience approach, a risk-based approach, a deterministic risk approach or a probabilistic risk assessment approach. The risk management approach refers to a systematic application of management policies, procedures and practices to the tasks of identifying, analyzing, evaluating, treating and monitoring risk. A resilience approach emphasizes addressing underlying risk drivers and strengthening the capacities and resources of a system to cope with risks, stresses and shocks. The risk-based approach is to identify and assess risks and then prioritize action to address risks, from high-level to low-level risks. A deterministic risk approach is used to assess disaster impacts of a given hazard scenario, to consider the impact of a single risk scenario. A probabilistic risk assessment approach refers to systematic and comprehensive assessment of all possible scenarios, their likelihood and associated impacts of an event to obtain more refined estimates of hazard frequencies and damages.

All of these approaches to risk assessment and analysis are used to inform decision makers about the potential level of risks related to the decision and alternatives, based on users' needs, capacity, resources and choices in different areas. Publications on disaster risk assessment and different approaches are available and accessible, together with examples and successful causes in on-line literature related to the topic, in addition to UNDRR and UNDP publications.

Whatever the approach, risk assessment invariably begins with identification and mapping of natural hazards. Normally, agencies or departments responsible for disaster management should have this information and decision makers for development projects just need to reach out to them to obtain it. It is surprising how often this doesn't happen, even for very major and critical projects. Once the hazards are identified and mapped, the next step is to determine who and what are exposed, including who is especially vulnerable, to the potential risks and what is the likelihood and likely severity if these risks lead to disasters? Risk assessment may follow this recognized formula or another formula which takes coping capacity into consideration:

$$\text{Hazards} + \text{Exposure} + \text{Vulnerability} = \text{Risk}$$

or

$$\text{Hazards} + \text{Exposure} + \text{Vulnerability} - \text{Coping Capacity} = \text{Risk}$$

Although risk assessment provides the foundation of risk analysis, risk analysis needs to look into additional internal and external factors related to the risks assessed. For example, the level of risk governance can make the difference between disaster and resilience. Risk assessment professionals or experts may be needed to elaborate the potential impact of disaster risks on the decision, through quantitative and qualitative analysis if possible and if time and budgets permit. In this way, potential risks can be better analyzed and options better identified. It is important to remember that, historically, decision makers of development projects have inadequately taken risk into account, thus risk and vulnerabilities are being accumulated to an alarming level. The challenge today is to face up better to any "uncomfortable facts" that may undermine a given project, or even destroy it.

### (iii) Analyse Alternative Options for a Risk-Informed Decision

At this stage, the information gathered should be sufficient for decision makers to come up with a set of alternative options for a project decision. If the project, for example, is to build a modern public hospital to improve people's access to medical care in a mega city, it may need to consider the possible risks triggered by floods, earthquake, and other related risks in order to keep it functional and resilient to disasters. In this case, a choice of different locations may vary the vulnerability to a given hazard, along with varying land prices and other costs.

Decisions will have different implications in terms of costs and benefits, time frames, risks and resilience, and short-term and long-term gains. It is advisable to make further elaboration on the pros and cons for each alternative option for the decision, ideally together with representatives of those concerned, to eliminate alternatives which may cost more or unwisely increase risks. Participation and communication will help minimize resistance, reduce negativity and enlist support for doing what is necessary.

Risk analysis is crucial for risk-informed decisions. This may sound obvious but often information about risks is insufficiently analyzed before a decision is taken. In-depth risk analysis may well be the stage that determines whether the project will be a success or failure, and whether the decisions taken are seen in retrospect to have been good ones. Analysis can be very complex, seeking to identify measures, and mitigate exposures to various risks or natural hazards. To illustrate, the fact that there has been no earthquake in seismic prone areas for a while is not necessarily a good sign and it may in fact make a big one more likely. The size of a potential earthquake disaster is also greatly affected by its depth, direction and



distance and these are tricky to predict, even speaking in general time frames such as fifty years.

A good risk analysis goes deeper and involves quite detailed consideration of risk sources, likelihoods, sensitivities, consequences, contributing factors and the existing capacity for and effectiveness of risk governance. For example, a probabilistic analysis may estimate the probability of an earthquake of - say - 7.5 or more on the Richter scale in the next 50 years. However, for many decision makers this is still far from adequate analysis to estimate the amount of damage that would be done, or what counter-measures would be sufficient. Good practices available show that in-depth risk analysis is an effective tool to determine the level of tolerance to a given risk of disaster. Quantitative and qualitative methods can then be applied to reduce risk and prevent disasters from eroding development gains.

#### (iv) Evaluate Evidence for A Risk-Informed Decision

After the in-depth elaboration of the alternative options for a risk-informed decision, decision-makers then need to deploy some of the decision-making tools available to support their evaluation of the remaining alternative options, to sort out the best option possible. Again, this may sound obvious but choosing the best option and justifying why it is the best is no easy challenge when complex trade-offs are involved. Decision-making tools familiar to professional decision-makers include decision trees, matrices, spreadsheets and database analyses. These can help further evaluate and predict the best possible solution to the primary issue of concern and the likely outcome of each alternative decision.

Some argue that risk also comes with investment opportunities. For instance, risk evaluation may help balance between taking manageable risks and reducing them. Evaluation criteria may include implementation adroitness, the risk level for population and assets, the level of return on the investment, the cost in terms of both human and financial resources, and the degree of resilience and sustainability. Such evaluation criteria enable decision-makers to arrive at possible cost-effective alternatives, with an acceptable level of resilience.

#### (v) Taking a Risk-Informed Decision

Once decision makers are well-informed of potential disaster risks, their complexity, costs and potential consequences - and are in a position to determine the best option - they also need to consider the importance of communication about the forthcoming decision. No decision can be made in isolation from others made earlier which might be affected by the new decision. The announcement of the new project should also communicate the potential risks involved, how they were considered in deciding on the project, and how it is planned to address the risks during implementation. Openness with all concerned stakeholders, however drawn out and exhausting the process may feel, is usually the best course.

It is highly advisable to organize a final consultative meeting before taking the final decisions, to validate the selected final option and evaluate support received and minimize remaining opposition. The final validation should focus on key aspects related to the decision which includes the original objectives, budget and cost, opportunity cost and investment return of risk-informed decision, and the balance between risk tolerance and risk taking for the decision.

A draft statement can even be gently tested at such a meeting, for instance by stating in the presentation that the project will include strengthening against a given hazard at an additional cost of x% that is expected to save xxx amount in a given period by protecting the

original investment to xx% probability over xx years. If studies were done by reputable institutions on hazards involved, reference to them would be a welcome inclusion. A spokesperson of the responsible institution might even make a presentation, conveying the scientific basis and objectivity of the analysis that decision-makers are relying upon.

Such multi-stakeholder “cross evaluation” can be a bit energy and time consuming, but it helps decision makers arrive at the best possible decision, addressing the issue of primary concern while also minimising risk due to vulnerability to natural hazards. Make sure that both potential benefits and drawbacks of each option are well considered before making a final choice. Don’t be shy about delaying the final decision to seek further information if the best option does not seem easy to choose, or if a group of decision-makers remain divided.

Once the best available option has been selected, managers are then ready to make plans to cope with the requirements and problems that may be encountered in putting it into effect.

#### (vi) Implementing a Risk-Informed Decision

Once a decision is taken, implementation then becomes the top priority and centre of attention. It is implementation that determines if the decision actually leads to achievement of the desired results, especially the resilience and sustainability aimed for.

Traditionally, implementors or project managers will automatically look into human resources, budget, work plan and even a monitoring mechanism. The work plan thus developed allows to organize budgets and human resources needed, define the expected results and a mechanism that can serve as a monitoring tool, ensuring operations stay on schedule and to standards.

Implementation of a risk-informed decision needs a good level of risk communication to all involved. It requires additional attention to understanding the exact decisions taken on disaster risks and what was decided to be the risk tolerance level. If the decision taken was to tolerate a certain degree of risk, then implementors need to set up a risk monitoring and reviewing mechanism throughout the implementation period and enable corrective actions to be taken when risk is above level of tolerance. If the decision was mostly to reduce disaster risks, it is necessary to clarify the measures and determine if they prove adequate during implementation, or if additional measures, budget and capacities are proving required to achieve the expected reduction.

It may in fact be very challenging to get development project managers or implementors to manage risks and risk reduction measures during the project, as this may not have been their previous practice. They may see this as “not our job - we just build according to the schematics”. In such circumstances, decision makers may want to deploy a disaster risk management expert during implementation - someone using risk management approaches to help the project manager track the risk situation. Construction itself often reveals unknown or unexpected conditions or risk factors. The expert can also support communication with decision makers on potential or upcoming risks, balancing resilience, cost and timeframe.

#### (vii) Monitor and Evaluate Implementation of a Risk-Informed Decision

Monitoring is widely used as a tool to continuously assess project implementation, based on set targets and planned activities. Evaluation, on the other hand, provides a periodic in-depth and time-bound analysis that rigorously assesses the relevance, performance, impact and success of the project, as well as the level of risks to natural hazards and level of resilience to

disasters. Evaluation raises any problems that may have a negative impact on expected results. Therefore, it is not enough for decision makers and implementors to incorporate risk information into their work; only when it is also fully incorporated into implementation, monitoring and evaluation as well, will a project succeed in taking risks and their reduction fully into account.

There is in fact an alarming tendency to forget possible risks once a decision is made or once a thing is built. Managers should not underestimate the potential negative consequences for risks to be ignored in implementation, even completely ignored. To reduce extra expenditure on risk management is also a very common “corner to cut”, perhaps hidden within a structure once completed. Special attention is therefore required to ensure monitoring and evaluation of risk dynamics in project implementation. Monitoring - and especially evaluation - are also key tools for learning and capacity-building, generating examples of good practices (and bad!), along with the lessons learned.

#### (viii) Document the Implementation of Risk-Informed Decisions for the Future

Risk-informed decision-making has not yet become mainstream in most sectors in development. Path-breaking decision makers who have used risk assessment results to inform their decisions in a sector, or for a new project, should make a special effort to document the processes they used, so their “wheel” does not have to be re-invented.

Documenting the rationale for a decision is key, should the project one day be struck by an unforeseen disaster, helping to both reduce fallout and to provide data for an “autopsy” - to see exactly what went wrong at what point in the process that so better decisions can be made in the future.

### **V. Enabling Environment for Risk-Informed Decision-Making and Its Implementation**

As mentioned above, risk-informed decision-making is slowly, but steadily picking up momentum, especially in sectors whose risk level is of high public concern, along with its potential impact on people. Decisions in these sectors, as dam construction, construction and operation of chemical plants, health, critical infrastructure, space technology and nuclear plants, are more likely risk-informed. Because a failure in risk management in these sectors can lead to catastrophic consequences, risk information, assessment and management have become important parts of project planning, decision-making, implementation, monitoring and evaluation, and documentation.

The progress made by such sectors at risk management is an investment in resilience and sustainability, helping protect socio-economic development gains. However, risk-informed decision-making has not yet become mainstream. To mainstream risk-informed decision in development, an enabling environment needs to be created for this, wherein risk-informed decision-making and implementation are encouraged, appreciated and promoted in society at large.

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.

#### **i. Public Understanding**

Understanding the terminologies and concepts for disaster and risk issues is an important enabler for disaster risk-informed decision-making. Public action, by public officials and the

general public, depends on their level of cognition of disaster risk reduction. Confusion or misunderstanding may delay or interrupt risk-informed decision-making and implementation processes, thus undermining resilient development.

Relatively speaking, only a small number of people have become familiar with the essence of disasters and risks, as laid out in the international frameworks for disaster risk reduction since the 1990s. The majority of government officials and the general public, especially in different development sectors, still consider disasters as 'natural'. They still do not understand that it is development choices that cause the accumulation of exposure and vulnerability to natural hazards, and that this in turn increases the risk people and assets face.

Such poor understanding is one of the major obstacles that disaster risk reduction and management faces. The basic concepts have not yet become integrated into mainstream policy-thinking and decision-making in development. When there is an adequate and meaningful understanding on the part of public officials in various development sectors, in addition to disaster managers, only then will we begin to see risk-informed decision-making and implementation become mainstream in both development and disaster management.

## **ii. Public Policy**

Generally speaking, public policies represent political and executive power to guide the development of a given economy. Governments use policy statements to communicate particular changes required, starting process of change that is determined necessary. Climate change, environment, and new energy development are a few examples of areas where government policies are introducing changes towards sustainable development. Shifting to risk-informed decision-making in more development sectors requires similar changes. Government policy is a powerful enabler for such change.

APEC leaders' annual declarations have already provided a policy enabler for change, despite how APEC operates as a cooperative, multilateral economic and trade forum without legally binding obligations. Its policy statements now need to be strengthened and supported by each member economy individually, at home. Policies on risk-informed decision-making can be developed by both the executive and legislative branches of each APEC member economy, to make development planning and practices a new and crucial frontier for preventing new disaster risks, reducing existing risks and building resilience.

Public policies and their implementation are subject to periodic review to adapt to new challenges over time and some governments now need to revisit their policies on disaster management and disaster risk reduction. The need for different policies to enable adequate human and financial resources as well as expertise to address disaster risks across development sectors, for which disaster management agencies are not equipped. It is high time for each member economy to review their policies and make them true enablers of disaster risk reduction in which risk-informed decision-making because a standard tool.

## **iii. Legislation**

Legislation can be a law or a set of laws usually introduced by public authority and made official by their legislature. Once a policy is set for a particular subject, such as disaster risk reduction or climate change, public authority is likely to go on to develop legislation to enforce the course of action set out in their policies. At the same time, policies can also be implemented as a way to fulfil legislative commitments. Legislation, combined with public policy, is a very powerful enabler of change. Legislation can legalize the inclusion of

risk-informed decision-making processes in all sectors, a big step forward in resilience-building.

Most legislation remains unchanged for long periods of time. Let's take disaster management law as example: Most such laws were created and passed years ago, with a primary focus on early warning, relief supply and humanitarian assistance when disasters strike. Although disaster risk reduction may be mentioned in the law, the overall thrust of most such laws fails to recognize that disaster risk and risk reduction are the responsibilities of the development branch.

The good news is that legislation concerning development issues can be amended to better take risks into account. A set of laws to promote risk-informed development - and restrict risk takers - can be of enormous importance in curbing the upward trend of disaster risks.

#### **iv. Disaster Risk Governance**

Disaster risk governance, by definition, refers to a structure of risk responsibility within public institution or private organizations at all levels, endorsing the core values of good governance, such as rule of law, participation, representation, accountability, sustainability, and even a long-term orientation in the risk management. This goes beyond traditional risk analysis, which uses a structured approach to identify possible hazards, analyze their causes and consequences, Instead, it involves a wider range of stakeholders, along with consideration for the broader legal, political, economic and social contexts in which a risk is evaluated and managed.

Disaster risk governance is seeking risk-balanced results and a culture of disaster risk reduction for resilient development. In this context, institutions, rules, processes and mechanisms can be deployed for effective risk analysis and guidance on how decisions about risks should be taken, implemented and evaluated and about how the management of risk should be governed and overseen.

#### **v. Accountability**

Accountability is a core principle of good governance. Progress in enhancing accountability should involve both individual accountability and public accountability. The former, by definition, is the acceptance of responsibility for one's own actions and willingness to be judged and evaluated on performance results. The latter is the obligation to answer publicly to an acceptable standard for the discharge of responsibilities that affect public risk-levels or lead to disastrous consequences.

Public accountability actually concerns the level of trust and confidence that the public have placed in an administration within the society as a whole. Good governance should contribute to improved accountability. This should push risk-informed decision-making and "cross-cutting" management that reconciles competing priorities, such as cost versus risk. Effective, public communication about the risk context is also part of public accountability.

#### **vi. Stakeholder Engagement**

Stakeholder engagement is widely used to find solutions to cross-cutting and challenging issues such as disaster risk reduction and climate change, which require collaboration in multiple areas, in particular with the science and academic group, who is able to provide scientifically-sound analysis and solutions to the risks concerned, for resilience in decision-making process. Stakeholder engagement helps improve accountability in

policy-setting, decision-making and implementation. A risk-informed decision can be approached by first starting to engage with stakeholders, elaborating the needs for the decision, understanding various parties' views and needs and promoting understanding of the reasons for the project.

Successful engagement of stakeholders can help build mutual trust and beneficial relations. It can sometimes even create opportunities for pooling human, technical and even financial resources to support the implementation of risk-informed decisions in order to achieve resilience and sustainability in the long-term. Stakeholder engagement is so important in risk reduction that it can easily determine the success or failure of a risk-informed decision and its implementation.

#### **vii. Community Participation**

Community participation has been long been promoted for achieving resilient and sustainable development, worldwide. It reflects the good governance principle of inclusiveness. For decision makers, community participation allows them to have a better understanding of the needs and concerns of the communities that their decision may affect, and to reduce unnecessary misunderstanding or even barriers in the communities concerned. It is also useful to tap into communities' knowledge of their surroundings and their existing capacities and cultural insights, all too often are underestimated or overlooked.

For communities, their participation enables them to voice their concerns and share their views often contributing to solutions that result in lower risk and less disasters in their community. Encouraging community participation also encourages community self-development, with a strong sense of ownership, where a community may take on more responsibility in managing disasters and risks that affect them and their communities

#### **VI. Summary**

Disasters will continue to be frequent, posing great threats to sustainable development. Risk of disasters continues to rise in both the Asia-Pacific region and the rest of the world. This reflects the reality that most APEC member economies have experienced in recent years. Disasters and their impact in 2022 provided a fresh reminder to APEC member economies that it is high time to take more action on the ground to curb the stubborn uptrend of disasters and risks.

Actions by APEC member economies in disaster management and risk reduction are better guided by the 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 the APEC member economies continue to coordinate the implementation of relevant APEC framework and planning for disaster risk reduction, decision makers guiding socio-economic development, in both the public and private sectors, should assume their responsibilities to prevent or reduce exposure and vulnerability to natural hazards, in line with the Paris Agreement on Climate Change and the 2030 Agenda for Sustainable Development. To start with, APEC member economies need to create a sound enabling environment to encourage and promote a shift from "risk-ignored" to "risk-informed" decision-making for development projects.

There are a great number of good cases in and beyond APEC member economies demonstrating that risk-informed decision-making needs to be guided by adequate risk

assessment and analysis. It may first sound difficult to make decisions that are 'risk-informed'. To make it easier, Food and Agriculture Organization of the United Nations (FAO) has come up with four practical questions below. Answering these questions will help decision makers ensure their decisions are risk-informed.

- Is based on a thorough analysis of whether and how such a decision would increase or ideally decrease risks to people, assets and systems affected by the decision. This analysis includes, but is not limited to, the frequency and intensity of multiple hazards, level of exposure of people, assets and systems to the hazards, their vulnerability and existing coping capacity (or the lack of it) and how the decision and its implementation will affect these factors.

- Has considered alternatives when the analysis points to potential increase of existing risks and/or creation of new risks to people, assets and systems that they would not be able to prevent, mitigate or manage well.

- Is made through a transparent and participatory process, inclusive of communities affected by the decision.

- Monitors implementation to ensure the decision's impacts on risk exposure and resilience of people, assets and systems, and their feedback, are well-documented for timely adjustments, learning and continuous improvement of decision-making.

The good news is that each APEC member economy can find its experts and professionals with adequate understanding, knowledge, expertise and capacity in risk assessment and analysis. Policy makers and decision makers in development sectors may just need to reach out to develop risk-informed decisions, cooperation and collaboration, thus creating an enabling environment to pilot and foster risk-informed decision practices in the development process. Testing, implementing and updating this Risk-Informed Decision-Making Framework for Resilience will be a good start - heading in the right direction - towards the achievement of APEC Putrajaya Vision 2040.

# Capacity Building of Disaster Prevention and Mitigation: Supply Chain Resilience of SMEs

## I. Introduction

### i. Background

Global climate change is intensifying. Since 2021, extreme weather events rare for thousands of years have occurred in many places around the world. According to the latest data released by the International Disaster Database, in 2021 alone, there were 432 major disastrous incidents in the world, affecting about 101.8 million people and causing economic losses of about 252 billion US dollars. In the report of Climate Change 2021: Fundamentals of Natural Science by Working Group I to the Sixth Assessment Report (AR6) released by the Intergovernmental Panel on Climate Change (IPCC) on August 9, 2021, it was pointed out that many changes in the climate system are directly related to the increasing global warming, including increased frequency and intensity of extreme high temperature events, marine heatwaves and heavy precipitation. In the next few decades, climate change will intensify in all regions of the world, and extreme high temperature and heavy rainfall events will become more frequent.



**Figure 1 Climate change aggravates natural hazards. Source: [HuffPost UK](#)**

At the same time, COVID-19 pandemic has gradually spread all over the world since 2019, causing a huge impact on the global economy. Facing the threat of the virus, economies continue to introduce extraordinary economic policies in response. However, the measures taken to prevent and control the pandemic also cause a huge impact on the social operation system, which is quickly transmitted to the real economy, resulting in reduced demand and restricted supply, leading to a sharp decline in gross world product, rising unemployment, significant shrinkage in international trade, and cliff-like drop in international investment. According to the World Economic Outlook issued by the International Monetary Fund in October 2020, the global economic growth rate is -4.4% in 2020, the largest economic contraction since World War II. Hence, for the APEC economies and even the global economy, to build back better from disasters, existing hazards and future potential risks is not at all easy. Therefore, capacity building of disaster prevention and mitigation comes with even greater urgency and importance.



## **ii. Scope and Methodology**

Focusing on SMEs, this study was conducted over one year, adopting a set of research methods including literature review, case studies, expert consultation, questionnaires, field research, among others. Through analyzing the serious damage to production and life caused by common disasters such as floods, droughts, lightning, tropical cyclones and derived infectious diseases, it lays out the SMEs disaster resilience capability framework and provides recommendations for SMEs disaster resilience building especially in the post COVID-19 Era.

Against the backdrop of continuous deterioration of the external environment and the ever-closer division of labor and cooperation among enterprises, the supply chain is an important foundation for the survival of enterprises. Only when the supply chain is resilient can enterprises ensure "to be capable of operation, production and delivery" in the crisis. To improve the supply chain resilience, enterprises must proceed from the overall view and long-term interests and build capacities at both conceptual and behavioral level.

This study focuses on enterprise supply chain resilience building, aiming to help SMEs enhance risk awareness, improve the Enterprise Business Continuity Plan, carry out pre-disaster risk monitoring and emergency preparedness at the conceptual level, and comprehensively improve the SME adaptability and resilience in the face of disasters in terms of end-to-end supply chain operation optimization, digital technology empowerment and sustainable concept implementation at the behavioral level.

## **II. Constraints of Resilience Building for SMEs**

Different economies in our world today may have different definitions of SMEs. For example, according to the Cambodian SME Development Policy, micro-enterprises refer to those with less than 10 employees or start-up capital of less than US \$50,000; small enterprises refer to those with 11 to 50 employees or start-up capital of US \$50,000 to US \$250,000; and medium-sized enterprises refer to those with 51 to 100 employees or start-up capital of US \$250,000 to US \$500,000.

In the Lao PDR, according to Decree No.42 of the Policy for Promoting the Development of SMEs, small enterprises mainly refer to those with an average annual number of employees of no more than 19 or total assets of no more than K\$250 million and an annual turnover of no more than K\$400 million; medium-sized enterprises refer to those with an average annual number of employees of no more than 99 or total assets of no more than K\$1.2 billion and an annual turnover of no more than K\$1 billion.

In Thailand, according to Ministerial Regulations on Designation of the Characteristics of SME Promotion Act B.E. 2562 (2019) and Announcement of the Office of SME Promotion Subject Designation of Characteristics of Micro Enterprises, Micro, Small and Medium-sized Enterprises (MSMEs) have been redefined on the basis of annual revenue and employment in order to be able to promote the targeted entrepreneurs effectively according to the current economic situation. For example, small enterprises in manufacturing refers to those with annual revenue of more than 1.8 million baht but not more than 100 million baht, and with more than 5 employees but not more than 50. While in trade and services sectors, MSMEs are those with more than 1.8-million-baht annual revenue but not more than 50 million baht, and those with more than 5 employees but not more than 30 employees.

Therefore, the choice of SMEs definition could depend on many factors, such as business culture, population size, industry, and the level of international economic integration (World

Bank, 2010). These make it difficult to adopt a universal SME definition and each economy needs to take into consideration its own situation. However, as the bedrock of global economy and a community with significantly untapped economic potential, SMEs in APEC economies may face common challenges and constraints in resilience building and could explore commonly effective ways to strengthen disaster resilience.

SMEs in developing economies could be mainly divided into three sectors: production sector (agricultural processing, manufacturing, and mining), service sector and trade sector (wholesale and retail). Most of them are supported by local investment, driven by domestic demand and domestic market-oriented family workshops, with limited resources and non-standardized business modes and management tools. They are extremely vulnerable in the face of unforeseen events and huge changes in the external environment, and their disaster resilience needs to be improved. They may face the following six constraints in disaster resilience building:

#### **i. Resource**

SMEs are prone to face difficulties in disaster prevention due to their own characteristics which can be embodied as: small scale, less resources, unstable market environment and insufficient investment in disaster prevention and mitigation. A UNDRR study shows that lack of capacity and resources is the primary obstacle preventing global SMEs from investing in disaster risk reduction measures.

#### **ii. Awareness**

SMEs lack awareness of risk prevention, lack channels to understand the economic situation and external environmental changes, and pay less attention to potential risks such as internal working environment safety. Information asymmetry also leads to the lack of understanding of disaster prevention and mitigation measures (tax refund, insurance cost reduction, etc.) provided by central and local governments for most SMEs.

#### **iii. Finance**

SMEs have limited access to financing information, and most banks and financial institutions do not give priority to the business plans of SMEs, therefore there is also a shortage of financial products that meet their needs. In addition, as the cost of processing loan documents for SMEs is still very high, enterprises are faced with problems such as lack of funds, insufficient liquidity, mismatch between financial products and demand.

#### **iv. Technology**

As SMEs lack the reserve of professionals and the ability to apply emerging technologies, and the cost of using new technologies such as the Internet is high, it is difficult for them to set up early warning and information sharing platforms; at the same time, the technical support provided by the government and the private sectors in disaster early warning and risk monitoring is still in its infancy and needs to be further developed and improved.

#### **v. Strategy**

Most SMEs passively respond to the impact of disasters in production and operation. Due to lack of risk awareness, SMEs give inadequate consideration in disaster preparedness and risk prevention in their business strategies and lack emergency plans such as business continuity plans to guide their disaster response actions in the event of a disaster.

## vi. Challenges Presented by Globalization

Climate change and COVID-19 pandemic reveal the unbalanced development of global value chains: large enterprises may ensure normal operation by changing suppliers and storing redundant key materials, while SMEs as suppliers often find it difficult to adapt to the changes and challenges of the global market and lack the ability to cope with the fierce market competition and the risk of global supply chain breakage. Therefore, compared with large enterprises, SMEs are often hit harder and suffer longer.

## III. Framework for SMEs Disaster Resilience Building

### i. Literature Review on Disaster Resilience Building

Since 1970s, in order to cope with increasingly frequent natural hazards and man-made disasters, study on resilience has gradually deepened. Resilience (capacity for resisting natural calamities) is defined by the United Nations International Strategy for Disaster Reduction (UNISDR, known as the United Nations Office for Disaster Risk Reduction, UNDRR, in 2015) as the capability of a system, community or society exposed to disasters to resist, absorb, adapt to and recover from disasters in a timely and effective manner by protecting and restoring important basic structures and functions. In the 1990s, the concept of enterprise resilience was gradually formed. It refers to the capacity of enterprises to survive, adapt, recover and develop under sudden disaster impact or continuous chronic pressure.

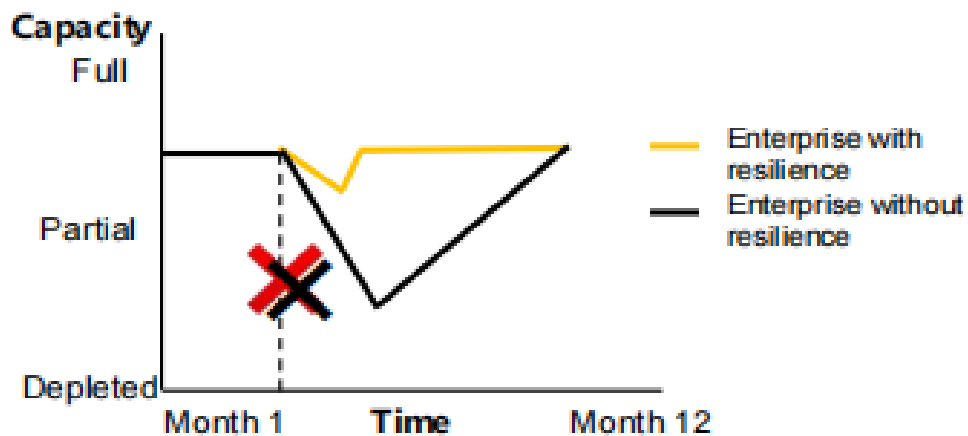


Figure 2 Definition of enterprise resilience. Source: Ivanov 2021

To build enterprise resilience and achieve more steady and sustainable development, enterprises need all-round capacity reserves such as optimized and improved response mechanism, strong and resilient supply chain, outstanding leadership and coherent strategy, mindset shift and raised awareness of employees, as well as innovative application of emergency technologies. In 2021, in a guidance outline on enterprise disaster resilience building capability (China's self-funded APEC project under EPWG - EPWG 01 2021S: Regional Economic Integration through the Lens of Disaster Resilience), enterprise resilience is analyzed in six dimensions: supply chain, market demand, investment and financing, technology, enterprise organization and culture.

According to Hosseini et al. (2019), supply chain resilience is the key to maintain a company's normal operation in a fragile environment and ensure the uninterrupted supply of products and services to the market. Since the global spread of COVID-19 in 2020, the operation mode of many enterprises was changed on an unprecedented scale. As supply network is complex,

integrated and intertwined, interruption of one certain supply chain may cause chain reaction. Amidst these challenges, enterprises began to stress the improvement of supply chain resilience and take emergency measures in an effort to maintain the stability and sustainability of their supply chains.

In case of a destructive event, supply chain resilience is reflected in three aspects: absorptive capability, adaptive capability and restorative capability. Vgrin et al. (2011) defines absorptive capability as the ability of supply chain to resist the impact of disasters and maintain normal operation. Absorptive capability is related to the robustness of supply chain and is the first line of defense of supply chain resilience. When supply chain is disrupted, Ivanov (2010) argues that the second line of defense, that is, adaptive capability, can help the supply chain adjust quickly to adapt to disruptions. As the third line of defense, restorative capability refers to the capability to restore damaged buildings, facilities, technological processes, etc. to their original state on the physical level.

While building disaster resilience, it is also very important for enterprises to establish a set of scientific evaluation methods and index system. Kearney, an internationally renowned consulting company, has developed a set of supply chain resilience assessment matrix, which can understand the overall resilience level of enterprises by quantitatively evaluating the robustness, elasticity and coupling of supply chains. Resilience evaluation tools can help enterprises identify missing points, find the direction of resilience building and promote enterprises to strengthen disaster preparedness through quantitative diagnosis, early prevention, real-time tracking and accurate response from the internal and external environment of enterprises.

The consequences of lacking resilience are fatal, but the cost of building resilience is also very high. Limited by lack of resources and insufficient risk awareness, SMEs are facing many challenges in the process of disaster resilience building. To help enterprises cope with these challenges, guide them to mitigate disaster risk and build resilience capacity, UNDRR released a reporting guide in 2022, which proposes recommendations to governments and NGOs in four dimensions: introducing supportive policies, providing financial products, enhancing risk prevention awareness, and addressing supply chain vulnerability, with a view to reducing the risk of disasters and the exposure and vulnerability of enterprises to disasters through pre-disaster prevention.

China's self-funded APEC project under EPWG - EPWG 01 2021S: Regional Economic Integration through the Lens of Disaster Resilience also found that in addition to the need for enterprises to strengthen their own awareness of risk prevention and enhance their capabilities through product R&D and innovation, sales channel expansion and the application of digital technology, they should also vigorously develop public-private partnerships (PPP), and the government and other civil society can provide support through policy development, publicity and education, scientific and technological cooperation, etc., to help enterprises build resilience capability.

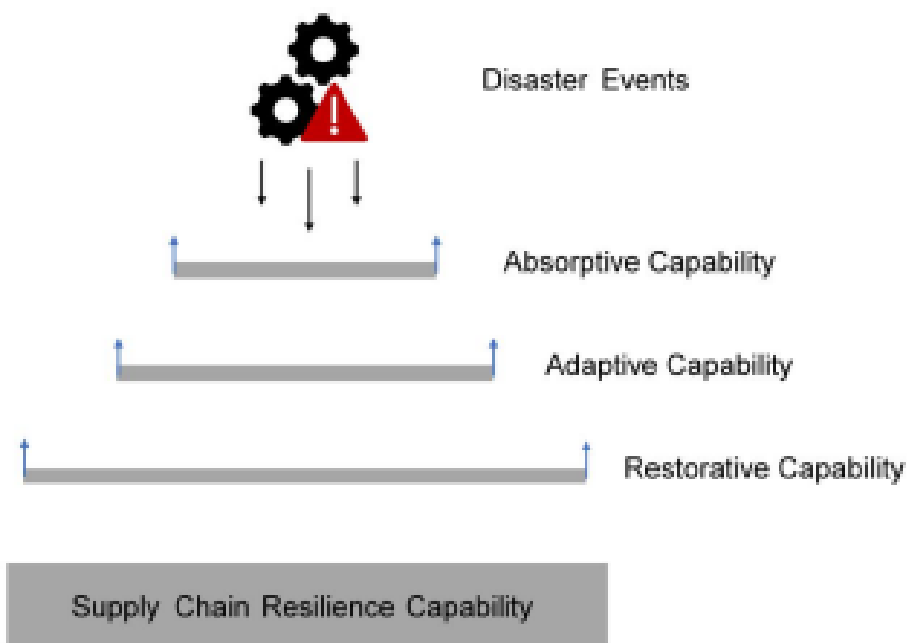
## **ii. Why Resilience Capacity Building for SMEs**

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.

However, the existing studies on resilience capability building is still relatively macro in nature, and their relevance for SMEs lacks applicability and operability. In addition, governments are actively introducing relevant assistance policies, however, the guiding functions of these policies need to be further enhanced. A UNDRR survey also pointed out that 79% of the SMEs involved in the study indicated that they had never received policy support related to disaster risk management from local governments. According to an OECD study report on 55 economies (OECD, 2020), only 15% of the policy combinations are effective among the policies and measures implemented by governments to help SMEs strengthen disaster resilience capability building.

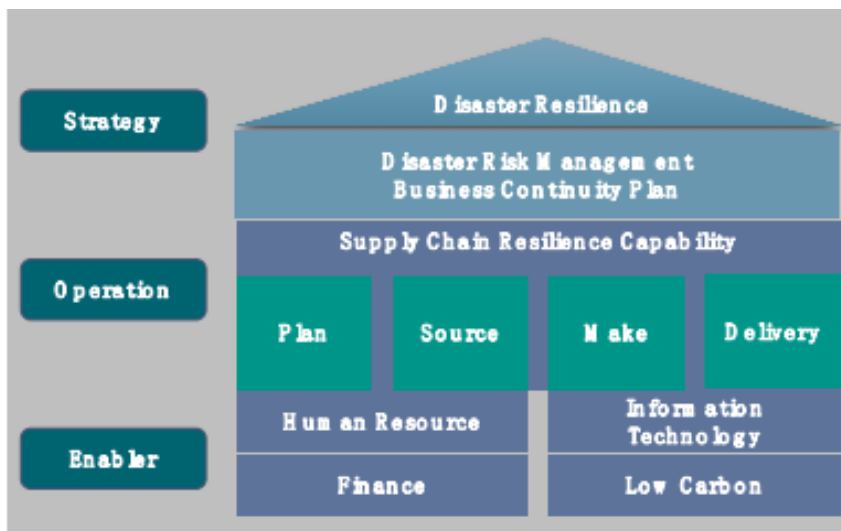
In this context, this study assesses common priorities of disaster risk management and constraints of SMEs resilience building in most APEC member economies to put forward recommendations from both internal and external ecology SMEs, hoping to contribute to APEC member economies' effort in building resilient enterprises with absorptive, adaptive, and restorative capabilities.



**Figure 3 "Three lines of defense" of supply chain resilience. Source: Ivanov 2021**

### iii. Framework for SMEs Disaster Resilience Capacity Building

With better disaster resilience as its ultimate goal and vision, the framework is consisted of three levels - strategy, operation and enablers, aiming to include and connect essential factors, from top to bottom, for SMEs to prepare for disaster resilience building and/or strengthen resilience capacity.



**Figure 4 Framework for SMEs Disaster Resilience Capacity Building**

(i) Strategy Level: Disaster Risk Management

Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risks, reduce existing risks and manage residual risks, to help strengthen disaster resilience and reducing disaster losses (UNDRR, 2021). Disaster risk management of governments and the public sectors is guided by the Sendai Framework, which is considered and coordinated in relevant development plans, resource allocation and program activities, while enterprises mainly refer to international standards such as ISO 31000: 2018 and Enterprise Risk Management framework by the Committee of Sponsoring Organizations (COSO ERM).

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 present, the external environment faced by enterprises shows the characteristics of frequent and concurrent multi-hazards and disaster derivation. Risk management, as an important component of corporate strategic planning, is of great significance to the sustainable development of enterprises. Disaster management plan can maintain business operations and help enhance market competitiveness when enterprises encounter sudden catastrophic events. At the same time, contingency plan can not only meet the requirements of coping with risks, but also enhance risk awareness of enterprises to take preventive measures in advance at low cost and enhance the resilience of enterprises against risks, thus securing guarantee for the sustainable development of enterprises.

(ii) Operation Level: Supply Chain End-to-end Operation

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.

In terms of demand side, when the external environment changes tremendously, the market demand will change accordingly, and it is often difficult for SMEs to adapt to the unusual surge or sudden drop in demand. Therefore, resilience capacity building requires SMEs to accurately understand the customer needs and rationally use information technology to carry out demand prediction, inventory analysis and coordination of supply and demand, on the one hand; and it requires SMEs also to innovate in product functions and marketing methods, retain existing customers and broaden business opportunities to maintain the stability of demand, on the other hand.

In terms of supply side, a disaster will have an impact on all links - planning, procurement, manufacturing, warehousing, transportation and distribution - in the supply chain, and it is difficult to achieve normal supply if any of these goes wrong. Therefore, resilience capacity building requires SMEs to establish certain redundancy based on risk management strategies, such as risk inventory, capacity buffer, etc. In addition, SMEs can also increase the visibility, flexibility and stability of the supply chain through the digital transformation of the supply chain, so as to reduce the impact of unexpected risks on enterprises and help them achieve cost optimization while building resilience.

### (iii) Enablers Level: All-round Support

As mentioned above, 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 and human resources. In addition, in the context of global warming, SMEs also need to implement the concept of low carbon and sustainable development.

#### a. Technology Application

In the background of digital economy, it is an underlying trend for enterprises to engage in digital transformation. In the field of disaster prevention and mitigation, SMEs can quickly resume work and production with the help of digital technologies such as artificial intelligence, big data and cloud computing, and accurately allocate resources to ensure effective production and operation. The application of new technologies could help enterprises realize end-to-end visualization of supply chain, deepen cooperation with clients and suppliers through data sharing, significantly improve management efficiency and operational efficiency, and effectively reduce organizational operating costs (Jin Guofeng, 2022). Moreover, accelerating R&D on key emergency technologies and equipment, promoting emergency products and services, and cultivating and developing emergency industries also provide new ideas for sustainable development of SMEs.

#### b. Financial Investment

The impact of disasters on the operating capital of enterprises is mainly reflected in the reduction of operating income and the shortage of cash flow. Adequate cash and relatively liquid assets can effectively alleviate the financial impact brought by the decreased income or the increased expenditure. According to the study, most enterprises with resilience are well prepared with sufficient funds before the disaster, have sound assets and liabilities, and establish cost reduction programs to effectively cope with the impact of disasters on corporate cash flow during disaster (Zhu Minhui, 2020).

#### c. Human Resources Development

Through excellent corporate culture and flexible human resource management, enterprises can build organizational resilience to cope with disasters. In the case of crisis, enterprises actively assume social responsibility and provide humanistic care for employees, which can inspire and stimulate employees' courage and confidence and enhance their ability to cope with difficulties (He Jie et al., 2020). In addition, the effective implementation of the business continuity plan can be ensured by providing disaster risk awareness and emergency knowledge training and guidance to improve the emergency response capacity of employees in case of emergencies.

#### d. Low Carbon and Sustainable Development

There is an intrinsic link between the environment and disasters: climate change changes the natural environment, affects the human resource base and increases the vulnerability of communities; this aggravates the frequency and extent of damage of natural hazards, weakens the restorative capability of society and challenges traditional coping strategies. In the process of disaster mitigation and relief, unreasonable procurement, production, warehousing and other measures will increase carbon emissions, aggravate the greenhouse effect, and trap the whole emergency management process into a vicious circle. As early as 2004, UNISDR proposed that disaster mitigation and relief should be combined with the concepts of environmental protection and sustainable development. Therefore, disaster risk management should also consider low carbon environmental protection to fundamentally avoid more disaster risks brought by climate change.

### **IV. Best Practice Factors and Cases**

#### **i. Proposed Solutions for SMEs' Disaster Resilience Building**

It is far from enough for SMEs to build a high level of disaster resilience capacity by enhancing their own internal capacity. They also need to cooperate with the government, civil society and supply chain eco-partners. Specifically, internally, SMEs need to give full play to their endogenous potential, act according to their capabilities, and build resilience capacity in a top-bottom and up-down way, mainly at three levels: strategy - operation - enablers; Externally, they also need to actively utilize the capabilities of the ecosystem and develop public - private partnerships with the government, society and other NGOs in emergency management to jointly build a sustainable external environment and seek external support for resilience capacity building. In the context of global economic integration, in order to improve the ability to enter and compete in the international market, SMEs also need to try to engage in the building of global industrial chain and supply chain and achieve symbiotic development.

#### **ii. Inner Improvement: Build Capacity**

##### **(i) Enhance Risk Awareness and Strengthen Risk Management**

Pre-disaster investment can effectively reduce disaster risks and reduce losses caused by disasters to a large extent. 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.



Enterprise risk management is usually divided into four steps: risk assessment, business impact evaluation, continuity plan development and test optimization. As most SMEs in developing economies lack complex product categories and supply networks, managers can identify the risks faced in the business process based on experience and preliminarily assess the impact, formulate emergency plans accordingly, clarify specific measures to maintain business continuity in case of disasters, and share them with employees to guide emergency actions in case of disasters.

a. Risk Assessment

Risk here refers to potential events that may have adverse impact on SMEs. These events include not only external risk factors such as natural hazards and infectious diseases, but also internal risk factors such as the production and operation environment, business operation processes and personnel safety awareness. Risk prediction is the first step of risk management. Enterprises must effectively identify risks, analyze their sources and predict the probability of risk, through which they can prioritize the risks according to their probability and impact, and conduct evidence-based risk monitoring..

b. Business Impact Analysis

Business impact analysis refers to - based on SMEs’ own strategy and business objectives, qualitative and quantitative indicators are applied to model and analyze the risk factors to evaluate the probability of risk occurrence, the extent of damage to and the risk tolerance of the enterprise. The risk planning matrix (see Figure 5 below) is an important tool for risk assessment, which requires the risk scenarios to be defined in the matrix based on the likelihood of a disaster, so that the vulnerability of business operations under different risk scenarios can be clearly defined and the impact of the risk is thus assessed and graded.

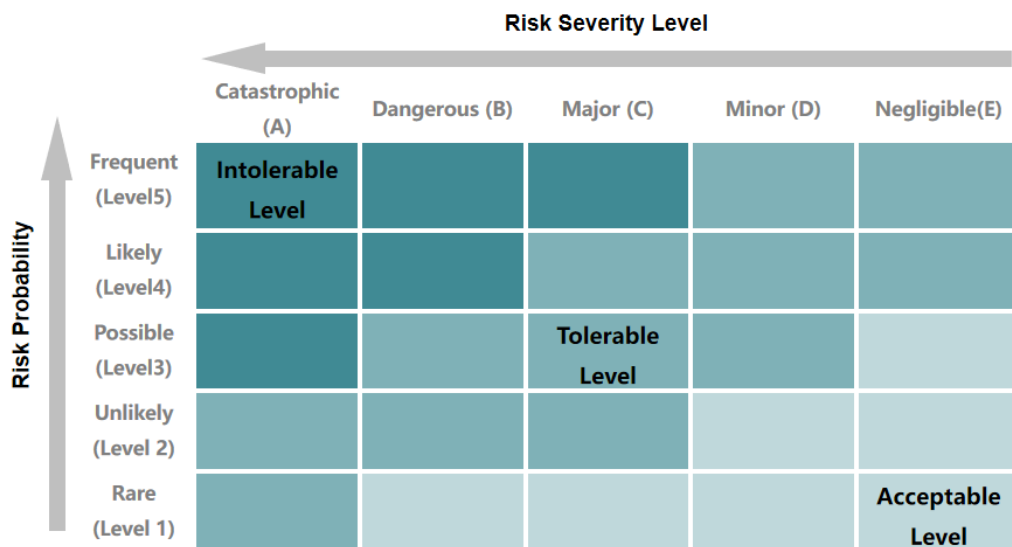


Figure 5 Risk Planning matrix

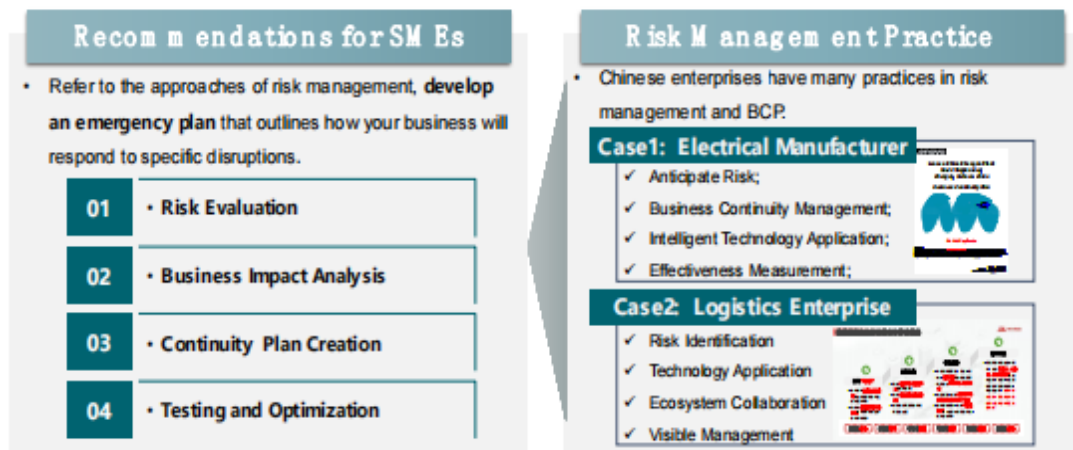
c. Continuity Plan Development

Business continuity strategy is the key to risk management. Based on the results of risk assessment and business impact analysis, enterprises need to formulate emergency plans, seek alternatives for production locations, check the availability of emergency equipment, and clarify contingency objectives, responsible parties, contingency measures and core processes that must be maintained in different scenarios after defining the organizational

structure, maximum downtime and acceptable levels of loss (human, financial, data, reputation, etc.).

#### d. Test and Optimization

Risk management is a continuous process. As the enterprise gradually enters global markets, risks will become more complex and interconnected, so it is important to regularly review the risk and disasters that enterprises may face and their capacities in order to formulate risk management measures that are more in line with their current situation. At the same time, in business continuity plan, regular scenario simulations and stress tests should be included to evaluate the effectiveness of the plan and adjust responses to adapt to the changing internal and external risks.



**Figure 6 Suggested ideas for risk management in SMEs**

#### Case 1: Risk management practices in a Chinese electronic manufacturing factory

In 2016, an electronic manufacturing factory located in Wuhan City of Hubei Province of China was affected by heavy rainfall and suffered widespread power outages, resulting in overall production delay. On the one hand, the stagnation of the production line caused the huge daily profit loss for the factory; on the other hand, it has also caused overstock of raw material and insufficient supply of finished products.

The factory then established a comprehensive business continuity plan, which aims at maintaining the normal operation of the production lines in the event of an emergency, draws the organizational structure, identifies the key assets, sets the recovery time targets, and formulates detailed responses to various disasters including rainstorms, and various business interruption scenarios such as power outages. Moreover, the factory also conducts regular tests and drills of its contingency plans, using its technological strengths to monitor and visually manage the effectiveness of its contingency plans and to update and improve them in a timely manner. In addition, the factory also provides emergency-related awareness raising and training to all staff, so as to raise their awareness of disaster risks and to ensure efficient implementation of contingency plans.

Benefiting from proactive risk management, the factory has efficiently resolved problems such as forced shutdowns of production line and shortages of staff and materials during several natural disasters and COVID-19 in recent years, quickly restoring production capacity, minimizing risks and reducing losses.

#### Case 2: Risk management practices for hazardous materials in a German enterprise

A pharmaceutical enterprise develops and sells highly innovative medical facilities in Hamburg, and provides solutions for wound healing, general surgery, gynaecology, minimally invasive surgery and metabolic surgery. The company has stored some hazardous chemical raw materials (e.g. acetic acid and ethyl ester) for a long time to meet its business needs. Due to their corrosive and volatile nature, these hazardous chemicals pose a significant challenge to the safe production and operation of the enterprise.

Based on this background, the enterprise formulated a complete set of management plans. First, in order to avoid environmental pollution or even poisoning of people, the enterprise trains and screens operators and conducts risk assessments of storage sites. Second, the rescue equipment is regularly tested and rescue teams are trained, so that when an accident occurs, the enterprise can make a judgment immediately, carry out emergency activities in a timely manner, quickly control the accident site and systematically diffuse the damage caused by the crisis.

The enterprise's hazardous materials management system, as an important part of the enterprise's risk management system, has played an important role when it suffered a disaster, not only minimizing the enterprise's economic losses, but more importantly, effectively reducing the casualties.

#### (ii) Optimize Supply Networks and Utilize Innovation

Supply chain resilience is the foundation for enterprises to maintain normal operations after a disaster. Some SMEs mostly rely on a single supplier and are limited by resource constraints, so it is difficult to improve the resilience of enterprises through reserve redundancy. Therefore SMEs should optimize various points in the supply chain, such as planning, procurement, manufacturing, shipping and distribution, with the goal of cost optimization and risk avoidance. Not only that, but along with the gradual penetration of new technologies such as the Internet and 5G, enterprises can also enhance their disaster resilience capacities through business innovation and technology applications.

##### a. Planning: Demand Forecasting and Innovation in Product and Marketing

In times of disasters, the demand tends to fluctuate abnormally. Therefore, enterprises should improve the management level of demand planning, use historical data and information technology to forecast customer demand in advance to reduce the uncertainty of demand to a certain extent; scheduling and purchasing based on the demand forecast can also maximize the utilization of enterprise capacity and inventory. In addition, according to the "4P" strategy, enterprises can continuously innovate from four aspects: Product, Price, Promotion and Place, to broaden the customer base, enhance customer loyalty and maintain a stable growth in demand.

#### Case 3: Practice of demand stabilization in a Chinese restaurant during COVID-19

During the COVID-19, the catering industry in China suffered huge losses, with data showing that 78% of catering enterprises lost 100% of their revenue and 9% of them lost more than 90% of their revenue. Under this background, the normal operations of a hot pot restaurant in China, which is famous for its excellent customer service and quality dining experience, has also been severely challenged. As dine-in was limited, the operators of this restaurant put their offline service online and provided take-away services to maintain revenue, but the take-away service alone could not turn a profit due to customer concerns about the safety control of the food production and delivery process.

As a result, enterprises began to try service-oriented livestreaming to bring it closer to consumers by showcasing service levels and providing exclusive benefits and discounts. At the same time, the shop's exclusive mobile applications and mini-programme went online, providing customers with a variety of products including ingredients and condiments. In addition, the shop has also actively expanded other sales channels and cooperated with local communities to participate in community group purchases, which have garnered numerous praises. All of these practices enabled the shop to survive from the impact of the COVID, and achieved a steady increase in demand.

#### b. Procurement: Multi-sourcing and Near-shoring

The single-supplier model is extremely fragile in times of disaster, in which SMEs often face the risk of supply chain interruption due to unstable material supply. In order to cope with this problem, enterprises can adopt a multi-supplier model, select alternate suppliers for all equipment and raw materials, and give more consideration to local companies when selecting suppliers, and reduce logistics and transport costs by simplifying the transportation methods and shortening the transportation distances, while also ensuring supply chain agility.

As a supplier to large enterprises, SMEs can join the supplier map driven by large enterprises to keep abreast of the risk of interruption in their supply networks, as they gradually focus on supply chain risk management and begin to attach importance to supply network visibility and multi-level supplier collaboration management. At the same time, they can improve their digital procurement management capabilities with the help of large enterprises and achieve the cost reduction and increased efficiency in the whole process from Source to Payment.

#### Case 4: SMEs realize supply chain upgrading driven by "chain owners"

The traditional supply chain structure is less stable and less resilient, and it often "breaks the chain" due to the risk of one-time and one-place. In response to this problem, a large electronic manufacturing enterprise gradually sets up a global hybrid manufacturing model, combining its own factories, OEM (Original Design Manufacturer) and ODM (Original Design Manufacturer), so that each of the three models can achieve independent, complex and efficient production, but the complex supply network also makes it difficult to visually control the risk.

To address this problem, this enterprise uses high-tech technology to open up a collaborative supplier sourcing platform through the Supply Chain Intelligence Control Tower to actively collect data and information from suppliers at all levels, and builds a collaborative, agile and transparent global supply network, which monitors customer demand and supplier supply in real time, and synchronizes the identified risks to stakeholders in the supply network in a timely manner, so that participating SMEs can perceive and respond to the risks in advance.

In addition to procurement synergies, more and more SMEs have planned and implemented new campuses, production line processes, information-based production systems and logistics systems, thanks to the enterprise's sharing and guidance and leading supply network optimization solutions. In terms of R&D and talents, SMEs have also reaped the benefits of tailor-made services such as digital platform building, IT office and data governance, which overall enhance the synergy between enterprises along the industrial chain.

#### c. Manufacturing: Redundancy and Industrial Alliance

After the outbreak of the COVID-19, lean manufacturing enterprises, led by automotive manufacturing enterprises, were severely affected by the lack of reserves of key materials. Therefore, safety stock and capacity buffer are the keys to the resilience of enterprises. However, SMEs can hardly afford the high cost of redundancy, so they need to cooperate with upstream and downstream enterprises to establish industrial alliances and share risks through resource sharing.

#### **Case 5: Collaborative practice of supply chain eco-partnership of an auto manufacturer in China**

Wuhan City is an important producer of China's automobile manufacturing industry, and a large number of automobile manufacturers have invested and built factories there. The COVID-19 caused stagnation of the supply chain system, and automobile enterprises especially SMEs faced a risk of production shutdown.

Since the COVID-19, the company realized the challenges the supply chain was facing, and quickly launched an emergency supply chain risk management plan to assess each link of the supply chain in light of the COVID situation. It measured the risk resistance of suppliers in terms of supplier EHS level, supplier production capacity and logistics and transportation feasibility, and worked hand in hand with suppliers to ensure quality, quantity and continuous supply in the passenger car supply chain through global resource deployment and optimization of development steps at different stages of the pandemic.

Based on such a highly collaborative working mechanism, its key suppliers were able to allocate global resources effectively. Through active communication and cooperation, the cooperation between the car company and suppliers reduced the development cycle from two years to three to six months, rapidly reducing its dependence on some imported components while ensuring quality, reaching a supply chain localization level of over 90% and significantly reducing supply chain risks.

#### **d. Delivery: Facilities Allocation and Logistic Networking Planning**

In the supply chain planning stage, enterprises can make reasonable layout in the selection of factory and warehouse sites as well as logistics network design to minimize delivery time and transport costs; In addition, SMEs can also establish partnerships with multiple third-party logistics service providers to ensure that there are multiple logistics solutions to achieve in-time and effective supply in case of emergencies.

#### **Case 6: Practice of a shoe-making enterprise in China to deal with export challenges**

In the face of challenges presented by the COVID-19 pandemic, a Chinese shoe-making enterprise shifted from its traditional order-driven model to a user-driven one. Over the years, most of its orders were delivered in batch production by original equipment manufacturers (OEMs). After the pandemic, it realized that flexible reform is needed to ensure production, adapt to small batch and multi-model orders, and reduce production costs. It also utilized big data to analyze sales data, track market changes and make improvements to its products based on the return rates and buyer's evaluation.

In terms of innovative marketing models, it strengthened its online communication with foreign customers through new marketing models such as online marketing, online communication and video conference. Using the data from customs and cross-border platforms, the enterprise increased its social media exposure rate, number of followers and

transaction conversion rate in overseas markets, and improved the accuracy of marketing, promotion and leading customer flow.

### (iii) Emphasis on Green Development and Digital Technology

In the context of global warming, the world is increasingly concerned about reducing carbon emissions and achieving sustainable development. For enterprises, when facing operating pressure and meanwhile hoping to achieve sustainable development, the implementation of a green supply chain is particularly important. SMEs, while ensuring their economic benefits, can work together with upstream and downstream counterparts in the supply chain and improve internal coordination among different departments to minimize the impact of production links, from raw materials, production and processing all the way to end-of-life recycling, on the environment and optimize the economic, social and environmental benefits of the supply chain.

At the same time, accelerating the digital transformation can not only guarantee SMEs business continuity during the COVID-19 but also even seize new growth opportunities in the future. Considering the constraints of SMEs in terms of human, financial and material resources, SMEs hoping to engage in and facilitate digital transformation need to seek help or support from technical counterparts/stakeholders. They can utilize the technical tools with low cost and low entry barriers provided by their technical stakeholders or partners to promote technology-enabled and technology-driven disaster resilience.

#### Case 7: Intelligent office platform empowers SMEs' digital transformation

An internet company in China has developed a smart office software, and data shows that over 70% of its users are SMEs. For example, a small manufacturing enterprise in China's Guangzhou Province, which produces intelligent robots, has set up a low-code MES system on this platform and enabled digital management of its production. Its digital management covers raw material preparation, production planning, output and capacity analysis, sales process and customer management. By doing so, its managers and front-line personnel can keep linkage within the shortest time and with the smallest error and realize efficient management, coordination and operation.

Another example comes from a Chinese, textile manufacturing enterprise, who integrated its self-developed Internet of Things (IoT) platform with this smart software for data collection, online monitoring and early warning analysis of mobile devices. Digitization has penetrated into all aspects of the enterprise's upstream and downstream operations. Now it has 187 mobile terminal applications covering business intelligence, IoT, among others, and has completed its transformation from a device-driven business model to a digital-driven one.

### **iii. Strengthening Government Role and Public-Private Partnership for Building Resilient Ecosystem**

#### (i) Improving Disaster Risk Management at Strategic Level

According to the recommendations of the Sendai Framework, governments need to play an active role in helping enterprises build disaster resilience. They need to improve disaster risk management mechanism at strategic level and cooperate with international/regional organizations, non-government organizations (NGOs) and the civil society to raise risk awareness of the whole industry and the whole society, including SMEs, through publicity.

Guided by the principle of putting people first and ensuring people's livelihood, China has now put in place a full-fledged disaster risk management mechanism which is supported by unified leadership, comprehensive coordination, top-bottom/up-down classified responsibility and territorial management. The mechanism also stressed the leadership of the government, mutual and self help during emergencies, as well as the supportive role of communities and local welfare organizations.

While in Germany, disaster risk management is divided into four levels: local authorities, regions, states and the federation. Unified regulations are implemented throughout the country, and the federal office of civil defense coordinates the assistance needed by the states, and the states and regions should also set up their own rescue teams.

#### a. Optimize Emergency Management Laws and Action Plans

Responsibilities and obligations of various departments during emergency response and disaster relief should be clarified, based on which appropriate contingency plan and action/relief plan against different disasters should be formulated. The government should play a central and leading role in formulating and improving emergency-related laws and regulations, establish and improve relevant emergency mechanisms to deal with emergencies, and provide a safe production and living environment for enterprises and citizens.

In 2006, China issued *Emergency Response Plan for Public Emergencies* that articulated practical and effective action/response plan for various emergencies. In 2022, it also published *Emergency Management System Plan during the 14<sup>th</sup> Five-year Plan Period (2021-2025)* to make a comprehensive arrangement on disaster prevention, mitigation, relief and workplace safety during this development period, laying a solid foundation for a law-based and science-based emergency management in China.

Another example is also - in Germany, the *Law on the Protection of Citizens* guides all departments of the state to take relevant measures to protect and safeguard citizens in the event of public crises that pose a threat to their lives and property. Germany has also formulated a national unified fire protection regulation to achieve the necessary uniformity of behavior of the fire departments in all federal states to provide guarantee for future fire protection activities.

#### b. Encourage Enterprises to Establish Risk Management System

Improved safety management is instrumental to sustainable enterprise development. Taking China as an example, in its *Emergency Management System Plan during the 14<sup>th</sup> Five-year Plan Period (2021-2025)*, it encourages enterprises to improve safety management by risk ranking and hazard investigation. While also in Germany, a unique dual-track mechanism is implemented to supervise enterprises' safety production, with social and commercial supervisory forces such as the Work Accident Insurance Federation in addition to the government and other official bodies. At the same time, Germany actively pursues relevant vocational education and realizes a mechanism of consultation and cooperation between the employers, employees and the government. Similarly in Japan, the Central Committee for Labor Safety and Health set up by the government is mainly responsible for checking the implementation of safety measures in production units and guiding and supervising production units to fulfil their responsibilities and obligations.

#### c. Raise Risk Awareness and Promote Risk Culture

Education on public knowledge about disaster prevention, mitigation and emergency rescue should be further strengthened, during which the central and local government could do more. Since 1991, National Disaster Reduction Center of China's Ministry of Emergency Management (affiliated to Ministry of Civil Affairs before March 2018) started *Disaster Risk Reduction in China*, a publication specifically aims to "promote a culture of disaster reduction and relief", providing information for the public and private sector on disaster reduction and contributing to risk publicity and public risk awareness especially at local community level. Moreover, inspired by International Day for Disaster Reduction, in order to encourage the whole industry including the private sector and the civil society to promote a risk-informed and climate-smart culture, China defines the day of 12 May as China's Day for Disaster Reduction and requires different government departments both at strategic and local level to organize publicity activities such as emergency drills, skill competitions, equipment exhibition, among others. A large number of SMEs engage in the Day every year to share practices, discuss challenges, show capacities, promote corporate risk culture, understand government policies and guidance and expand their partnership networks.

(ii) Build A Resilient External Environment by All Stakeholders

As an important part of socio-economic development, SMEs need sustainable external environment to support their resilience. The construction of a resilient city (see Figure 7 for more details) should therefore be regarded as a strategic vision and long-term goal; in addition, the government and other social forces should work closely together to strengthen infrastructure construction, build a resilient community and enhance the ability of society as a whole to cope with disasters.

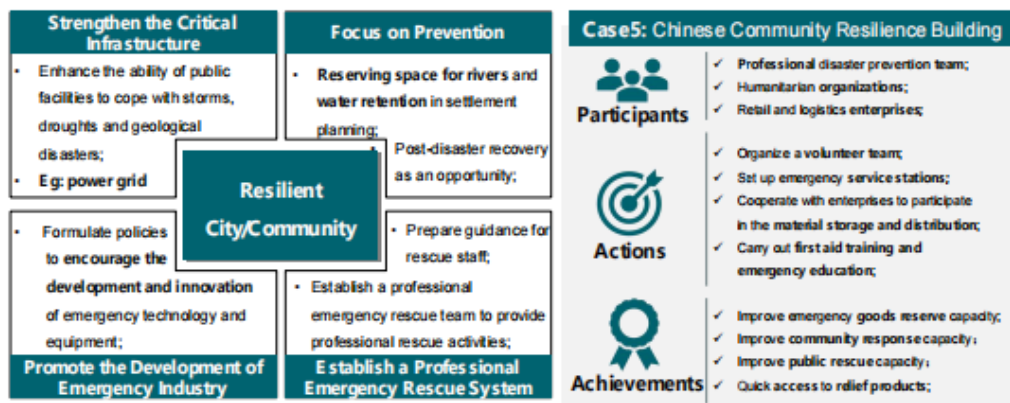


Figure 7 Ideas for building a sustainable external environment

a. Strengthen Critical Infrastructure

According to the definition of resilient infrastructure by the Organization for Economic Co-operation and Development (OECD), resilient infrastructure is infrastructure that is planned, designed, constructed and operated to ensure that it can effectively predict, prepare for and adapt to the changing external environments, withstand and respond to the damage caused by disasters, and can be rapidly recovered from disasters. For the resilient infrastructure, depending on the different context in different economies, the public or private sector needs to carefully plan the layout, especially committed to the construction and maintenance of infrastructure such as roads and power grids to ensure that they can be used properly in times of disaster.



Infrastructure development also requires global efforts to make it comprehensive, interconnected and integrated, with which the connectivity of global supply chain will be enhanced and the ability of SMEs having access to international markets will be improved.

#### b. Promote Emergency Industry

The government can formulate corresponding policies to support and appropriately guide the cultivation and development of the emergency industry. Taking China as an example, it has issued *Guiding Opinions on Accelerating Emergency Industry* to speed up R&D on key technologies and equipment, optimize the industrial structure, promote the development of industrial clusters, support the development of enterprises and promote emergency products and services.

It also established an emergency rescue support system through central- and local- level financial support to promote the industrialization of emergency management. Exhibitions on smart emergency command, IT application, emergency equipment for disaster relief and smart city are held every year in China to provide exchange platforms for both large enterprises and SMEs in emergency industry in China and beyond.

Even in China's local communities, guided and supported by the local government and some welfare organizations, some SMEs are trying to explore innovate ways to facilitate emergency industry from bottom to top. For example, Zhongfanganhu - China Network of Community Safety and Protection - a private SME in Beijing is now exploring a new model of developing convenience stores in local communities as focal points during emergencies. Communities, SMEs and residents will have access to the pre-positioned emergency toolkits or kits in nearby convenience stores and also use the stores as emergency shelters.

#### c. Focus on Early Warning and Disaster Prevention

Disaster prevention requires the joint efforts of government departments and citizens. Government departments should take into account the local cultural characteristics and climate change in urban planning, and plan for water storage and drainage systems in advance to deal with floods. For vulnerable groups, the government should also arrange special emergency plans, such as special evacuation plans for hospitals and nursing homes, and update them regularly. Enterprises and citizens themselves can make necessary disaster preparations by taking protective measures for housing facilities and proactively using disaster warning applications.

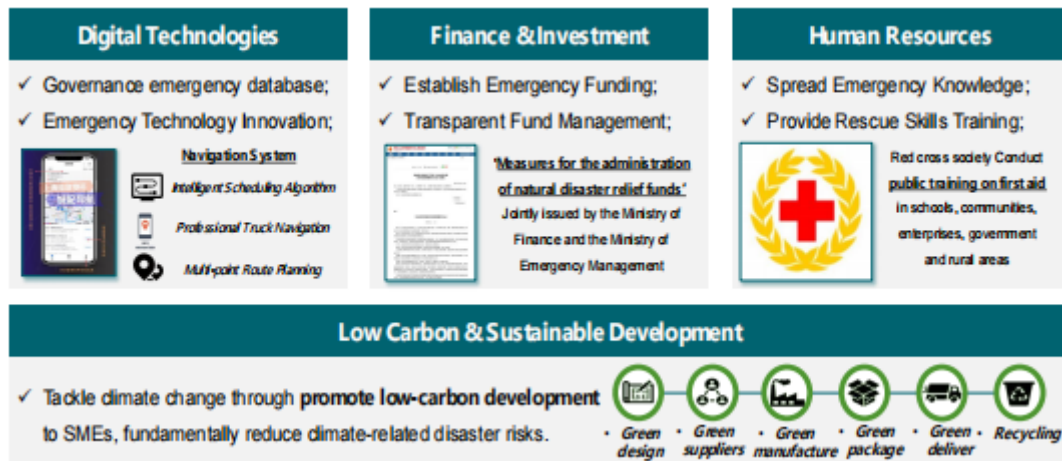
#### d. Establish a Professional Emergency Rescue System

Successful rescue requires the establishment of well-organized, strong and efficient rescue teams. China's Ministry of Emergency Management has integrated 13 key functions of 11 disaster/emergency-related departments into one Ministry to guide, manage and regulate the whole chain of emergency management and is now encouraging an emergency rescue team system with China Search and Rescue Team as the core, technical rescue as the backbone, and volunteers and NGOs as the pillar, so that all stakeholders can play their due roles during emergencies.

#### (iii) Encourage All-round Capacity Support to SMEs

SMEs Disaster resilience building requires the empowerment of digital technology, financial investment and human resources, 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 and departmental collaboration to improve the resilience of disaster risk.



**Figure 8 All-round capacity support to SMEs**

a. Digital Technology Application

Digitalization and networking are the fundamental ways to integrate and develop global industrial chain and supply chain. SMEs can rely on the help of scientific and technological enterprises from various parties, make use of new production tools, start from the digitization of organizations, gradually move towards the digitization of their business, and eventually promote the digitization of the entire industrial chain; the government can strengthen the digital awareness of SMEs by organizing lectures and public welfare activities, and other ways to conduct relevant policy interpretation, study and training; in addition, setting up special funds, establishing digital platforms, and carrying out digital infrastructure construction are also common support measures.

b. Financial Investment

The government can establish emergency rescue funds but needs to ensure they are used in accordance with relevant standards and managed in a transparent manner. China's Ministry of Finance and Ministry of Emergency Management jointly issued the Interim Measures for the Management of Central Natural Disaster Relief Funds, which put forward clear requirements for the proper management and use of disaster relief funds at the local level.

In addition, commercial banks can also provide green channels for emergency financing for SMEs. According to incomplete statistics from the China Banking Association, since the COVID-19, all 134 urban commercial banks and 18 private banks in China have introduced specific measures for financial services for pandemic prevention and control and resumption of work and production in order to assist enterprises in their recovery. In addition, many banks have taken their financial services online to ensure the normal operation of financial assistance in times of disaster.

c. Low-carbon and Sustainable Development

Green, low-carbon and sustainable development is a topic of common concern for the whole society and the underlying trend of supply chain integration and development. The government should optimize the environment for green development of enterprises, guide SMEs to integrate low-carbon concepts into supply chain development, encourage SMEs to

contribute to cooperation on standard setting and technology innovation, and develop green industry chain; and provide exclusive financial and policy support for SMEs to assist them in establishing an expert team of low-carbon transformation to help them in the green transformation and development.

#### **Case 8: Improvement of warehouse and distribution system of Fast Moving Consumer Goods (FMCG) retailing enterprises under cooperative warehouse-merging model**

The supply chain model of traditional FMCG enterprises is characterized by low single delivery volume, low delivery efficiency and high delivery cost. The cost of warehousing is increasing recently and the existing warehouse planning and information system can't meet the demand of reserving and managing various types of goods. Therefore, these enterprises put it first: reducing production and delivery costs and improving economic benefits. A logistics service provider that integrates warehousing, transportation and distribution can not just reduce cost but improve efficiency as well.

Taking Jingdong Logistics (JDL), a large logistics service provider in China, as an example, it proposed an innovative model of cooperative warehouse-merging. Based on its own pre-positioned supply network, JDL cooperated with small and medium-sized warehouses and give full play to their reserve and delivery capacity to reduce storage costs of both sides. Then, it leveraged its advantage of smart technology to help those small and medium-sized warehouses achieve the visualization of end-to-end data in the industrial chain and inventory allocation of goods in different warehouses across different regions. It also sent equipment and experts to these SMEs to help improve their operational efficiency and reduce management cost. In doing so, both JDL itself and SMEs see win-win results.

With the rapid development of China's e-commerce business, especially in the FMCG retailing industry, this cooperative model helps improve the efficiency of delivery both at regular times and during promotional activities such as the "Double Eleven". Idle warehouse resources are integrated and diverse needs of customers are met.

#### **V. Conclusion**

As an important part of the economy and society, SMEs play an important role in reducing disaster risks and improving resilience. Although there are constraints in human, material and financial resources, their relatively simple business activities and organizational structure allow them to be relatively flexible and responsive when disasters occur. Through the innovation in product functions and business models, SMEs can adapt more quickly to the impact of disasters and increase their resilience.

In the context of globalization, it is also important for SMEs to improve their ability to enter international markets as important participants in global supply chains and to prepare for 'going global'. Enterprises could be encouraged to participate in building global supply chain to ensure that in the face of major emergencies, the interconnectivity of the global supply chain can help ensure or recover the smooth global flow of critical materials, thus supporting the resilience development of SMEs.

# ANNEX/ APPENDIX

## Annex A: A Proposed Risk-Informed Decision-Making Framework for Resilience (RIDMFR)

### Risk-Informed Decision-Making Framework for Resilience

- Sendai Framework for Disaster Risk Reduction  
- Paris Statement on Climate Change  
- The 2030 Agenda for Sustainable Development

APEC Putrajaya Vision 2040: An Open, Dynamic, Resilient And Peaceful Asia-Pacific community

### Steps towards A Risk-Informed Decision-Making and its implementation

#### Decision Making

Identify objective and needs; Collect relevant Information; Analyse Alternatives available; Evaluate Evidence; Make a Decision



#### Risk Management

1. Identify the Risk; Analyze the Risk; Evaluate or Rank the Risk, in terms; Treat the Risk; Make a final option to reduce risk



#### Risk-Informed Decisions

1. Identify the Needs and Context for a Risk-Informed Decision  
2. Collect and Assess Information for a Risk-Informed Decision  
3. Analyse Alternative Options for a Risk-informed Decision  
4. Evaluate Evidence for a Risk-Informed Decision  
5. Make a Risk-Informed Decision



#### Implementation

1. Implementing a Risk-Informed Decision, supported by risk communication and risk monitoring  
2. Monitor and Evaluate Implementation of a Risk-Informed Decision  
3. Document the Implementation of Risk-Informed Decisions for future reference

#### Enabling Environment for Implementation of a Risk-Informed Decision

Public Understanding, Government Policy, Disaster Risk Governance, Legislation, Accountability, Community Participation, Stakeholder Engagement.

## **Annex B: Terminology**

**Hazards:** A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. **Natural hazards** are predominantly associated with natural processes and phenomena.

(UNDRR 2017)

**Capacity:** The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. (UNDRR 2017)

**Coping capacity:** The ability of people, organizations and systems, using available skills and resources, to manage adverse conditions, risk or disasters. The capacity to cope requires continuing awareness, resources and good management, both in normal times as well as during disasters or adverse conditions. Coping capacities contribute to the reduction of disaster risks. (UNDRR 2017)

**Decision making:** The process whereby an individual, group or organization reaches conclusions about what future actions to pursue given a set of objectives and limits on available resources. This process will be often iterative, involving issue-framing, intelligence-gathering, coming to conclusions and learning from experience. (Research Gate)

**Disaster:** A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. (UNDRR 2017)

**Disaster risk:** The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity. (UNDRR 2017)

**Disaster risk reduction** is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development. (UNDRR 2017)

**Disaster risk management** is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses. (UNDRR 2017)

**Disaster risk governance:** The system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy. (UNDRR 2017)

**Disaster risk assessment:** A qualitative or quantitative approach to determine the nature and extent of disaster risk by analyzing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend (UNDRR 2017).

**Decision-making:** The process whereby an individual, group or organization reaches conclusions about what future actions to pursue given a set of objectives and limits on available resources. This process will be often iterative, involving issue-framing,

intelligence-gathering, coming to conclusions and learning from experience (Schoemaker & Russo 2016).

**Resilience** refers to the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. (UNDRR 2017)

**Vulnerability:** The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards. (UNDRR 2017)

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