



**Asia-Pacific  
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# **The STI Contribution to Policymaking on Natural Disaster Resilience: Better STI, Better Resilience, Better Competitiveness**

**APEC Policy Partnership on Science, Technology and Innovation**

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## 1. OVERVIEW

Most APEC economies are often stroke by disasters of natural origin (i.e. earthquakes, landslides, mudflow, forest fires, and volcanos eruptions). The natural phenomena related to the 'Ring of Fire' frequently impact on the growth and competitiveness of the economies across the Pacific Ocean. Governments need to create an ecosystem enabling the generation of knowledge and technology in order to mitigate the impact to the population, the economy and the development caused by any natural catastrophe. This project aims to create an ecosystem among APEC economies supporting the connections between policy-making on natural disaster resilience and the contribution thereto provided by science, technology and innovation (STI), connections that are often deficient in the less-developed economies of APEC.

In order to create ecosystem among APEC economies a 2-day workshop was held in Santiago de Chile on 1-2 of August 2018. The workshop was attended by 63 participants (26 women) from nine (9) economies representing different views from research, industry and government:

1. Australia;
2. Chile;
3. China;
4. Japan;
5. Mexico;
6. New Zealand;
7. Peru;
8. Russia; and,
9. Thailand.

The workshop, at first, has created opportunities for all participants to better understand the state of art on the natural disaster resilience in different economies as well as analysed challenges and advances related to it within each present economy. It then allowed participants to work in groups in order to discuss the challenges in natural disaster resilience and its connection to science, technology and innovation and generate recommendations for policy making that can be drawn from participants' personal professional experience and expertise.

As a result of a mutual learning exercise among stakeholders from both developed and developing APEC economies, this initiative has generated recommendations through which it intends to contribute to the policy making process on natural disaster resilience based upon STI evidence.

This set of recommendations will therefore boost APEC economic integration; support competitiveness and innovation in APEC economies by a better preparedness and resilience policies to cope with disasters of natural origin. The main benefit of this initiative will be the improvement and consolidation of new R&I capacities providing more efficient responses via the identification and understanding of the factors interceding in the societal risks unleashed by any disaster of natural origin.

## 2. METHODOLOGY

In order to be able to generate policy recommendations the workshop was divided into two main parts:

1. Introductions of the current state on natural disaster resilience and case studies examples on policies introduced in different economies; and
2. Group work to elaborate set of recommendations.

For the **Part 1**, case study presentations were made by such economies like Australia, China, Japan, Mexico, Russia and Chile, where Chile, as a host economy, has introduced different aspects of its natural disaster resilience, starting with policies on governmental level and finishing with concepts of health and psychology status of people before and after disaster of natural origin.

In order to generate better discussions on the case studies, moderators were appointed for different modules. Moderators were chosen from economies that did not present their case studies at the workshop, Peru and Thailand, so that they can build on their experience and that of their economies to enrich discussions within the group.

During Part 1, all participants were divided into 8 groups insuring diverse representations in each group of economies, economic sectors and institutions. At the beginning of the session, each group had time to make introductions within their groups, so each group members can identify their peers from the beginning.

For group discussions of the **Part 2**, Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDDR) was used as a base. The framework has four main priorities:

- 1: Understanding Disaster Risk;
- 2: Strengthening Disaster Risk Governance;
- 3: Investing in Risk Reduction; and,
- 4: Enhancing Disaster Preparedness for Collective Response, and to “Build Back Better” in Recovery; Rehabilitation and Construction.

So, all participants were divided into four (4) groups where each group had to work on recommendations related to a different priority of SFDDR. Before group discussions, a moderator for the session made a brief introduction into the SFDDR and established objective for group discussions. The idea was to make recommendations based on experiences of each groups´ members.

At the end of group discussions each group made brief presentations explaining their recommendations for policy making from STI perspective and reasons behind them.

The agenda of the workshop can be seen at Annex 1. For more information on the agenda and related materials, please visit the project website:

<http://www.conicyt.cl/apec/>

Once the report was generated it was distributed among participants for their feedback and inputs. The separate meetings (teleconference, face to face meetings and video conferences) with some individual and institutional actors were held in order to ensure that the policy recommendations can be actually implemented or taken into considerations by stakeholders on local, regional and global levels.

### **3. DELEGATES**

The set of actions to be developed within this project aims to benefit a broad range of stakeholders involved in the domestic ecosystems for science, technology, innovation and resilience related to natural hazards. Beneficiaries are expected to be directly involved in the governmental preparation, promotion and implementation of decisions and understanding of the complex impacts of natural disasters on their economy in order to produce a robust exchange of ideas and conclusions. Beneficiaries are also expected to be knowledgeable with their economies' priorities for science, innovation, and resilience for disasters of natural origin.

In order to ensure that policy recommendations to be developed within the workshop, the organizers have invited participants from broad range of institutions and economies:

- A) Governmental entities (ministries, councils, others) related to policy-making on resilience and preparedness for disasters of natural origin;
- B) Institutions of science, technology and innovation;
- C) Funding agencies of science, technology and innovation; and,
- D) Relevant experts from public or private universities/institutions/research centers.

The workshop was attended by 67 participants from nine (9) economies:

- 1. Nine (9) from developed economies:
  - a. Australia (4);
  - b. Japan (1);
  - c. New Zealand (4);
- 2. 58 from developing economies:
  - a. Chile (49);
  - b. China (1);
  - c. Mexico (2);
  - d. Peru (2);
  - e. Russia (2); and,
  - f. Thailand (2).

Gender diversity can certainly contribute to the development the set of recommendations for resilience on natural hazards, therefore the project targeted women participation to 23%. However, the set up goal reached more than 35% with 26 women out of 67 participants.

Unfortunately, due to the distance between Chile and Asian economies of APEC, most of economies did not nominate candidates for the workshop, limiting the number of funded external experts, participants and speakers, to 10 only, instead of suggested 24.

For more details, please see list of participants at Annex 2.

#### **4. POLICY RECOMMENDATIONS**

##### **4.1. SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030**

The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) was adopted at the Third UN World Conference in Sendai, Japan, In March, 2015. It is the result of discussions between different governmental stakeholders, supported by the United Nations Office for Disaster Risk Reduction at the request of the UN General Assembly.

The conference was represented by three segments:

1. Inter-governmental;
2. Multi-stakeholders; and,
3. Public Forum.

It was attended by 6,500 participants including 2,800 government representatives from 187 economies that include 25 head of states and 100 ministers.

Although, the Sendai Framework is a result of previous discussions/mechanisms developed earlier, it introduces shifts towards disaster risk management as opposed to disaster management, shifting its focus on prevention rather than reduction of existing risk.

It also introduced people centered preventive approach, paying attention to health resilience as cross-cutting topic. Stakeholder engagement and connection with Sustainable Development Goals (SDG) are another key elements of the Framework.

For more information of SFDRR and each priority please visit:

[https://www.unisdr.org/files/43291\\_sendaiframeworkfordrren.pdf](https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf)

##### **4.2. GROUPS RECOMMENDATIONS**

The workshop was organized within the framework of Policy Partnership on Science, Technology and Innovation (PPSTI) group, the main focus of the recommendations was on role of science and technology in implementing SFDRR in APEC economies. All participants were divided into four (4) groups with each group working on one of the priorities of Sendai Framework in groups with each group generating recommendations based on their expertise and experience. Although the objective of the group work and discussions was explained prior, each group has developed different approach to generate recommendations. While considering broader aspects of SFDRR priorities, the groups focused on specific issues which need to be highlighted in near future,

## SFDRR Priority 1: Understanding Disaster Risk

Group 1 analyzed SFDRR Priority 1. The group highlighted several existing actions to be taken into consideration to understand disaster risk:

1. Enhance disaster loss and damage accounting, economy-wide and local disaster risk assessment and communication of disaster risk, with specific focuses on risks of urban **and less developed regions**.
2. Use space and disaster risk mapping technologies, and **emerging technologies** and strengthen the capacity for using these technologies for improved understanding of disaster risks at global, economy-wide and local level.
3. Strengthen regional exchange on disaster risk information and science in order to better understand complex disaster risks including risks of trans-boundary, cascading and compound disasters.
4. **Develop a synthesis system under international cooperation to share integrated grass-root and scientific knowledge among a broad range of stakeholders and promote dialogue in the economy-wide platform.**

In order to generate policy discussion for disaster risk management, it is important to understand risk, its capacity, social and economic relevance, characteristics and the environment.

To be able to do so there are several actions that SFDRR has proposed on different levels:

1. ECONOMY-WIDE AND LOCAL LEVEL: data generation and management; hazard, risk and vulnerability maps; good practices, training and education; cooperation between policy makers and scientific community among others.

2. GLOBAL AND REGIONAL LEVEL: development and dissemination of science based methodologies and tools; promotion of partnership with science and academia and others.

THE WORKSHOP GROUP 1 took into account broader aspects of SFDRR priority 1 issues, however, it mainly focused on specific issues to be outlined in near future, based on its members' experience and expertise thus far. Taking the above-mentioned into account, and based on personal experience and expertise of group members, the group 1 has suggested following recommendations to reach Priority 1:

**Policy Recommendation 1:** Data sharing mechanisms between stakeholders (including private sector). The group has underlined the necessity to have data sharing mechanisms to understand risk better and have weighted actions to prevent or respond to disaster risk.

**Policy Recommendation 2:** Data provision in a form which matches research data needs and pipelines. Not only data have to be shared, they have to have special format, so researchers can actually use them into their investigations to better understand disaster and risks it might bring with it.

**Policy Recommendation 3:** DRR scientific advisory network at all levels of decision making (decentralized approach). The group has stressed the necessity of scientific advisory for policy makers related to DRR, so that presentation or response policies are based on latest findings and can allow actions that are structured better.

**Policy Recommendation 4:** Innovation incentive policy for disaster resilience building. Resilience is one of the most important factors in understanding risk and it needs to be promoted through policies that encourage innovation.

**Policy Recommendation 5:** Developing capacity of scientist to “Translate” their research into common and good means of communication (both ways). DRR research is advanced in various economies, however, not all of it is properly understood by general public and policy makers, so there is a need to training for researchers to better explain their findings.

**Policy Recommendation 6:** Overall policy about providing access to DRR relevant data as principle that overrides the brief and jurisdiction of individual agencies and departments. In addition to suggested policies 1 and 2, there is a need to develop legislature that makes data access a norm on different policy levels.

These six policies recommendations were tagged by timeframe, cost, coordination efforts and other parameters as below:

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5	Policy 6
Timeframe	Long	Short	Short	Short	Medium	Medium
Cost (\$)	High	Low	Low	Mod	Mod	Low
Coordinating Sci effort	Low	Low	Low	Mod	High	Mod
Legal frame	Mod	Low	Low	Mod	Low	High
Effort res. inclusiveness	Mod	Low	high	Mod	Mod	Low
Governance	Mod	Low	Mod	High	Low	High
R&D	High	Low	Low	Low	Low	Low

As a result, it can be seen that out of 6 policy recommendations generated by the group, the policy 1, Data sharing mechanisms between stakeholders, is the policy that needs high level of research and development in order to be able to understand risk better.

## **SFDRR Priority 2: Strengthening governance**

Group 2 focused on Priority 2 – Disaster Risk Governance that have following actions included:

1. Strengthening science-policy-practice nexus at all levels (economy-wide, local, trans-boundary and regional).
2. Developing inter-disciplinary economy-wide science and technology plans to support implementation of the Sendai Framework. This includes actions by academia/universities to develop their own disaster risk management plans.
3. Enhancing collaboration between local governments, academia and other partners to promote local communities' knowledge and traditions and to sustain and replicate many good practices that exist locally for science-based decision making.

Disaster risk governance at all levels is one of the most important elements for an effective and efficient management of disaster risk. Not only it included strategies, action plans and guidance, but also is in charge of coordinating efforts between different stakeholders and sectors that are key for strengthening disaster risk governance.

Some recommendations by levels generated within the Framework are as follows:

1. **ECONOMY-WIDE AND LOCAL LEVEL:** promoting quality standards, such as certification for disaster risk management with private sectors, civil societies, scientific communities and others;
2. **GLOBAL AND REGIONAL LEVEL:** promoting mutual learning and exchange of good practices and information among interested states.

WORKING GROUP 2 has divided the policy actions for strengthening governance through science and technology into local and global, especially addressing the pressing need for three main pillars:

- coordination at all levels,
- information/data sharing and transfers among a very comprehensive set of stakeholders,
- human and professional capital

The group has developed a list of policy recommendations at **LOCAL LEVEL:**

**Policy Recommendation 1:** Addressing lack of coordination as a mid-term policy:

- Increasing coordination between (i) government and private sector (and their real problems) and (ii) research institutions

- Using decision making models for providing evidence in terms of optimal decisions

**Policy Recommendation 2:** Improving information transparency and quality for sharing purposes across governmental agencies through technology (opportunity for data sciences for visualization and screening techniques for online access) as a mid-term policy too.

**Policy Recommendation 3:** Incorporating the concept of resilience in various laws and regulation as a short-term policy recommendation.

**Policy Recommendation 4:** Improving communication (through technologies) during the disaster as a short to mid-term recommendation.

**Policy Recommendation 5:** Focusing research money on resilience as a short term recommendation

**Policy Recommendation 6:** Training government and industry professionals to facilitate communication with research institutions as a mid to long term policy recommendation.

The six policies recommendations at local level can be tagged by timeframe, cost, coordination efforts and other parameters as below:

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5	Policy 6
Timeframe	Medium	Medium	Short	Short to Medium	Short	Medium to Long
Cost (\$)	Low	Low	Low	Mod	Mod	Mod
Coordinating Sci effort	Medium	Medium	Low	High	Mod	Mod
Legal frame	Mod	Mod	High	Mod	Low	Low
Effort res. inclusiveness	Mod	Mod	High	Mod	Mod	Mod
Governance	High	High	High	High	Low	Mod
R&D	Low	Mod	Low	Mod	High	Mod

The list of recommendations at **GLOBAL LEVEL** identified by the WORKING GROUP 2 includes:

**Policy Recommendation 1:** Identifying similarities among economies and work together in similar hazards as a mid term policy recommendation;

**Policy Recommendation 2:** Creating global resilience platform for sharing practices and research information as a short to mid term one;

**Policy Recommendation 3:** Fostering governments to provide best possible socio-economic data to analyses and study disasters as a mid to long term policy recommendations;

**Policy Recommendation 4:** Instigating research institutions to publicly share all information and data that is funded by government as a short term one;

**Policy Recommendation 5:** Creating international centers for “capacity building” as a mid to long term recommendation; and

**Policy Recommendation 6:** Making joint calls for research projects across various economies as a short term policy.

These six policy recommendations at global level can be tagged by timeframe, cost, coordination efforts and other parameters as below:

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5	Policy 6
Timeframe	Medium	Short to Medium	Medium to Long	Short	Medium to Long	Short
Cost (\$)	Low	High	Low	Low	High	Mod
Coordinating Sci effort	High	High	Mod	Mod	Mod	Mod
Legal frame	Low	Mod	Mod	Mod	Low	Low
Effort res. inclusiveness	Mod	High	High	Mod	Mod	Mod
Governance	High	High	High	High	Mod	Mod
R&D	High	Mod	Mod	High	Low	High

For the Priority 2, the group has also identified:

- **Stakeholders:** research agencies and research institutions/centers, relevant ministries, local government organizations, relevant industrial partners such as public utilities, lifelines, parliament, etc.; and,
- **Resources:** research funds dedicated to resilience, human capital and professional capital spread across the territory, infrastructure (experimental, computational, communications), authority/institutional trust

So, as a result, the group has specified several recommendations on local and global levels where datasharing and building resilience platform on global level are some of the most important policy recommendations that need to be taken into account in the near future.

### **SFDRR Priority 3: Investing in DRR for resilience**

In order to ensure that disaster risk prevention and reduction is driven by innovation and new discovering, investment by both private and public sectors is important and not only can lead into innovative cost-effective prevention solutions and in long term can have positive economic effect on different levels.

Some recommendations by levels within SFDRR are as follows:

1. **ECONOMY-WIDE AND LOCAL LEVELS** : allocation of necessary fund at all level and in all institutions that are involved with DRR strategies, plans, implementations and establishment of legal framework; establish and promote mechanisms for disaster risk transfer and insurance in a way that the impact of disasters does not necessarily lay son public institutions and societies and others.

2. **GLOBAL AND REGIONAL LEVELS:** promotion of disaster risk transfer and sharing mechanisms in cooperation with international community, business, international financial institutions and other relevant actors; promotion of cooperation between research networks and the private sector to develop innovative cost-effective approached to reduce disaster risk; etc. Making DRR an area of focus within education including networking between universities.

Ensuring risk-sensitive investments through enhanced role of the science and technology community.

Developing young professionals in the field of multi-disciplinary disaster risk reduction. Enhancing and showcase projects that promote science and technology-based DRR and encourage governmental and social investment in disaster risk reduction.

WORKING GROUP 3 has analyzed recommendations made within SFDRR and chose five (5) recommendations that for group members looked most appropriate for the priority 3 considering their own expertise. The group has identified specific action, stakeholders, resources and timeframe for each chosen policy recommendation as below:

**Policy Recommendation 1:** Promoting, as appropriate, the integration of disaster risk reduction considerations and measures in financial and fiscal instruments;

**Policy Recommendation 2:** Promoting mechanisms for disaster risk transfer and insurance, risk-sharing and retention and financial protection, as appropriate, for both public and private investment in order to reduce the financial impact of disasters on Governments and societies, in urban and rural areas;

**Policy Recommendation 3:** Promoting and enhancing, through international cooperation, including technology transfer, access to and the sharing and use of non-sensitive data and information, as appropriate, communications and geospatial and space-based technologies and related services; maintain and strengthen in situ and remotely-sensed earth and climate observations; and strengthen the utilization of media, including social media, traditional media, big data and mobile phone networks, to support economy-wide measures for successful disaster risk communication, as appropriate and in accordance with laws of each economy;

**Policy Recommendation 4:** Increasing business resilience and protection of livelihoods and productive assets throughout the supply chains, ensure continuity of services and integrate disaster risk management into business models and practices;

**Policy Recommendation 5:** Allocating the necessary resources, including finance and logistics, as appropriate, at all levels of administration for the development and the implementation of disaster risk reduction strategies, policies, plans, laws and regulations in all relevant sectors.

The group has developed the table below to demonstrate relationship between policy recommendations, specific actions to be taken to implement it, stakeholders involved, necessary resources and timeframe of implementation.

Policy recommendations	1	2	3	4	5
Specific action	Promoting awareness of the relationship between disaster and social-economic impacts.	Introducing financial risk-sharing mechanisms into the activities of owners and managers of critical infrastructure (i.e.: insurance, financial incentives	Including people with life-threatening and chronic disease in the design of policies and plans to manage their risks before, during and after disasters, including having access to life-saving services.	Integrating risk and resilience into business strategic planning of companies, accounting for internal and external aspects affecting the production due to disasters. That could	Development of a economy-wide DRR action plan based on priorities identified at the local level by adopting methodologies such as risk matrices, impact and

		for fast recovery measures in the case of events).		be done through disseminating evidence.	vulnerability assessments.
Stakeholders	Public sector/ policy-makers; financial institutions ; academia; industries; media; science advocates ; NGOs; civil society, including vulnerable groups.	Experts (academia , private and public sectors); Public sector/ policy-makers / regulatory authorities; insurance companies ; financial institutions ; civil society, including vulnerable groups.	Patients in critical condition and their families; health professionals; public sector (policy-makers); health-related industries (pharmaceuticals, insurance...); academia.	Industries; Academia; Public sector (policy-makers); Communication vehicles.	Public sector (policy-makers at the local and economy levels); experts; civil society, including vulnerable groups; media.
Resources	Financial resources; trained human resources; data (quality and data collection); information based on data; methods for public engagement.	Public budget; financial resources from the private sector; institutional and legal framework ; human resources; methods for public engagement; media.	Life-saving services, devices and medicines; institutional framework; financial resources; human resources; mapping of population health priorities.	Data (evidence and case studies); Human capital; Financial resources; media; tools and methodologies.	Data; financial resources; human capital; institutional framework.
Timeframe	Short term (pre-requisite for other actions).	Short term (with a good monitoring system).	Short term (for most vulnerable groups) and medium-long term for other groups.	Medium term.	Medium term.

In order to be able to see relationship between policy recommendations of the Priority 3 and those of other priorities, these five policies recommendations can be tagged by timeframe, cost, coordination efforts and other parameters as below

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5
Timeframe	Short	Short	Short	Medium	Medium
Cost (\$)	Low	High	Low	Mod	High
Coordinating Sci effort	Low	Low	High	Mod	High
Legal frame	Mod	High	Low	High	High
Effort res. inclusiveness	Mod	Mod	High	Mod	Mod
Governance	High	High	Mod	High	High
R&D	Low	Low	Mod	Low	Mod

As can be seen from the table above, each policy recommendation has specific actions that can be undertaken in order to make the recommendations a reality. Most of the actions involved variety of stakeholders and from short to medium term timeframe. So, as a result we can see that the priority can be addressed through the actions identified as long as most of the stakeholders can come into agreement and develop mechanism for the policies implementations.

#### **SFDRR Priority 4: To Enhance Disaster Preparedness For Effective Response And To Build Back Better**

The group 4 has worked on SFDRR Priority 4 that has some of the following objectives:

1. Promote the role of multi-disciplinary science and technology in effective pre-disaster planning, preparedness, response, rehabilitation, recovery and reconstruction to build back better.

2. Develop an efficient and effective cooperation among the science community and business sector by utilizing the advancements of the fast developing information and communication technology (ICT) including big data.

3. Research into innovative and practical solutions to promote the whole-of-society engagement.

The WORKING GROUP 4 considers that all proposals must be focused on people, and that the shape of the policies must be based on empathy to generate general trust for the process of “Build Back Better”.

Taking the abovementioned into account the group has developed the following policy recommendations:

***Policy Recommendation 1:*** Institutional framework, supported by laws in order to offer cooperation, technical support, considering the crossing of borders, with a comprehensive integrated system of information with knowledge vision including all major groups and other stakeholders, such as business and industry, children and youth, farmers, indigenous people, local authorities, non-governmental organizations, scientific and technological community, women, workers and trade unions;

***Policy Recommendation 2:*** Education, training and engagement using local tools, local knowledge, and emergent technologies to prepare people to the situation of risk and emergency considering their particularity;

***Policy Recommendation 3:*** A percentage of public investment in research, development and innovation related to resilience, considering different aspects of resilience, such as physical, social, and psychological;

***Policy Recommendation 4:*** Designing of a resilience criteria to incorporate resilience indicators for infrastructure, including in reforms and new constructions, which must be monitored during and after the construction; and,

***Policy Recommendation 5:*** Psychological support to the victims of disasters.

As can be seen from the list of recommendations, most of them are related to the recommendations of the previous priorities with a stronger focus on people and relationships between and among different stakeholders.

These five policy recommendations can be tagged by timeframe, cost, coordination efforts and other parameters as below:

	<b>Policy 1</b>	<b>Policy 2</b>	<b>Policy 3</b>	<b>Policy 4</b>	<b>Policy 5</b>
Timeframe	Long	Short	Short to Medium	Short	Short
Cost (\$)	Mod	Mod	Mod	High	Low
Coordinating Sci effort	High	Mod	High	Mod	Low
Legal frame	Mod	Mod	Mod	High	Low
Effort res. inclusiveness	Mod	Low	High	Mod	Mod
Governance	High	High	Mod	High	Low
R&D	High	Mod	High	Mod	Low

#### **4.3. POLICY RECOMMENDATIONS – CONCLUSIONS**

Although SFDRR includes policy recommendations to strengthen disaster preparedness, resilience and response, the workshop has shown that the policies have to be analyzed on each levels and by different stakeholders to be able to adjust SFDRR recommendations into realities of each economy and its regions and also highlight special needs to policies that not only reflect experiences and expertise from past, but also incorporates innovative scientific approach into policies, ensuring better policies that can allow understand risks better, encourage investment into resilience and general preparedness for risks and improve systems of risks governance.

The summary of all policy recommendations developed during the workshop can be seen in the table below.

PRIORITY 1	PRIORITY 2		PRIORITY 3	PRIORITY 4
	Local Level	Global Level		
Data sharing mechanisms between stakeholders	Addressing lack of coordination	Identifying similarities among economies and work together in similar hazards	To promote, as appropriate, the integration of disaster risk reduction considerations and measures in financial and fiscal instruments	Institutional framework for cooperation, technical support, with a comprehensive integrated system of information with knowledge vision including all major groups and other stakeholders
Data provision in a form which matches research data needs and pipelines	Improving information transparency and quality for sharing purposes across governmental agencies through technology	Creating global resilience platform for sharing practices and research information	To promote mechanisms for disaster risk transfer and insurance, risk-sharing and retention and financial protection, as appropriate, for both public and private investment in order to reduce the financial impact of disasters on Governments and societies	Education, training and engagement using local tools, local knowledge, and emergent technologies to prepare people to the situation of risk and emergency considering their particularity
DRR scientific advisory network at all levels of decision making	Incorporating the concept of resilience in various laws and regulation	Fostering governments to provide best possible socio-economic data to analyses and study disasters	To promote and enhance access to and the sharing and use of non-sensitive data and information; maintain and strengthen in situ and remotely-sensed earth and climate observations; and strengthen the utilization of media to support economy-wide measures for successful disaster risk communication	Public investment in research, development and innovation related to resilience, considering different aspects of resilience
Innovation incentive policy for disaster resilience building	Improving communication (through technologies)	Instigating research institutions to publicly share all information	To increase business resilience and protection of livelihoods and productive assets	To create a resilience criteria to incorporate resilience

PRIORITY 1	PRIORITY 2		PRIORITY 3	PRIORITY 4
	Local Level	Global Level		
	during the disaster	and data that is funded by government	throughout the supply chains, ensure continuity of services and integrate disaster risk management into business models and practices	indicators for infrastructure
Developing capacity of scientist to “Translate” their research into common and good means of communication	Focusing research money on resilience	Creating international centers for “capacity building”	To allocate the necessary resources at all levels of administration for the development and the implementation of disaster risk reduction strategies, policies, plans, laws and regulations in all relevant sectors	Psychological support to the victims of disasters
Overall policy about providing access to DRR relevant data as principle that overrides the brief and jurisdiction of individual agencies and departments	Training government and industry professionals to facilitate communication with research institutions	Making joint calls for research projects across various economies		

Most of the policy recommendations stressed necessity to develop data sharing mechanisms and make it norm at all levels of a certain economy, local, regional and global. To get better prepared for risks it is important to have people centered approaches where research can be translated into general understanding and trusted links developed between different stakeholders.

## **5. FOLLOW UP STEPS**

As a follow up actions, Chile will be sharing the report with the APEC economies through the Policy-Partnership for Science, Technology and Innovation Fora as well as legal representatives of the economies in Chile. It will also keep its website developed for the workshop in order to keep the report available to stakeholders at different levels, local, regional and global, along with other related reports collected for this purpose. The economy will also continue collecting relevant materials in the field, so the website can be a reference in the future for disaster risk resilience and related policies.

**ANNEX 1  
WORKSHOP AGENDA**

**THE SCIENCE TECHNOLOGY AND INNOVATION CONTRIBUTION TO POLICY  
MAKING  
ON NATURAL DISASTER RESILIENCE**

**WORKSHOP  
August 1-2, 2018**

- **Organizer:** National Commission for Scientific and Technological Research of Chile – CONICYT
- **Venue:** 2nd floor, 1375 Moneda Street, Santiago

<b>DAY 1, 1 AUGUST</b>	
8.30 – 9.00	Registration and Coffee Break
9.00 – 9.10	Introduction Welcome remarks Mario Hamuy, President of Council, CONICYT
9.10 – 9.15	Remarks Christian Nicolai, Executive Director, CONICYT
9.15 – 9.45	Reducing Disaster Risk in Chile: Current Status and Challenges. <b>Keynote Speaker:</b> Cristóbal Mena, Deputy National Director, National Emergency Office (ONEMI), <b>Chile</b>
9.45 – 9.55	Press Photo
9.55 – 10.00	Presentations of Participants (economy, institution, position, etc.)
<b>Moderator: Zenon AGUILAR BARDALES, Deputy Director of Research, Peruvian – Japanese Center of Seismology and Disaster Mitigation Investigation, Peru</b>	
10.00 – 10.30	Natural Hazards Resilience Research in New Zealand <b>Asaad Shamseldin</b> , Professor, Civil and Environmental Engineering, University of Auckland, <b>New Zealand</b>
10.30 – 10.40	Questions and answers
10.40 – 10.55	Coffee Break
10.55 – 11.25	Building Resilience After the September Earthquakes in Mexico <b>Norlang GARCÍA</b> , Deputy Director, Economic and Social Studies Department, National Center for Disaster Prevention (CENAPRED), <b>Mexico</b>

11.25 -11.35	Questions and answers
11.35 -12.05	Earthquake Disaster Resilience in China <b>Yongxian ZHANG</b> , Deputy Director, Earthquake Prediction Department, China Earthquake Networks Center, <b>China</b>
12.05 – 12.15	Questions and answers
12.15 – 12.45	The Role of Science and Technology in Earthquake Hazard Characterization: A Chilean Experience <b>Sergio BARRIENTOS</b> , Director, National Seismologic Centre, University of Chile, <b>Chile</b>
12.45 – 12.55	Questions and answers
12.55 – 14.00	Lunch
<b>Moderator: Kampanart SILVA</b> , Senior Nuclear Scientist, Nuclear Research Group, Nuclear Research and Development Division, Thailand Institute of Nuclear Technology, <b>Thailand</b>	
14.00 – 14.30	Science Technology for Disaster Risk Reduction: Global and Regional perspectives <b>Rajib SHAW</b> , Chair of United Nations Science Technology Advisory Group for Disaster Risk Reduction, Professor de la Universidad de Keio, <b>Japan</b>
14.30 – 14.40	Questions and answers
14.40 – 15.10	The Organization of Scientific-Technical Activities in the System of EMERCOM of Russia <b>Evgenii GAMAIUNOV</b> , Head of Section of Scientific-Technical Department, Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM), <b>Russia</b>
15.10 – 15.20	Questions and answers
15.20 – 15.35	Coffee Break
15.35 – 16.05	The Role of Data Science in Informing Disaster Mitigation and Resilience Policy <b>Simon DUNSTALL</b> , Research Director, Decision Sciences Program, Data61, CSIRO, <b>Australia</b>
16.05 – 16.15	Questions and answers
16.15 – 16.45	Policy Making on Natural Disaster Resilience: Vulnerability and Health <b>Paula Repetto</b> , Department of Psychology (PUC), Principal Investigator, Research Center for Integrated Disaster Risk Management (CIGIDEN), <b>Chile</b>
16.45 – 16.55	Questions and Answers

16.55 – 17.15	Closing remarks day 1 CONICYT
<b>Day 2, 2 AUGUST</b>	
8.30 – 9.00	Registration and Welcoming Coffee
9.00 – 9.15	Briefing on Day #1 and Objectives for day #2 CONICYT
<b>Moderator: Rajib SHAW, Chair of United Nations Science Technology Advisory Group for Disaster Risk Reduction, Professor de la Universidad de Keio, Japan</b>	
9.15 – 11.45	Drafting Policy Recommendations on Natural Disaster Resilience Working groups on Sendai Framework Priorities (one or two per priority): <ul style="list-style-type: none"> <li>- <b>Priority 1:</b> Understanding disaster risk</li> <li>- <b>Priority 2:</b> Strengthening disaster risk governance to manage disaster risk</li> <li>- <b>Priority 3:</b> Investing in disaster risk reduction for resilience</li> <li>- <b>Priority 4:</b> Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction</li> </ul>
10.45 – 11.00	Coffee Break
11.45 – 12.30	Group Presentations on Key Recommendations
12.30 – 12.45	CONCLUSIONS <b>Rajib SHAW, Chair of United Nations Science Technology Advisory Group for Disaster Risk Reduction, Professor de la Universidad de Keio, Japan</b>
12.45 – 13.00	Closing Remarks <ul style="list-style-type: none"> <li>- General Ricardo Toro, Director, National Emergency Office, <b>Chile</b></li> <li>- Khaled Awad, Director, Fund for Promotion of Scientific and Technological Development, CONICYT, <b>Chile</b></li> </ul>
13.00 – 13.10	Press Photo
13.10 – 14.30	Networking Lunch and wrap-up

**ANNEX 2  
LIST OF PARTICIPANTS**

<b>N</b>	<b>Name</b>	<b>Position</b>	<b>Organisation</b>	<b>Economy</b>
1	Simon DUNSTALL	Research Director, Decision Sciences Program	Data61, CSIRO	Australia
2	Edmundo Claro RODRIGUEZ	Program Research Director	CSIRO Land & Water	Australia
3	Viviana Gaete	Education Manager	Australian Embassy in Chile and Ecuador	Australia
4	Jemma Williams	Political and Economic Officer	Australian Embassy in Chile and Ecuador, Department of Foreign Affairs and Trade (DFAT)	Australia
5	Sergio BARRIENTOS	Director	National Sismological Centre	Chile
6	Paula Repetto	Principal Investigator	Research Center for Integrated Disaster Risk Management (CIGIDEN) Department of Psychology, Pontifical Catholic University of Chile (PUC)	Chile
7	Karla González	Execuitive Director	National Institute of Hydraulics (INH)	Chile
8	Scarlett Vásquez	Vice-director	National Institute of Hydraulics (INH)	Chile
9	Alex Godoy	Director, Center of Research in Sustainability (CISGER)	University of Desarrollo (UDD)	Chile
10	Joaquín Daga	Researcher, Latin-American Centre of Economical and Social Politics (CLAPES)	Pontifical Catholic University of Chile (PUC)	Chile

11	Rodrigo Cienfuegos	Director, Research Center for Integrated Disaster Risk Management (CIGIDEN)	Pontifical Catholic University of Chile (PUC)	Chile
12	Tatiana Izquierdo	Professor	University of Atacama	Chile
13	Rodrigo MORENO	Assistant Professor, Department of Electrical Engineering	University of Chile	Chile
14	Fabio Weikert	Staff member, Division of Natural Resources and Infrastructure	Economic Commission for Latin America and the Caribbean (CEPAL)	Chile
15	Eliana Palma	Staff member, Division of Natural Resources and Infrastructure	Economic Commission for Latin America and the Caribbean (CEPAL)	Chile
16	Karla Zapata	Director	ENEL Chile	Chile
17	Edson Landeros	Director	Technological Water Center (CETAQUA)	Chile
18	Carlos Cárdenas	Department of Antarctic and Subantarctic Programs	University of Magallanes (UMAG)	Chile
19	Cristina Isidora Gueneau de Mussy Marchant	Analyst, Department of Energy, Science, Technology and Innovation (DECITY)	Ministry of Foreign Relations	Chile
20	Luis Felipe Robledo Aldana	Researcher	University of Andres Bello (UNAB)	Chile
21	Marcela Angulo González	Director, Technological Capacities, Corporation for the Promotion of Production (CORFO)	Ministry of Economy, Promotion and Tourism	Chile
22	Jorge Pezoa	Professor, Department of Electrical Engineering	University of Concepcion (UDEC)	Chile

23	Audrey Gallaud	Vice-director of Natural Resources, Department of Strategic Management, production and Development	Center of Information on Natural Resources (CIREN)	Chile
24	Jaime Alvarez	Staff Member	National Council of Innovation for Development (CNID)	Chile
25	Alondra Chamorro	Principal Investigator, Research Center for Integrated Disaster Risk Management (CIGIDEN)	Pontifical Catholic University of Chile (PUC)	Chile
26	Juan Carlos de la Llera	Counselor, School of Engineering Dean, Faculty of Engineering	Pontifical Catholic University of Chile (PUC)	Chile
27	María Victoria Soto	Professor, Department of Geography, Faculty of Architecture and Urbanism	University of Chile	Chile
28	Leonel Ramos Santibáñez	Director, Department of Urbanism, School of Architecture, Urbanism and Geography	University of Concepcion (UDEC)	Chile
29	Marcelo Duran Burgos	Geomatic Professional	Center of Information on Natural Resources (CIREN)	Chile
30	Alejandra Gosthe	Director. Knowledge Transfer	Agua Andinas	Chile
31	Carlos Berroeta	Director, Research and Scientific Relations	Agua Andinas	Chile
32	Etienne Choupay	Coordinator, Project Unit, Division of Innovation	Ministry of Economy, Promotion and Tourism	Chile
33	Rodrigo Cespedes	Staff member, Strategic Investment Fund (FIE)	Ministry of Economy, Promotion and Tourism	Chile

34	Francisco Cereceda	Director, Laboratory of Environmental Chemistry (LAQ) Director, Centre of Environmental Technologies (CETAM)	University of Federico Santa Maria (USM)	Chile
35	Diana Queveda	Senior Research	Water Technology Center (CETAQUA) Chile	Chile
36	Germán Morgado Chávez	Professional, Unit of Risk Management and Energy Emergencies, Security and Energy Market Division	Ministry of Energy	Chile
37	Sergio Godoy E.	Researcher, Faculty of Communication	Pontifical Catholic University of Chile (PUC)	Chile
38	Natalia Silva	Head, Management Department of the National Civil Protection System	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
39	Mariela Trujillo	Head, Development and Projects Department	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
40	Andres Ibaceta	Head, Civil Protection Division	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
41	Francisco Cerda	Professional, Projects Development	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
42	Felipe Riquelme	Professional, Projects Development	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
43	Gonzalo Huechao	Professional, Planning and Management	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
44	Renato Cifuentes	Reseracher	Mayor University	Chile
45	Cristobal Mena	Deputy Director	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
46	Ricardo Toro	Director	National Emergency Office (ONEMI), Ministry of Interior and Public Security	Chile
47	Mario Hamuy	President of Council	National Commission for Scientific and Technological Research	Chile
48	Christian Nicolai	Executive Director	National Commission for Scientific and Technological Research	Chile
49	Rodrigo Monsalve	Director, International Cooperation Program	National Commission for Scientific and Technological Research	Chile
50	Khaled Awad	Director, Fund for Promotion of Scientific and Technological Development	National Commission for Scientific and Technological Research	Chile

51	Mónica Vargas	Director, School of Sociologists	University of Chile	Chile
52	Jerson Reyes	Chief, Unit on Research Development and Management, Electrical Department	National Energy Commission	Chile
53	Paola Alejandra Moraga Contreras		Pontifical Catholic University of Valparaiso (PUC)	Chile
54	ZHANG Yongxian	Professor	Department of Earthquake Prediction China Earthquake Networks Center	China
55	Rajib SHAW	Professor	Graduate School of Media and Governance Keio University	Japan
56	Norlang Marcel GARCÍA ARRÓLIGA	Deputy Director of the Economic and Social Studies Department	National Center for Disaster Prevention	Mexico
57	María del Carmen RODRÍGUEZ JUÁREZ	Liaison and Communication Coordinator	National GeoIntelligence Laboratory of CentroGeo	Mexico
58	Asaad Shamseldin	Professor, Civil and Environmental Engineering	University of Auckland	New Zealand
59	Jacqui Caine	Ambassador	New Zealand Embassy in Chile	New Zealand
60	María Jesús PRIETO		New Zealand Embassy in Chile	New Zealand
61	Javiera Visedo	Market Development Manager, Education New Zealand	New Zealand Embassy in Chile	New Zealand
62	Tania Sarith PEÑA BACA	Specialist in Environmental Science and Technology	National Council of Science, Technology and Technological Innovation (CONCYTEC)	Peru
63	Zenon AGUILAR BARDALES	Deputy Director of Research	Peruvian – Japanese Center of Seismology and Disaster Mitigation Investigation (CISMID)	Peru
64	Evgenii GAMAIUNOV	Head of Section of Scientific-Technical Department	Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters	Russia
65	Yana KUZNETSOVA	Senior specialist-expert, Department for International Cooperation	Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters	Russia
66	Sitthisak MOUKOMLA	Geo-informatic Officer	Geo-Informatics and Space Technology Development Agency (GISTDA)	Thailand
67	Kampanart SILVA	Senior Nuclear Scientist, Nuclear Research Group, Nuclear Research and Development Division	Thailand Institute of Nuclear Technology (TINT)	Thailand

### ANNEX 3

#### APEC Project Evaluation Survey: Workshop

*APEC Project Name/Number: THE STI CONTRIBUTION TO POLICY MAKING ON NATURAL DISASTER RESILIENCE: BETTER STI, BETTER RESILIENCE, BETTER COMPETITIVENESS - PPSTI 07 2017A*

*Date: 1 & 2 August 2018*

Instructions: Please indicate your level of agreement with the statement listed in the table below. Thank you.

	Strongly Agree	Agree	Disagree	Comments
The workshop achieved its intended objectives to generate policy recommendations	9	2		
The agenda items and topics covered were relevant	7	4		
The content was well organized and easy to follow	8	3		
The trainers/experts or facilitators were well prepared and knowledgeable about the topic	11			
The arrangements prior and during the workshop were well organized	10	1		
The time allocated for the workshop was sufficient	9	2		

1. How relevant was this workshop to you and your institution/company?

5	4	3	2	1
Very	Mostly	Somewhat	A little	Not much
7	3	1		

2. What needs to be done next by APEC to strengthen action on policy recommendations in DRR? Are there plans to link the workshop's outcome to subsequent collective actions by fora or individual actions by economies?

Explain: \_\_\_\_\_

**Comments received:**

*Specific policy actions, which link the science technology community in the domestic platform of the respective economies to implement Sendai Framework.*

*In my opinion, an important action will be to promote this kind of workshops in a local level. In general, although policies are made at an economy level, local authorities are unaware of them and I think it will be very helpful.*

*Regarding the first question, I believe that forums should be held on specific risk reduction topics, such as Early Warning Systems, or risk reduction policies regarding earthquakes. Public policies tend to be broad and varied issues should focus more specific objectives. Regarding to the second question by the moments there is no plans to link the workshop's outcome to subsequent collective actions by fora or individual actions, but the China's experience learned in the last workshop will be show in Mexico in order to applicate some ideas.*

*It would be important to promote businesses participation and data sharing among the economies. The outcome will be shared within our institution and with other institutions related to DRR.*

*Following actions should consider follow up proposal and further discussion (how and where these proposal are being included in UN agenda), workgroups conformation in specific topics, and agenda construction. It is advisable to establish a research core in DRR, led by CONICYT, to strengthen the action policies in South America. Chile could be leading the trend based on its own DRR experience and furthermore, proposing a world meeting (Post SENDAI agreement) to update and strengthen UN DRR policies.*

*Policy recommendations generated in the workshop should be revised and validated by experts, and discussed with government officials from relevant economies. By involving all stakeholders (including the civil society) in the debate, policy recommendations can be taken to another level and become actual policy proposals.*

*Chile is far to follow the recommendations of the Sendai framework, the scientists, local society, scientific center o private investigate, do that they can with their resources but it lacks of political government involvement and investment.*

*Yes, there are plans and policy recommendations were made during the workshop.*

*I think it was really helpful having people from different backgrounds and studies, the multidisciplinary environment allowed us to understand better people's needs in their specific areas. I think that putting scientists and policy makers together is truly **essential**.*

3. How could this workshop have been improved? Please provide comments on how to improve the workshop, if relevant.

Explain: \_\_\_\_\_

**Comments received:**

*Possibly a bit more time in each session.*

*The workshop was very interesting and well organized, although more people were probably interested a larger number of assistants would have not been practical.*

*The experiences shown in the workshop were of many themes. The public policies on disaster risk reduction are broad, perhaps they should focus on specific issues, health, education, knowledge of risk, and that should be linked to the Sendai Framework for Action*

*The organization was great. Maybe a bit more time on the second day for the groups to work.*

*I think that, as a workshop, it worked great. It could still be improved by strengthening the conclusion phase as it looks a little bit blurred about what is going to be done with all resulting work, how conclusions are going to affect or modify existing policies, and how participants are able to continue supporting or participating in DRR*

*More time to come up with policy recommendations would have been appreciated.*

*The workshop was very good. In my view, the only aspect to be corrected is the primary focus on earthquakes.*

*Needs more time to have a deeper discussion of the priority - actions between experts and participants. To share experience...*

*Each participant should be able to integrate the discussion group of his choice, according to his knowledge and professional background, or the need for feedback.*

*Minor improvements to presentation facilities would be helpful.*

#### **General Comments:**

I enjoyed the conference very much. Next time, possibly we need a few more representatives from the ministry of science and technology and academy of sciences from the economies.

It will be very interesting if the final document with the workshop conclusions is shared with local authorities to move the regional and economy-wide recommendations into a more local level.

Congratulations!!! for the workshop organization. All was great!!

I thank the APEC and especially CONICYT for the great effort in putting all together. The reception was great and y'all provided all the necessary help to make us feel comfortable. The workshop provided a space for networking with representatives from other economies.

Great workshop, great experience.

Eager to continue helping. Thanks!

The workshop was an outstanding opportunity to improve my knowledge about DRR, to try to apply the relevant concepts to real problems, and to make new connections. It was a valuable experience, for sure, thanks to the CONICYT team.

The workshop was excellent and very instructive. In order for next activities to be improved, they might consider having the presence of non experts. An important aspect of natural disaster resilience is the experience and knowledge of people in the ground: farmers, citizens, workers, etc. Their experiences should have a role in events like this.

The workshop was very well organized.

#### **GENERAL COMMENTS RECEIVED BY E-MAIL WITHOUT FORM FILLING**

Muchas gracias por la invitación y por la posibilidad de aportar en este grupo. *(thank you very much for the invitation and possibility to contribute to the this group)*<sup>1</sup>.

So good to meet you last week, and thanks for all your kindness!

Agradezco la invitación al Workshop realizado y la gran organización. *(thank you for the invitation to the workshop and for the great organization)*<sup>2</sup>.

Muchas gracias por el recibimiento y la atención que nos brindaron en el Taller. Fue muy bueno intercambiar las experiencias con los demás participantes de las diferentes economías. *(thank you for hosting and attention that was paid in the workshop. It was very good to exchange experiences with other participants from different economies)*<sup>3</sup>.

Fue una gran experiencia. *(it was great experience)*.<sup>4</sup>

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<sup>1</sup> Translated by CONICYT

<sup>2</sup> idem

<sup>3</sup> idem

<sup>4</sup> idem

I enjoyed the conference very much, and thank you once again for inviting me.

Muchas gracias por el correo y el taller; estuvo muy bueno e interesante. *(thank you very much for the e-mail and the workshop, it was very good and interesting)*<sup>5</sup>

Thank you for the opportunity. I really enjoyed it very much.

Muchas gracias por toda la información y por haberme hecho participe del workshop. Fue muy interesante. *(thank you very much for all information and to make me participate in the workshop. It was very interesting).*<sup>6</sup>

Thank you for organizing the excellent workshop.

I would like to thank you for the opportunity of attending the APEC workshop on natural disaster resilience. It was a great opportunity to engage in high-level discussions, learn more about the subject and make interesting connections.

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<sup>5</sup> idem

<sup>6</sup> Translated by CONICYT