



**Asia-Pacific
Economic Cooperation**

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Reducing Risks and Coping with Climate Change Along Coastal Areas: Workshop on Adaptation Strategies to Climate Change and the Role of Public-Private Collaboration

Viña del Mar City, Chile | November 2019

APEC Emergency Preparedness Working Group

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APEC Project: EPWG 01 2019A

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1. Executive Summary

The event was held under APEC Project EPWG 01 2019A: Reducing Risks and Coping with Climate Change along Coastal Areas: Workshop on Adaptation Strategies to Climate Change and The Role of Public-Private Collaboration, and funded by APEC Support Fund (ASF) – General Fund.

It was developed at the Marina del Rey Hotel, Viña del Mar city, Chile, between November 04-06, 2019, was organized by General Directorate of Maritime Territory and Merchant Marine and your Project Overseer was Mr. Enrique VARGAS, Head of Marine Environment Preservation, Marine Pollution and Climate Change Department

The Project EPWG 01 2019A, financed the participation of six speakers and nine attendants to the Workshop, all belonging to the APEC members economies.

The General Directorate of Maritime Territory and Merchant Marine, self-financed the participation of six speakers and nineteen attendants.

The Workshop was a three day's event led by Project Overseer (PO) and your organizing staff, a total of forty participants from the public, private and academic sectors attended, who can discuss about reducing risks and coping with climate change along coastal areas.

The Workshop included several sessions with varying dynamics such as expert presentations, case studies discussion and instances for questions and answers. Workshop participants had the opportunity to share experiences on adaptation measures that have been implemented in the APEC region.

At the end of the second day of the Workshop, four working groups were formed, where participants had the opportunity to make their contributions and deliver their conclusions and recommendations, emphasizing the importance of improving communication between the Economies in order to be better prepared for face the impacts of climate change in the coastal zone.

The third day of the Workshop included a field trip to the Chilean Hydrographic and Oceanographic Service facilities and the scientific research vessel AGS-61 "Cabo de Hornos".

Finally, it's important to note that, very good comments were received regarding the organization of the event, logistics arrangements, quality of the invited expert speakers and the topics addressed during the development of the Workshop.

2. Purpose of the Workshop

The purpose of the Workshop was to address the impacts produced in the coastal zone as a consequence of extreme weather events associated with climate change, such as storm surge and phenomena such as El Niño Southern Oscillation (ENSO) and to generate a venue for sharing climate change hard and soft adaptation measures and Disaster Risk Reduction (DRR) approaches in the APEC region. The Project will allow the exchange of best practices and strategies among between public, private and academic sector representatives, as well as to visualize the socio-economic impacts produced in the activities that take place in coastal areas, such as fishing, aquaculture and port infrastructure.

3. Workshop Organization and Development

On 28 August 2019, the PO directly contacted the speakers (APEC funding and self-funding), who fulfilled the profile required for the objectives of the Workshop. For this, a formal invitation letter was sent via email, receiving a positive response in most cases.

The Economies represented through the APEC funding speakers were:

- Indonesia
- Australia
- Mexico
- Japan
- Peru
- Chile

A list of the speakers participating in the Workshop is attached in Annex I.

On 9 September 2019, the PO through the Program Director, Mr. Febby ANDRYANANTO, sent the e-mail with the invitation to the Emergency Preparedness Working Group (EPWG) members, to participate in the APEC Project EPWG 01 2019A.

The General Information Circular (GIC) and the Nomination Form are attached to the invitation.

The GIC was previously sent for approval to Ms. Kallie TEO, Program Executive - APEC Secretariat, dated 5 September 2019, this document included general guidelines on Workshop planning (Event Dates, Venue, Draft Agenda, Regarding the funding entitlements and logistic aspect).

Before the Workshop, seven Nomination Form were received, completing a total of thirteen participants belonging to the following Economies:

- China
- Malaysia
- Mexico

- Papua New Guinea
- Peru
- Viet Nam
- Chile

However, the delegates of China and Mexico Economies were unable to obtain their travel permits in time, which prevented their attendance at the Workshop.

Finally, the Workshop was attended by 28 participants, of which nine was APEC funding and nineteen self-funding. A list of personnel who actively participated in the Workshop is attached in Annex II.

It was developed at the Marina del Rey Hotel, Viña del Mar city, Chile, between 4-6 November 2019, was organized by General Directorate of Maritime Territory and Merchant Marine (DIRECTEMAR) and your Project Overseer was Mr. Enrique VARGAS, Head of Marine Environment Preservation, Marine Pollution and Climate Change Department.



Figure 1: Official photo of APEC Workshop developed in Viña del Mar – Chile.

The Workshop was conducted in English, but also had simultaneous translation into Spanish, the official language of the host Economy to ensure the participation and discussion of local participants.

During the first two days, specific presentations were made by the invited expert speakers, which were divided into the following sections:

- 4 November:
 - o Session 1: Climate change in the ocean and coastal zone

- Session 2: Impacts of climate change and adaptation on port infrastructure
 - Session 3: Impacts of climate change and adaptation on coasts
- 5 November:
- Session 1: Change in the distribution and abundance of fisheries as a result of Climate Change
 - Session 2: Chile's Framework Law on Climate Change and sectoral adaptation plans on fisheries, aquaculture and coastal cities
 - Session 3: Cases Study

The subjects included in each of the sections of the Workshop were considered to comply with the outcomes proposed in the Project and in the Cases Study preliminary results of projects that are currently being implemented in matters of climate change were announced, which were:

- Determination of the risk of the impacts of Climate Change on the coasts of Chile (Project of Environmental Ministry)
- Information system that systematizes and integrates data on fisheries, aquaculture and Climate Change (Project of Global Environmental Facility (GEF)).
- Impacts of climate change and options for Disaster Risk Reduction in Pacific Islands (Project of Pacific Region Infrastructure Facility (PRIF))
- Key elements and structure of a new Integrated Chilean Ocean Observation System (SIOOC) (Project of Scientific Committee for COP-25).



Figure 2: Australian Speaker, PhD. Ron Cox, making his presentation. At the end of the second day, four work tables were formed, where each participant was encouraged to share their views and advice on the Workshop's impact and efficiency as well as possible suggestions and policy implications for future APEC related cooperation programs and activities. These opinions and/or recommendations are given in point 4 of this report.



Figure 3: Speakers and workshop attendees interacting at work tables.

On the third day of the Workshop, was made a field trip to the scientific research vessel AGS-61 “Cabo de Hornos” and then to the Chilean Hydrographic and Oceanographic Service (SHOA) facilities, where the participants had the opportunity to know the technical capabilities Chile’s Economy in these matters.



Figure 4: Field trip to the scientific research vessel AGS-61 “Cabo de Hornos”.

In the SHOA, a last presentation entitled “Key elements and structure of a new Integrated Chilean Ocean Observation System (SIOOC)” by PhD. Silvio Pantoja was made, subsequently visited the Operations Room of the National Tsunami Warning System (SNAM) and the Monitoring Room for the Sea Surface Temperature (SST) along the Chilean coast.

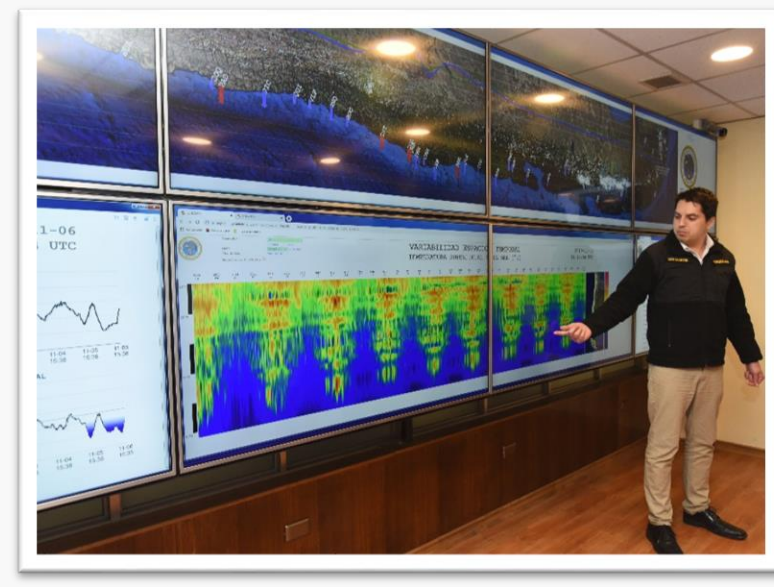


Figure 5: Visit to Chilean Hydrographic and Oceanographic Service (SHOA) facilities.

The Workshop included the execution of three surveys, two of them to measure the knowledge reached during the Workshop and thus comply with Outcome # 1. The

first survey was conducted to the participants by email before starting the Workshop, while the second survey was conducted at the end of field trip. After the Workshop, a last survey regarding the usefulness of information, replicability of the initiative, visualization of problems (economic, social, environmental), and possible limitations and evaluation of the Workshop was conducted. The results of these surveys are included in Annex III.

In general, the Workshop was a great sharing experience and learning opportunity to all participants so it is expected that they can take the tools delivered during the Workshop and implement them in their Economies and workplace.

It is important to note that, very good comments were received regarding the organization of the event, logistics arrangements, quality of the invited expert speakers and the topics addressed during the development of the Workshop.

Finally, dated 15 November 2019, an e-link was sent to both speakers and participants, where the following Workshop information was included:

- Final Agenda
- Contact List
- Official Photo
- Presentations
- General Photos
- Short Bio into of Speakers
- APEC Survey (Evaluation Form)

https://drive.google.com/open?id=152ikA4uo_owp1d3Fq5IDLHyeQXv7M_eM

4. Opinions and Recommendations

- Work Table N°1: Presentations made during the Workshop indicate that Climate Change is evident and concrete actions need to be taken in the shortest possible time, mainly APEC members economies that have adjacent coastal areas. In addition, not only adaptation, but also mitigation, should be considered as a priority. It is recommended to take as an example some of the cases presented in the Workshop on best practices in adaptation to Climate Change and use what has been learned about “Disaster Risk Reduction (DDR)” to replicate it or adapt it to each Economy. The participants of this Work Table also think that not only physical data is important, it should also have data in economic and social aspects. There should be greater awareness about the effects of climate change to maintain ecosystems, sustainability in fisheries, aquaculture, tourism, among others.
- Work Table N°2: To face climate change and contribute so that the public policies of APEC Economies generate positives synergies: Reorientation of public policies to enhance technological development that integrates the capacities of the region. Adaptation of economic activities that demand less use of energy and water in the APEC region. Reduce environmental costs for the promotion of new economic activities that help risk mitigation. Improve communication mechanisms to generate adequate participation of economic, social and political actors. Monitoring (social, environmental, economic and political) is a very effective mechanism to reduce costs and uncertainties for the short and long term reaction. Continue promoting technological development for the generation and use of clean marine energy. Capacity building and technological transfer always is necessary and welcome.
- Work Table N°3: The participants of Working Table N°3 recommend a Cooperation Agreement between the academy sector (technicians and / or researchers) and the government sector (policy makers). This Agreement would serve to improve communication between both sectors and work together on climate change issues and the preparation of policies for DDR. It's know that each APEC member economy has its own reality, therefore, in some cases, short, medium or long-term measures may be taken. In others, public-private or interdisciplinary projects may be established. It's appreciated to have activities such as this Workshop, since it allows to obtain knowledge, experience and maintain communication between the economies.
- Work Table N°4: The participants of Working Table N°4 recommend respecting the regulations and the technical environmental suggestions that are established for each of the APEC members economies. It is also recommended to have a zonal management, especially when there are differences in the shape of the coastline (case Chile's Economy). They also recommend having an interdisciplinary vision to deal with the effects of climate change, not only from a scientific point of view, but also incorporating economic and social aspects.

5. Final Conclusions

The APEC Project “Reducing Risks and Coping with Climate Change along Coastal Areas: Workshop on Adaptation Strategies to Climate Change and The Role of Public-Private Collaboration” had the participation of six expert speakers funded by APEC and six expert speakers self-funded by DIRECTEMAR, who with their experience made a valuable contribution in the topics discussed during the Workshop.

Workshop attendees (09 financed by APEC and 19 self-funded by DIRECTEMAR), had the opportunity to learn interesting topics among which they highlighted: Climate change and variability in APEC region; scientific aspects related to understanding of the ENSO phenomenon; storm surge, wave disasters and climate change adaptation in coasts and ports; effects of climate change on port infrastructure and adaptation strategies and climate change impacts and adaptations in the Northern Humboldt Current Ecosystem with a focus on the fishery.

The field trip provided information to the participants related to the monitoring and data collection system for scientific research on climate change used by the Chile’s Economy. On board the vessel AGS-61 “Cabo de Hornos” the participants were able to recognize and understand main tasks carried out by the scientific research vessel and find out the equipment used in oceanographic cruises. During the visit to the SHOA facilities, the participants were able to recognize the instruments and technology used for tsunami monitoring and visualizer the data collection system of sea surface temperature and other environmental variables, in addition to its spatial distribution along the coast of Chile.

It is recommended to integrate data to improve communication between APEC members economies. The data could be part of a database streamed line, to help policy makers. A good example of this type of database is that of the Pacific Tsunami Warning Centre (PTWC), sponsored by NOAA, UNESCO. This system works through a web page, where the economies that make up the Pacific basin deposit the information of variables that they provide in case of any tsunami warning or alarm. The above constitutes a good model or example to be replicated for climate change in the ocean sponsored by APEC.

Ongoing scientific and social research on climate change and related its impacts on coastline, ports infrastructure and marine eco-system are critical and must be supported. It is very important to use of updated, empirical research information to inform and support mitigation and adaption initiatives for inevitable climate change related event. Therefore, collaboration among research institutes among APEC economies is a way forward.

Annexes

Annex I: List of the Speakers Participating

APEC-funded experts

Name	Economy
Nelly Riama	Indonesia
Hiroyasu Kawai	Japan
Rodolfo Silva	Mexico
Jorge Tam	Peru
Ron Cox	Australia
Silvio Pantoja	Chile

Self -funded experts

Name	Economy
René Garreaud	Chile
Patricio Winckler	Chile
Alicia Gallardo	Chile
Priscilla Ulloa	Chile
Nico Kohlhas	Chile
Jaime Letelier	Chile

Annex II: List of Active Participants

APEC-funded participants

Name	Economy
Claudia Galli	Chile
Vanessa Beiza	Chile
Fakhrul Razi	Malaysia
Nurul Huda	Malaysia
Ronald Sofe	Papua New Guinea
Erik Cortijo	Peru
Ana Alegre	Peru
Lu Ngoc Lam	Viet Nam
Dinh Pham Hien	Viet Nam

Self -funded participants

Name	Economy
Enrique Vargas	Chile Project Overseer
Julio Castro	Chile
Pablo Córdova	Chile
Betsabé Hurtado	Chile
María Olga Paredes	Chile
Pedro Roca	Chile
Alejandro de la Maza	Chile
Esteban Ávila	Chile
Ignacio Martínez	Chile
Eugenia Valdebenito	Chile
Ana Carriel	Chile
Macarena Maldifassi	Chile
Victor Agurto	Chile
Francisco Fernández	Chile
Francisco Molteni	Chile
Diego Moreno	Chile
Leyla Miranda	Chile
Jenny Maturana	Chile
Claudia González	Chile

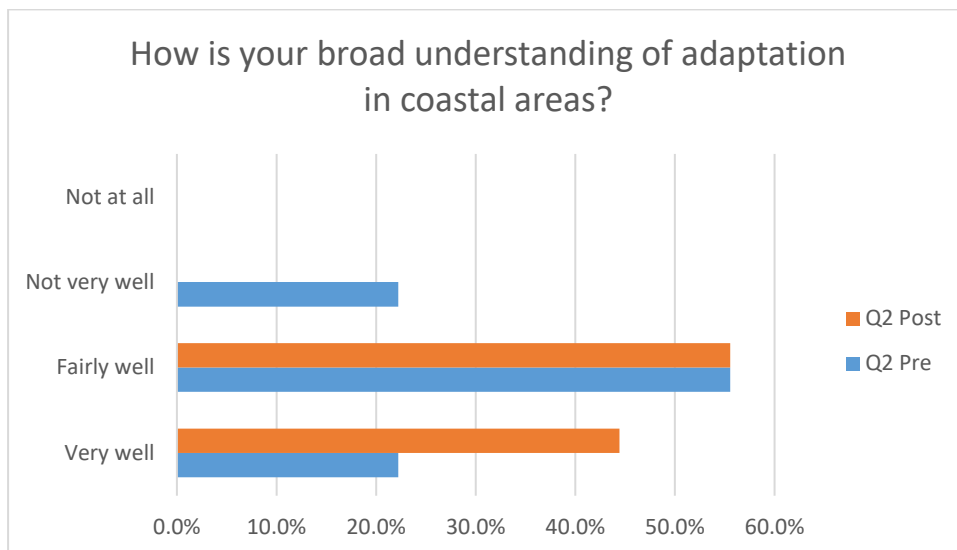
Annex III: Ex-Ante and Ex-Post Evaluation

Aim: The present analysis will serve an evaluation to measure the project outcomes, such as quantitative measures of impact, evidence of change, in order to provide information regarding the scale of impact of the workshop.

Instructions: The following questionnaire is formulated in four types of questions: Multiple choice, YES/NO, ranking and open questions. Please mark or fill as requested.

1) How well do you feel that you understand global environmental issues?

The graphic shows an increase in the overall knowledge of global environmental issues of the workshop attendants, after the event.

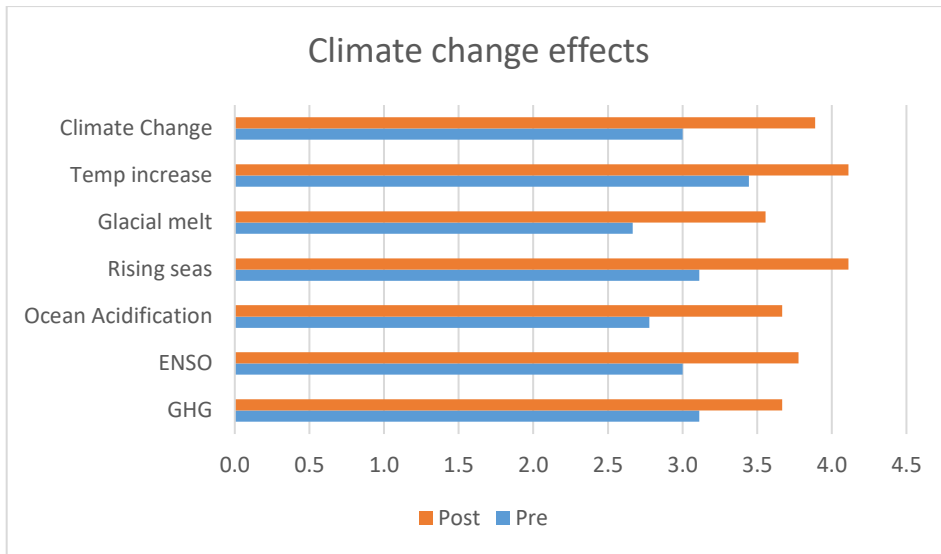


The analysis shows an overall increase in the amount of broad understanding of adaptation in coastal areas, after the workshop.

2) How would you describe your knowledge about the following and its effects? (5 is highest knowledge, 1 is lowest knowledge).

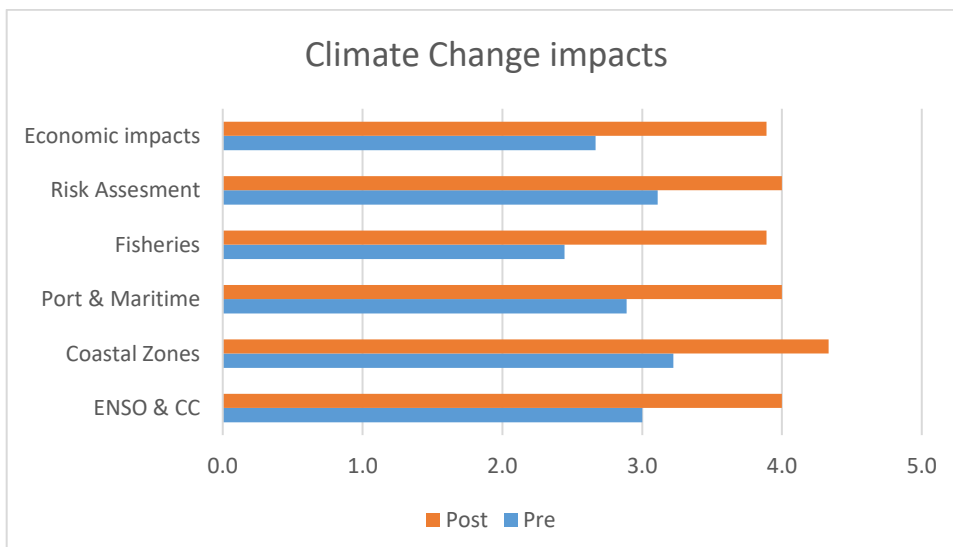
- Greenhouse Gases (GHG)
- El Niño Southern Oscillation (ENSO)
- Ocean acidification
- Rising Sea Levels
- Decreased Polar Ice Cover – Glacial Melt
- Temperature increases
- Overall Climate Change

The graphic shows an overall increase between the ex-ante and the ex-post surveys, considering the mean value of evaluation of the attendants, relative to the knowledge of the effects of climate change.



3) How would you describe your knowledge about the following impacts of climate change? (5 is highest knowledge, 1 is lowest knowledge).

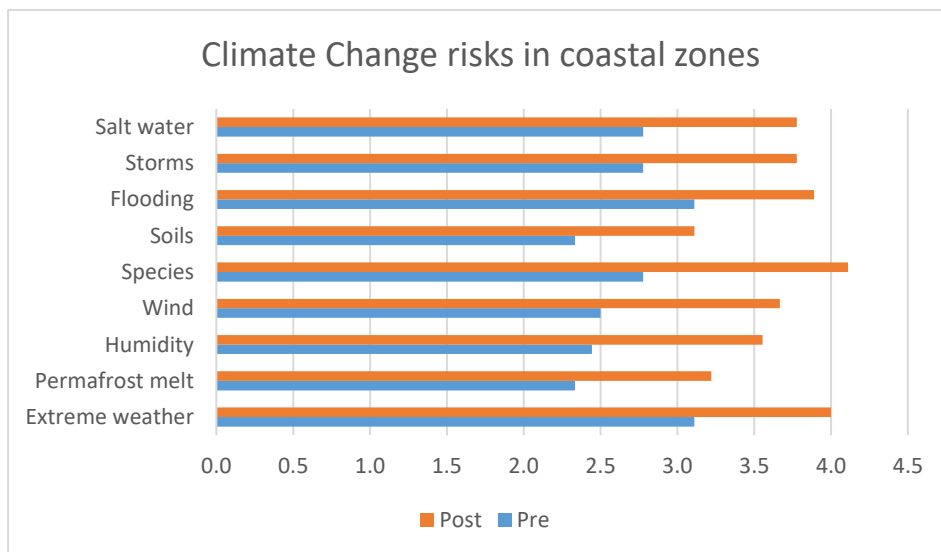
- ENSO and its linkage with climate change in the APEC region
- Impacts in coastal zones as a result of extreme weather events
- Impacts on port and maritime infrastructure
- Change of distribution and abundance of fisheries as result of climate change
- Risk assessment of the impacts of climate change on the coasts in the APEC region
- Impacts on the economy and trade



Regarding climate change impacts, the survey analysis shows an increase in the mean value of knowledge, comparing answers from before and after the workshop.

4) How would you describe your knowledge about the associated climate change risks on in coastal zones? (5 is highest knowledge, 1 is lowest knowledge).

- Extreme weather events
- Permafrost melt
- Higher relative humidity
- Stronger wind patterns
- Maritime species shift
- Saturated soils
- Flooding and inundation
- Increased storm surge height
- Salt water intrusion

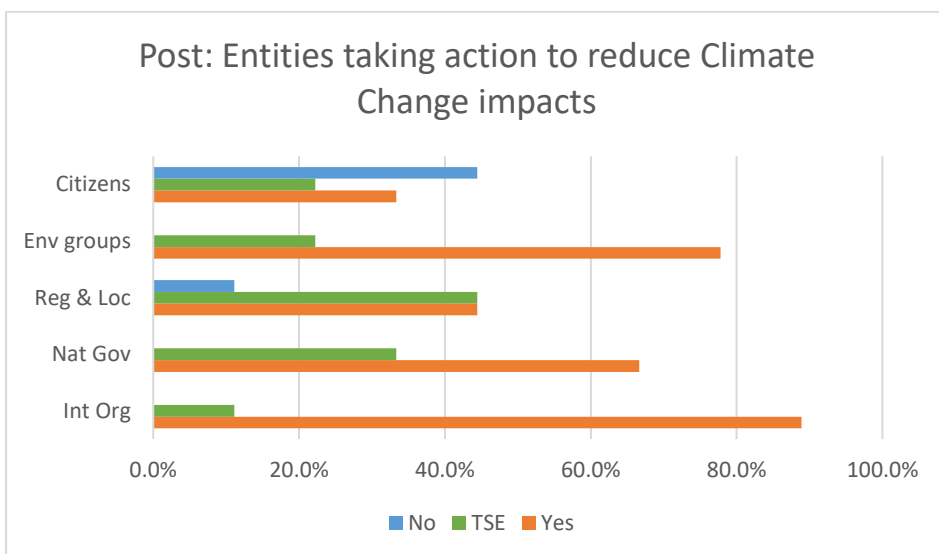
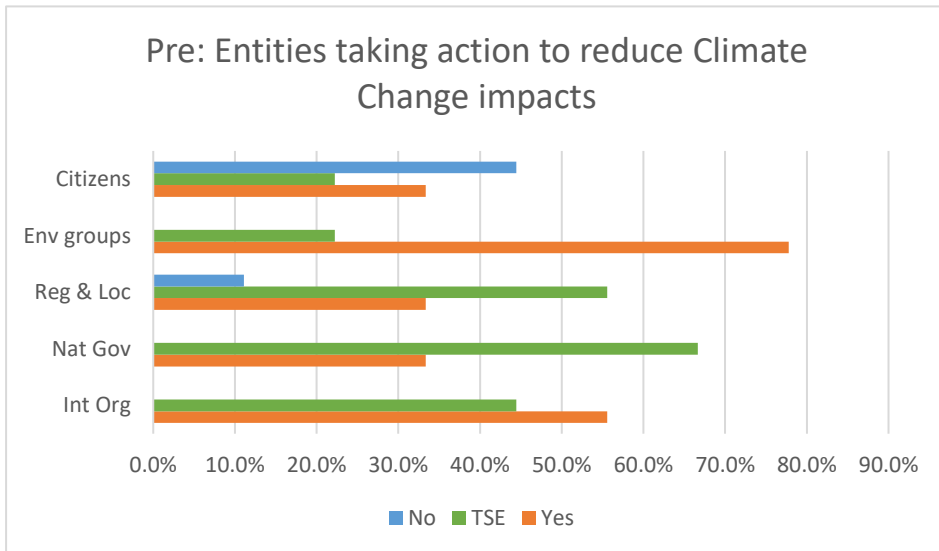


The graphic shows an overall increase in the mean value of the replies regarding the knowledge of climate change risks in coastal zones, when comparing previous and post awareness of this topic.

5) Do you think the following entities are taking initiatives to reduce climate change?

	Yes	No	To some extent
International Organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
National Government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Regional and local government
- Environmental groups
- Citizens

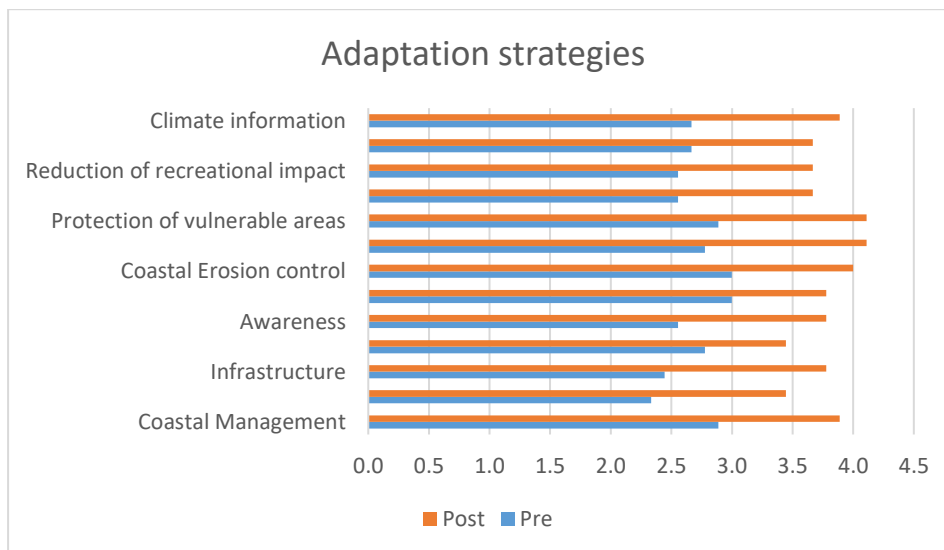


It is possible to notice an increase in the amount of the percentage of the “Yes” category, in almost every group, which shows the increase of the knowledge of the type of work undertaken by these groups provided by the workshop.

6) How would you describe your knowledge about the following adaptation strategies to cope with climate change impacts in coastal zones? (5 is highest knowledge, 1 is lowest knowledge).

- Integrated Coastal Zone Management process
- Generation and enforcement of zoning schemes
- Spatial planning to protect, accommodate and retreat coastal infrastructure

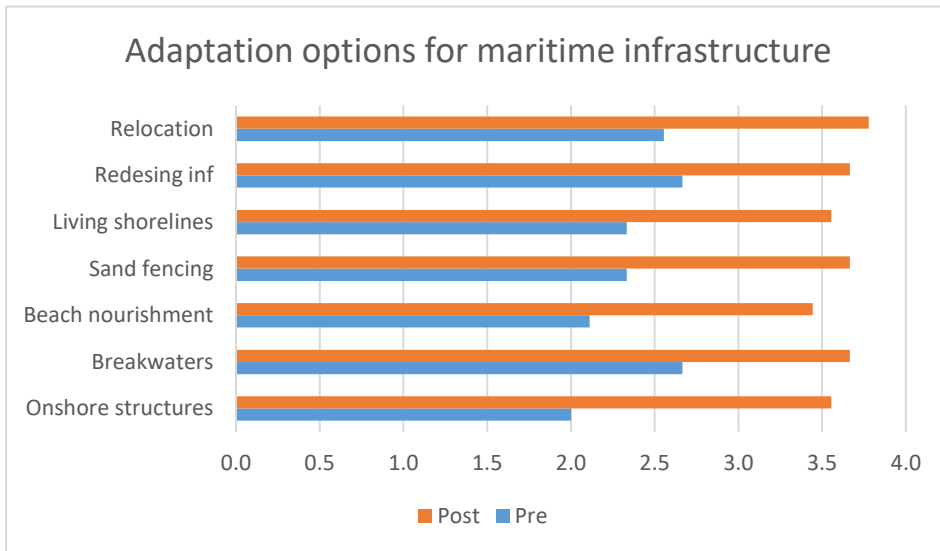
- Long-term planning adaptation strategies
- Strengthening of promotion of awareness to climate change
- Flood control measures
- Interventions to control coastal erosion
- Improvement in vulnerability assessment capabilities
- Protection of vulnerable areas from seal level rise, storm surge, higher wave action, erosion and other climate impacts
- Sea level rise projections and coastal topographic features to provide information on flooding areas
- Reduction of recreational impacts on coastal areas
- Enhance resilience, incorporating changing climate conditions into policy, planning, regulatory, and financial mechanisms
- Practice of climate-informed research



7) How would you describe your knowledge regarding the following adaptation options, including costs and benefits of port and maritime infrastructure? (5 is highest knowledge, 1 is lowest knowledge).

- Onshore, Shore-Parallel and Shore-Perpendicular structures
- Breakwaters
- Beach nourishment
- Sand fencing

- Living shorelines
- Redesign infrastructure
- Relocation of infrastructure



Finally, it is possible to observe an overall increase in the answers regarding knowledge of the different adaptation options for maritime and port infrastructure.

Annex IV: Final Agenda

November 04, 2019	
Time	Arrangements
08:30-09:00	Arrival of the attendees
09:00-09:30	Welcome and Opening Words
09:30-09:45	Photo Session
09:45-10:15	Coffee Break
10:15-10:30	<p>Project Overseas Overview</p> <p>Enrique Vargas (15 minutes) <i>General arrangements and housekeeping</i></p>
10:30-12:30	<p>Session 1: Climate change in the ocean and coastal zone</p> <p>Rene Garreaud (30 minutes) <i>Climate change and variability in APEC region, with emphasis in South America</i></p> <p>Nelly Florida (30 minutes) <i>The Role of Indonesian Through Flow in understanding the ENSO Phenomenon.</i></p> <p>Patricio Winckler (35 minutes) <i>Impacts of coastal storms in Chile. Past, future and adaptation schemes</i></p> <p>Open discussion (20 minutes)</p>
12:30-14:00	Lunch Break
14:00-15:30	<p>Session 2: Impacts of climate change and adaptation on port infrastructure</p> <p>Ron Cox (35 minutes) <i>Effects of climate change on port infrastructure and adaptation strategies.</i></p> <p>Hiroyasu Kawai (35 minutes) <i>Storm surge, wave disasters and climate change adaptation in Japanese coasts and ports</i></p> <p>Open discussion (20 minutes)</p>
15:30-16:00	Coffee Break
16:00-16:45	<p>Session 3: Impacts of climate change and adaptation on coasts</p> <p>Rodolfo Silva (35 minutes) <i>Retos y oportunidades en la implementación de infraestructura verde ante un clima cambiante</i></p> <p>Open discussion (10 minutes)</p>
16:45-17:15	Open discussion with all the speakers on stage (30 minutes)
November 05, 2019	
Time	Arrangements
08:30-09:00	Arrival of the attendees

09:00-10:30	<p>Session 4: Change in the distribution and abundance of fisheries as a result of Climate Change</p> <p>Jorge Tam (35 minutes) <i>Climate change impacts and adaptations in the Northern Humboldt Current Ecosystem</i></p> <p>Alicia Gallardo (35 minutes) <i>Experiences and lessons learned about harmful algal bloom (HAB) affecting aquaculture in southern Chile in 2016</i></p> <p>Open discussion (20 minutes)</p>
10:30-11:00	Coffee Break
11:00-12:30	<p>Session 5: Chile's Framework Law on Climate Change and sectoral adaptation plans on fisheries, aquaculture and coastal cities.</p> <p>Priscilla Ulloa (35 minutes) <i>Framework Law on Climate Change, Draft Nationally Determined Contribution (NDC) and general information on COP 25</i></p> <p>Nico Kohlhas (35 minutes) <i>National Action Plan on Climate Change and key elements taken of sectoral adaptation plans.</i></p> <p>Open discussion (20 minutes)</p>
12:30-14:00	Lunch Break
14:00-15:30	<p>Session 6: Cases Study</p> <p>Case study 1: Determination of the risk of the impacts of Climate Change on the coasts of Chile. Patricio Winckler (35 minutes)</p> <p>Case study 2: Information system that systematizes and integrates data on fisheries, aquaculture and Climate Change. Jaime Letelier (35 minutes)</p> <p>Open discussion (20 minutes)</p>
15:30-16:00	Coffee Break
16:00-16:45	<p>Session 7: Cases Study</p> <p>Case study 3: Impacts of climate change and options for Disaster Risk Reduction in Pacific Islands. Ron Cox (35 minutes)</p>

	Open discussion (10 minutes)
16:45-17:15	Open discussion with all the speakers on stage (30 minutes)

November 06, 2019	
Time	Arrangements
08:30-09:00	Arrival of the attendees
09:00-10:30	Visit to research vessel “Cabo de Hornos”.
10:30-11:00	Displacement to SHOA
11:00-13:00	<p>Session 8: Cases Study</p> <p>Case study 4: Key elements and structure of a new Integrated Chilean Ocean Observation System (SIOOC).</p> <p>Silvio Pantoja (35 minutes)</p> <p>Open discussion (20 minutes)</p> <p>Visit to Chilean Hydrographic and Oceanographic Service facilities</p>