

Pathways to Sustainable Growth under a Changing Climate

Enhancing Interaction between Climate Science and Society

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Asia–Pacific Economic Cooperation (APEC) Climate Symposium 2019

What: More than 130 participants from national hydrological and meteorological services, government officials, private sectors, nongovernmental organizations, and academia from 17 countries gathered to discuss how to better connect provider and user groups of climate information and enhance the usability and applicability of climate information and services.

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Where: Punta Arenas, Chile

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Extrême weather and climate events often lead to catastrophic socioeconomic consequences, destroying regional economies and even threatening human lives. Moreover, it is widely known that there is high possibility of an increase in the occurrence and intensity of extreme events in a changing climate, as many researchers have pointed out. Therefore, well-preparedness for climatic extreme events and appropriate management mitigating their socioeconomic impacts are critical to enhance the adaptive capacity to climate change and to achieve sustainable growth. This can be accomplished through developing and utilizing a system to warn of climate-related hazards in advance using reliable climate information based on the most accurate scientific knowledge.

When applying the climate information for early warning and risk management, understanding different values and needs among related sectors and stakeholders is essential not only to improve the climate information-based early warning systems, but also to enhance the usability and applicability of the system.

The Asia–Pacific Economic Cooperation (APEC) Climate Symposium 2019, entitled “Pathway to Sustainable Growth under a Changing Climate: Enhancing Interaction between Climate Science and Society,” aimed to share the knowledge and experience of utilizing climate information to be serviced for early warning systems and climate-related risk management with experts from various sectors including climate science, its application, risk management, and policy-making. The symposium was conducted for two and a half days, encompassing keynote speeches and three plenary sessions.

Climate services for sustainable development under a rapidly changing climate

In the opening and keynote speeches, speakers threw light on the importance of sustainable growth in the face of climate change and of bridging the gap between climate and application sectors and between scientists and policy-makers in mitigating the negative impacts of climate change. The keynote session focused on the increasing trend of climate extremes under global warming in Chile, a general overview of and the key components of climate risk management, and climate services in the health sector. The main theme of the session was about how climate services could contribute to achieving sustainable development and how scientific knowledge could be translated into decision-making to enhance climate risk management.

Dr. Marcelo Leppe, Director of Chilean Antarctic Institute, gave an overview of changing climate and abnormal and extreme climate events observed in Chile and Antarctica over the last decade, which include heatwaves and droughts, ecosystem and biodiversity, and glaciers and sea ice changes. Pointing out that Antarctic Peninsula near Chile is a “climate thermometer” and Chile is placed in a position of inescapable vulnerability, he emphasized that the vulnerability can only be overcome with cooperative work between climate scientists and policy makers.

Dr. Glenn McGregor, Professor of Climatology at Durham University in the United Kingdom, mentioned that under a rapidly changing climate, the ultimate goal of climate services is to produce “actionable” and/or “usable” information related to climate risks. According to him, this goal could be most effectively achieved when climate information services are integrated into policy decision-making frameworks, especially for the development of effective early warning system (EWS). He also suggested a coproduction approach based on end-users’ needs, putting emphasis on the importance of collaborative and flexible approaches between providers and end-users. He gave an example that the meaningful relation between El Niño–Southern Oscillation (ENSO) and the rates of diarrhea outbreak in the Southwest Pacific makes ENSO prediction useful for health risk management. Finally, he pointed out the imperative of close communications and interdisciplinary work among stakeholders in the related sectors to establish best practices of health risk management using ENSO forecasts.

Dr. Joy Shumake-Guillemot, Officer in Charge of the World Meteorological Organization (WMO)–World Health Organization (WHO) Joint Office, introduced large-scale global movements in the health community in realizing potentials of climate information for improving health-risk-related decision-making. She also emphasized codesign services between climate scientists and health practitioners to meet the needs of health communities, as Dr. Glenn McGregor pointed out, which ultimately makes the climate information useful and actionable in managing health risk. She also argued that new frontiers of climate services are integrating risks across time scales and continual evaluation from science to service process with iterative feedbacks.

Understanding and predicting extreme climate events

In the perspective of climate sciences, the first session addressed the trends and impacts of extreme weather and climate events in the Asia–Pacific region and how to minimize their negative impacts on society. First, Dr. Arun Kumar, Principal Scientist at the NOAA/NWS/NCEP/Climate Prediction Center in the United States, spoke briefly of the connections of climate variability to extreme events that can be used for the analysis and prediction of extreme climate events and introduced use of WMO operational infrastructure for the extreme event prediction. Second, Dr. Jin-Yi Yu, a professor at the University of California, Irvine, described the different characteristics of El Niño between the twentieth and twenty-first century. According to him, while ENSO is one of the most important and well-understood climate drivers, the twenty-first-century El Niño, the so-called central Pacific El Niño, produces different climate impacts in the Asia–Pacific region compared to the impacts of the twentieth-century El Niño. He underlined that this kind of scientific knowledge should be seriously considered in directing the ENSO-related risk management. Third, Dr. Paul Gregory, Senior Prediction Scientist at the Bureau of Meteorology (BOM) in Australia, talked about current climate trends and emerging climate impacts in Australia, BOM’s existing publicly available climate products and services, and BOM’s new subseasonal products that provide earlier warnings of climate extremes to help make operational decision-making at multiweek time scales. Fourth, Mr. Jose Vicencio, a meteorologist at the National Weather Service of Chile (DMC), provided a review of main extreme weather events in Chile in the last five years and emphasized the role of the DMC in communicating to general public via media regarding extreme weather information. Last, Dr. Jorge Carrasco, Research Associate of the Antarctic Gaia Research Center, also provided a review of global change in the southern austral region of Chile and future impacts of the major climate drivers on extreme rainfall events. All the presentations in this session emphasized observed changes in climate risks in recent periods in the Asia–Pacific region and the requirement of immediate response to the changes to reduce climatic risks.

Innovating early warning system to manage impacts of climate extremes

The second session discussed the key elements in the development of EWS and disaster risk management (DRM) to reduce the negative impact of extreme climate events. First, Dr. Timothy Manning, Senior Advisor of the Pacific Disaster Center, stated that disaster management has been based on an understanding of what happened in the past, but traditional risk model approaches might fail since disaster characteristics are changing so rapidly with shifting climate. He also mentioned that successful DRM through early warning basically relies on dealing with risks in communication to obtain appropriate actions of recipients. In this regard, he reached a conclusion that the scientific community needs to provide updated risk information and to change communication strategies as well. Second, Dr. Daeha Kim from the APEC Climate Center asserted that one of the strategies for better DRM is monitoring disasters early by using appropriate indices. Regarding droughts, he claimed that evapotranspiration (ET)-based drought indices are more effective for early detection of droughts

than precipitation-based indices and argued that ET-based drought indices could usefully be incorporated into operational models as it could help deliver a monitoring system that was less uncertain and more predictable.

Third, an integrated decision support system for early warning and decision-making in Taipei, Chinese Taipei (Taiwan), was introduced by Dr. Tzu-Yin Chang from the APEC Research Center for Typhoon and Society. According to her, the integrated decision support system uses many different data sources of disaster management, including social media and model-simulated risk, and boils down to one stop alert platform integrating six different alerts from 14 agencies and 13 layers. This platform provides not only risk information but also recommendations to reduce the risk. Fourth, Ms. Paola Uribe from DMC showed the development and practices of EWS in Chile. She emphasized that 1) EWS needs to be dynamic in consideration of a rapidly changing climate, and 2) thresholds for early warning should be changed in accordance with updated extreme events under a rapidly changing climate. She also asserted that officers in meteorological services have to understand what people need from the meteorological services in order to enhance usability of climate information the meteorological services provide.

Fifth, Dr. Ashbindu Singh, President of Environmental Pulse Institute, emphasized that timely alerts and actions can minimize climate risks substantially. He stressed that appropriate time lags for early warning are different by disaster types, environment, social conditions, etc. For example, for the case of Hurricane Katrina, a 12-h early warning was not sufficient for evacuation since people appeared to need 36 or more hours before making decisions concerning evacuation.

Throughout the session, it has been proven that successful EWS with adequate use of climate information can save people's lives and protect society from unexpected climate events, but there are certain gaps, especially between early warning and actions in response to the early warning, that are not appropriately understood. Social science research will be of importance at this point. Most speakers agreed on existence of differences in culture, ethnicity, and/or religion in responding to early warning, which needs to be considered in delivering messages effectively. Currently, social science research does not integrate well with physical science and disaster preparedness and management. In addition, although current warning systems are typically developed in a top-down manner, the warning systems in the future might be organized by local communities in a bottom-up manner. In particular, the bottom-up approach can enhance EWS to work as intended by incorporating traditional knowledge and practices in risk management. These gaps are not easy to be removed in a simple manner, but it is obvious that overcoming of the gaps and then success of EWS would ultimately increase the values of climate information as a socioeconomic asset.

Connecting climate information to socioeconomic values

The last session discussed various climate services provided by regional and global agencies from different perspectives and how to promote the socioeconomic values of climate information. First, Dr. Jinho Yoo, Director of the Climate Services and Research Division of the APEC Climate Center, addressed efforts of the APEC Climate Center to improve skills of seasonal forecasts and to tailor them to be used in application sectors. He noted that although climate prediction has become a key climate information source with some useful skills, the uptake of the climate information in decision-making process is still a challenge and that the scales and forms of information are the matter of issue. Moreover, in addition to the information's contents, its credibility and valuation are also critically important. Second, Dr. Sally Edwards, a regional advisor of Pan American Health Organization, noted that in developing EWS, we need to understand disease risk better, including social components, and we must strengthen governance and connection across relevant institutions and sectors. As an effort

to solve these issues, she introduced a cooperation of WMO and WHO in developing climate services for the health sector.

Third, Dr. Hugo Romero Aravena and Dr. Sergio Radic Schilling, professors in Chile, emphasized the value of climate information in urban planning and management as well as in dynamic monitoring and warning system for agriculture. Last, Dr. Jeffrey K. Lazo, consulting economist of Jeffrey K. Lazo Consulting LLC, discussed the economic value of climate information and services. He noted that all major investment in hydrometeorological service should consider their economic value and highlighted that an economic analysis of weather information can be simplified by the “Weather Information Value Chain,” which is a tool for understating value creation of hydrometeorological information and for explicating the difficulties of valuation and opportunities for value enhancement.

Closing

During the two-and-half-day symposium, speakers and participants shared and discussed their various experiences and knowledge regarding climate information and climate risks as well as their management. Key issues raised and discussed in the symposium can be summarized as follows. First, in order to enhance the uptake of climate information in a decision-making process, climate information needs to be transformed into more usable and actionable one. Many participants agreed that tailoring climate information and risk management should take needs-based and problem-solving approaches for “coproduction” through close communication among scientists and practitioners. In particular, the climate science community needs to improve communication skills to effectively and successfully transform scientific findings and knowledge into usable and actionable information, and also needs to make use of public opinion as a communication pathway to policy-makers as the policy-makers are responsive to the public’s demand for action. One common suggestion was to nurture climate experts called “climate information communicators,” who can translate scientific knowledge to simple and actionable messages that would help individuals have a better understanding of climatic risks and, subsequently, take necessary actions to deal with the risks. In addition, it was also suggested to develop and maintain a climate information platform that can facilitate better and more appropriate use of climate services for social and economic benefits to promote sustainable adaption to climate change.

Second, many aspects of traditional risk management should be reconsidered in terms of climate risks under shifting climate. In particular, under a rapidly changing climate, changes and trends of climate risks should be reanalyzed at both country and local levels. It was suggested that climate scientists need to update base data and the assumption of climate risk analyses since the public needs updated hazard-specific warnings in time.

Last, the development and operation of EWS, based on state-of-the-art climate information with advanced technologies, are expected to play a critical role in climate risk management. One of the key components determining success of EWS is to overcome gaps between early warning and followed action to which social science research and economic value analyses could contribute.

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