DEPARTMENT OF SCIENCE & TECHNOLOGY
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL & ASTRONOMICAL SERVICES ADMINISTRATION
PAGASA Bldg, Science Garden Agham Road, Diliman Quezon City

Tel. Nos: 439-9040 / 927-9308 Fax Nos: 929-4865 / 434-2696 Website: www.pagasa.dost.gov.ph Dial-A-Weather: 485-RAIN (7246)

Follow us on Twitter
twitter.com/#!/dost_pagasa

Follow us on Facebook
facebook.com/pages/dost_pagasa

APEC CLIMATE Symposium 2015

Crowne Plaza Manila Galleria
Quezon City, Philippines
2-4 November 2015

APEC Climate Symposium 2015

From Science to Action:

THE USE OF WEATHER AND CLIMATE INFORMATION FOR EFFICIENT DISASTER RISK MANAGEMENT

Crowne Plaza Manila Galleria

Quezon City, Philippines

2 - 4 NOVEMBER 2015

Table of Contents

APEC Climate Symposium 2015

From Science to Action: The use of weather and climate information for efficient disaster risk management

AGENDA

Monday, 2 November 2015

08:00 – 09:00	**REGISTRATION**
09:00 – 09:25	**OPENING CEREMONY** **MC:** *Ms. Sangwon Moon, Head, External Affairs Department, APEC Climate Center / Korea* • Opening Remarks by Dr. Chin-Seung Chung (Director, APEC Climate Center) • Opening Remarks by Dr. Vicente B. Malano (Acting Administrator, Philippine Atmospheric, Geophysical and Astronomical Services Administration) • Welcome Remarks by Sec. Mario G. Montejo (Secretary, Department of Science and Technology, Philippines) • Congratulatory Remarks by Prof. Bin Wang (Chair, Department of Meteorology, University of Hawaii)
09:25 – 09:45	**Commemorative Plaque Presentation and Photo Session**
09:45 – 10:00	Coffee break
10:00 – 12:00	**SESSION I – KEYNOTE SPEECH: GLOBAL PERSPECTIVES – CURRENT CHALLENGES FOR DISASTER RISK REDUCTION** **Chair:** *Dr. Hyungjin Kim, Head, Climate Research Department, APEC Climate Center / Korea*
10:00 – 11:40	• **Keynote speech** *Usec. Alexander P. Pama, Executive Director, NDRRMC and Administrator, Office of Civil Defense, Philippines* • **Sendai Framework: an Instrument for Climate Change Adaptation at the APEC Climate Symposium 2015** *Dr. Feng Min Kan, Chief of the United Nations Office for Disaster Risk Reduction for Asia & the Pacific*
11:40 – 12:00	**Q & A**
12:00 – 13:00	**Lunch**
13:00 – 17:00	**SESSION II – SCIENCE AND TECHNOLOGY FOR FORECASTING EXTREME WEATHER** **Chair:** *Prof. Eric Wood, Princeton University*
13:00 – 14:30	• **Lessons from recent results on tropical cyclones and climate** *Dr. Suzana Camargo, Columbia University* • **Tropical cyclone activity over the Western Pacific Ocean: Impact, forecasting and adaptation** *Dr. Yuriy Kuleshov, Bureau of Meteorology of Australia* • **Vulnerability assessment of precipitation extremes: Water resources and disaster management** *Dr. Eylon Shamir, Hydrologic Research Center*
14:30 – 14:45	Coffee Break

14:45 – 16:15	• **Recent progresses of operational predicting typhoon and heavy rainfall in Chinese Taipei** *Dr. Tien-Chiang Yeh, Central Weather Bureau of Chinese Taipei* • **Assessing the North American Multi-Model Ensemble (NMME) forecasts for seasonal forecasting and decision making over Africa** *Prof. Eric Wood, Princeton University* • **Ensemble forecasts of floods using numerical weather predictions** *Dr. David Robertson, Commonwealth Scientific and Industrial Research Organisation*
16:15 – 16:30	Coffee break
16:30 – 17:00	Wrap-up & Discussion
18:00 – 20:00	**Welcome Reception hosted by Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)**

Tuesday, 3 November 2015

09:00 – 12:45	**SESSION III – THE SHARING OF BEST PRACTICES FOR CLIMATE-RELATED DISASTER MANAGEMENT**
09:00 – 10:30	**Chair:** *Dr. Paul Gregory, Bureau of Meteorology of Australia* • **Science and Technology Adaptation for Community Water Resource Management** *Dr. Royboon Rassameethes, Hydro and Informatics Institute* • **Sharing experiences in the provision of weather and climate-related information to Regional and Local DRRMC's (Disaster Risk Reduction & Management Council) in the Philippines** *Mr. Hilton T. Hernando, Philippine Atmospheric, Geophysical and Astronomical Services Administration (*PAGASA) • **Participatory and Innovative Ways of Linking Science, Policy and Practice** *Dr. Donna Lagdameo, Red Cross Climate Centre*
10:30 – 10:45	Coffee Break
10:45 – 12:15	• **Enhancing Resiliency in Peru: climate related disaster management** *Ms. Lucy Harman Guerra, CARE Peru* • **Addressing gaps in availability of and access to climate information in climate-related disaster management** *Ms. Susan Asam, ICF International* • **Best practices for climate-related disaster management: Australian experience** *Dr. Paul Gregory, Bureau of Meteorology of Australia*
12:15 – 12:45	Wrap-up & Discussion
12:45 – 14:00	**Lunch**

14:00 – 18:00	**SESSION IV– THE EFFECTIVE USE OF CLIMATE INFORMATION FOR EFFICIENT DECISION MAKING AND DRR OPERATIONS** **Chair:** *Dr. Jane Rovins, Disaster Reduction and Resilience Solutions, Ltd.*
14:00 – 15:30	• **Integrated Risk Assessments: Making Science Usable** *Dr. Jane Rovins, Disaster Reduction and Resilience Solutions, Ltd.* • **Flood inundation modeling from reach to continental scale: Challenges and Opportunities** *Dr. Venketash Merwade, University of Purdue* • **Using drought indicators for disaster risk management: A case study of dam infrastructure in the Pampanga River Basin, Philippines** *Dr. Maksym Gusyev, International Centre for Water Hazard and Risk Management under the auspices of UNESCO*
15:30 – 15:45	Coffee Break
15:45 – 17:15	• **Development and Applications of a Typhoon Catastrophe Model - Open Cyclone** *Dr. Weihua Fang, Beijing Normal University* • **Hydro-meteorological data and modeling for flood forecasting and leading to better response for flood management in Indus river basin in Pakistan, a JICA funded UNESCO project** *Dr. Ai Sugiura, United Nations Education Scientific and Cultural Organization (UNESCO)* • **A Smarter Way of Managing Disaster Risks: the Use of Science and Existing Weather and Climate Information** *Atty. Lesley Jeanne Yu Cordero, World Bank*
17:15 – 17:30	Coffee Break
17:30 – 18:00	Wrap-up & Discussion

Wednseday, 4 November 2015

09:00 – 11:30	**SESSION V – WRAP-UP & DISCUSSION** **Chair:** *Prof. Bin Wang, University of Hawaii*
09:00 – 10:00	• **Session II Wrap-up** • **Session III Wrap-up** • **Session IV Wrap-up**
10:00 – 10:15	Coffee Break
10:15 – 11:30	• **Panel Discussion**
11:30 – 12:00	**CLOSING CEREMONY**
12:00 – 13:00	**Lunch**

Organizers

APEC Climate Center (APCC)

The Asia-Pacific Economic Cooperation (APEC) Climate Center is a leading climate information service provider in the Asia-Pacific region. We provide climate forecasts and information services, conduct research and development activities, and organize capacity building initiatives in the Asia-Pacific region and with developing countries. APCC was established in 2005 with the endorsement and warm welcome of the APEC senior officials and leaders. We annually organize the APEC Climate Symposium, which provides a forum for various scientists, academics, policy-makers and other stakeholders to share the latest science innovations in climate prediction and explore climate information applications.

In addition to organizing events, APCC provides operational services such as monthly seasonal outlooks and climate monitoring and prediction products, as well as conducting climate change R&D and supporting online tools and data services. At APCC, we strive to strengthen scientific and technological cooperation across the APEC region in order to help economies and societies deal effectively with the consequences of current and future climate-related hazards through the provision of climate information, research and technical support.

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

The Philippines through thePhilippine Atmospheric, Geophysical and Astronomical Services Administration is a member of the World Meteorological Organization (WMO), a specialized body of the United Nations. PAGASA is one of the attached agencies of the Department of Science and Technology (DOST) under its Scientific and Technical Services Institutes. It celebrated its 150th year anniversary this year as a National Meteorological and Hydrological Services (NMHS) of the Philippines. It is mandated to “provide protection against natural calamities and utilize scientific knowledge as an effective instrument to insure the safety, well-being and economic security of all the people, and for the promotion of national progress.

PAGASA maintains a nationwide network pertaining to observation and forecasting of weather and flood and other conditions affecting national safety, welfare and economy. It also undertakes activities relative to observation, collection, assessment and processing of atmospheric and allied data for the benefit of agriculture, commerce and industry. Besides engaging in studies of geophysical and astronomical phenomena essential to the safety and welfare of the people, it also conducts researches on the structure, development and motion of typhoons as well as formulates measures for their moderation. It also maintains effective linkages with scientific organizations both locally and internationally and promotesexchange of scientific information and cooperation among personnel engaged in atmospheric, geophysical, astronomical and space studies.

Profile of Guests & Speakers

DR. CHIN-SEUNG CHUNG
Director
APEC Climate Center

Dr. Chin-Seung Chung received his Ph.D. in Economics from the University of Georgia in 1983. He became the Director of the APEC Climate Center (APCC) in 2010. Prior to his position at APCC, Dr. Chung was the Dean of the Korea Development Institute (KDI) School. He worked at the Korea Development Institute as a Senior Research Fellow for 23 years since 1971. He also served as Deputy and Vice Minister at the Korean Ministry of Environment. While he was working at the Ministry, he was the Head Negotiator for the Korean Delegation for the Kyoto Protocol meeting of the United Nations Framework Convention on Climate Change in 1997. He has also served as a member and advisor to various national committees, including the Presidential Commission on Sustainable Development, the National Economic Advisory Council and the Regulatory Reform Committee.

DR. VICENTE B. MALANO
Acting Administrator
Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA)

Dr. Vicente B. Malano was appointed Acting Administrator of PAGASA in December 2013. Prior to this position, Dr. Malano was the Acting Deputy Administrator for Operations and Services for two years. He graduated with a Ph.D. in Meteorology degree from the University of the Philippines in 2003. He also completed his M.S.E. degree in Meteorology from the University of the Philippines and Master's Degree in National Security Administration (MNSA) from the National Defense College of the Philippines, with the rank of Lt. Colonel under PN (Marine) Reservist. He has a Diploma in Post Graduate Course on Hydrology from VITUKI, Budapest, Hungary. He has authored numerous publications which include among others, the papers entitled "Improving Disaster Risk Reduction and Management (DRRM) of Albay through Climate Change Adaptation" and "Effect of Moisture Data to the Structure and Movement of Tropical Cyclones in the Western North Pacific" that were published in 2010 and 2005, respectively and were released under the Typhoon Committee Secretariat, Tropical Cyclone Annual Report. He is recently a recipient of the Outstanding Alumnus Award from the University of Southern Mindanao.

MARIO G. MONTEJO
Secretary (Minister)
Department of Science and Technology

Secretary Montejo, a mechanical engineer by profession and an innovator, believes that the use of science and technology is always a sound development model for the improvement of the individual and society in terms of improved processes, products, services.

With his substantial background in engineering design and innovation spanning more than 20 years, he was chosen as one of Quezon City's Most Outstanding Citizens for 2015. He also received the 2015 "Dangal ng Lipi" Award in the field of Science and Technology given by the Provincial Government of Bulacan. Secretary Montejo was selected as the 2014 University of the Philippines Alumni Association (UPAA) Most Distinguished Alumnus, and 2011 Distinguished Alumnus in Science and Technology. In 2010, the University of the Philippines College of Engineering has named him one of the "100 Outstanding Alumni Engineers of the Century" during the Centennial celebration of the University of the Philippines.

Before joining the government service, Secretary Montejo was president of several engineering related firms along with the more recent ecotourism-related company.

His motto, 'Local technology works!' affirms a belief in the creativity of Filipinos particularly the Philippine scientific community.

PROF. BIN WANG
Chairman
Department of Meteorology
University of Hawaii

Professor Bin Wang of the Department of Atmospheric Sciences at University of Hawaii at Manoa specializes in Climate and Atmospheric Dynamics. He has shared the wealth of his expertise and depth of his insights through more than 300 peer-reviewed publications and pivotal participation in international scientific conferences as well as contributions to the leadership in climate and monsoon research community. His publications have been highly cited with 73 papers having more than 100 citations each (Google Scholar). Prof. Wang was elected Fellow of American Meteorological Society in 2009 and elected Fellow of American Geophysical Union in 2013. He received the Carl-Gustaf Rossby Research Medal in 2015 “for creative insights leading to important advances in the understanding of tropical and monsoonal processes and their predictability”. He is a guest professor at Nanjing University of Information Science and Technology and appointed as Director of Earth System Modeling Center since 2013.

UNDERSECRETARY ALEXANDER P. PAMA
Civil Defense Administrator and
NDRRMC Executive Director

Undersecretary Alexander Patiño Pama was appointed by His Excellency President Aquino as Acting Administrator of the Office of Civil Defense (OCD) and the Executive Director of the National Disaster Risk Reduction and Management Council (NDRRMC) on 12 May 2014.

Prior to his current appointment, Usec Pama worked at the Office of the Executive Secretary under the Office of the President and was the Executive Director of the National Coast Watch Council Secretariat which directly supported the inter agency body in the implementation of coordinated and coherent approach on maritime issues and maritime security operations towards enhancing governance in the country's maritime domain.

His assignment to the Department of National Defense (DND) is Usec Pama's third stint at the DND. He was once the Chief of Staff to then Secretary of National Defense Gilberto C. Teodoro, Jr.

CDA or UsecPama is the driving persona in the establishment of the Pre-Disaster Risk Assessment-Actions, Protocol and Program (PDRA-APP) being practiced as a system and a process in the NDRRMC which dramatically reduced the negative impacts, specifically on loss of lives, of recent disasters.

Retired Vice Admiral Pama is a member of the Philippine Military Academy Class of 1979 and served as Flag Officer in Command, Philippine Navy until his retirement on 21 December 2012.

Usec Pama has excelled in various military and civilian education and training courses, as well as on major organizational reform he has previously and currently undertaken.

DR. FENG MIN KAN
Head
Asia and the Pacific, Chief of the United Nations Office for Disaster Risk Reduction (UNISDR)

Dr. Feng Min Kan is currently the Head of UNISDR Asia-Pacific Office. Prior to assuming the current post based in Bangkok, she served in the capacities of a Special Advisor to the UN Assistant Secretary-General for Disaster Risk Reduction in Geneva; the Head of Advocacy and Outreach Unit and as the Head of Africa Regional Office of the UNISDR Secretariat. Before joining UNISDR Secretariat in 2002, she represented OCHA as the first Regional Disaster Response Advisor in Asia based in Kobe, Japan, where she set up the OCHA's regional office and advanced OCHA's partnership and networks with national governments, regional organizations and the NGOs in Asia. She has worked for a number of international organizations in different capacities, with progressive management responsibilities within the UN system, including OCHA, UNOPS, UNDP, UNCHR and IOM.

DR. SUZANA J. CAMARGO
Research Professor
Columbia University

Dr. Suzana J. Camargo is currently a Lamont Research Professor at the Lamont-Doherty Observatory of Columbia University. She is also the Executive Director of the recently launched Columbia Initiative on Extreme Weather and Climate. From 1999 to 2007 she was on the staff of the International Research Institute of Climate and Society of Columbia University. Dr. Camargo has studied various aspects of climate, in particularly the relationship of tropical cyclones and climate and has published over 70 peer-reviewed journal articles. She was one of the co-leaders of the US CLIVAR Hurricane Working group and is currently a member of the NOAA model diagnostics task force.

DR. YURIY KULESHOV
Professor
National Climate Center
Australian Bureau of Meteorology

Professor Yuriy Kuleshov holds a BSc degree from the Institute of Radio Engineering, Kharkov, Ukraine and a PhD in Physics and Mathematics from the Institute of Radio Physics & Electronics, Academy of Sciences, Kharkov, Ukraine. He is an Adjunct Professor at the Royal Melbourne Institute of Technology (RMIT) University and Swinburne University of Technology, Australia. For lifetime achievements in environmental research, in 2011, he was elected as an Academician (Foreign Member) of the Academy of Engineering Sciences, Russian Federation.

In 1981-1994, working for the Department of Environmental Satellite Remote Sensing at the Institute of Radio Physics and Electronics, Academy of Sciences, Ukraine, he was involved in the design of satellite microwave remote sensing systems including the first Soviet space-based radar of the "Cosmos/Ocean" satellite series. Working for the Australian Bureau of Meteorology from 1995, Professor Kuleshov leads 'Climate change and Southern Hemisphere tropical cyclones' international initiative focused on developing high-quality tropical cyclone archive, climatology and seasonal prediction for the Southern Hemisphere and the western Pacific. Since 2006 Professor Kuleshov leads the development of new methods of satellite remote sensing (GPS/GNSS Radio Occultation) for climate applications. In 2010-2014, he was leading a number of projects under the International Climate Change Adaptation Initiative aimed to strengthen capacity of climate information services in 15 Pacific Island Countries. He is a co-author of 12 book chapters, over 60 peer-reviewed journal articles and over 180 conference papers on climatology of severe weather phenomena (tropical cyclones, thunderstorms and lightning), seasonal climate prediction and satellite remote sensing for environmental and climate applications.

DR. EYLON SHAMIR
Researcher
Hydrologic Research Center

Dr. Eylon Shamir received his Ph.D. in 2003 from the University of Arizona, Tucson, Arizona, specializing in hydrology and water resources sciences. Since his graduation, Dr. Shamir has been with the Hydrologic Research Center, a non-profit research corporation located in San Diego, California. He conducts researches in water resources planning and management, hydrologic risk assessment and the impact of climate change on the hydrologic cycle. He co-authored over thirty peer-reviewed articles and led a recent 2015 Journal of Hydrology manuscript, which assessed water resources vulnerability to climatic change in Southern Arizona. The paper has been downloaded over 4,000 times. He serves as a principal investigator on a U.S. National Science Foundation multi-agency research project that aims to reconstruct the historical characteristics of the snow pack variability in Sierra Nevada Mountains, California. Dr. Shamir is currently serving as an Assistant Editor for the Journal of Hydrology and a Guest Editor for a special issue of the Journal of Water on Water Governance, Stakeholder Engagement, and Sustainable Water Resources Management.

DR. TIEN-CHIANG YEH
Deputy Director-General
Central Weather Bureau
Chinese Taipei

Dr. Tien-Chiang Yeh received his Ph.D. in Meteorology from the US Naval Postgraduate School and is currently Deputy Director-General of the Central Weather Bureau (CWB), Chinese Taipei. He also acts as a Technical Advisor at the Professional Advisory Committee of Disaster Reduction of Executive Yuan, Chinese Taipei. Dr. Yeh joined CWB in 1980, and took positions as Section Chief of Numerical Modelling Section, Deputy Director of Information Center, Director of Weather Forecasting Center, Director of Planning Division, and Chief Secretary of CWB. His research interests include numerical weather modelling, data assimilation, typhoon forecasting, and inter-sectoral applications of weather information.

DR. ERIC F. WOOD
Professor
Princeton University

Dr. Eric F. Wood holds the Susan Dod Brown Professorship in Civil and Environmental Engineering at Princeton University, where he has taught since 1976. He received his undergraduate degree in Civil Engineering at the University of British Columbia (Canada) and his Sc.D. in Civil Engineering from the Massachusetts Institute of Technology. His research area is in hydroclimatology with an emphasis on the modeling and analysis of the global water and energy cycles through land surface modeling, satellite remote sensing, and data analysis. His focus include the monitoring and forecasting of drought, hydrologic impacts from climate change, and seasonal hydrological forecasting. He participates in WCRP's Global Energy and Water EXchange (GEWEX) activities to develop long-term Climate Data Records of the terrestrial surface heat flux data sets for climate studies. He is/has been a Science Team member on the NASA Aqua/Terra AMSR-E and MODIS instruments, the NASA Global Precipitation Mission (GMP) mission and the NASA's soil moisture SMAP mission. For UNESCO he has guided the development of a Global Flood and Drought Monitoring and Forecasting System. He was elected to the National Academy of Engineering for "development of land surface models and use of remote sensing for hydrologic modeling and prediction."

DR. DAVID ROBERTSON
Senior Research Scientist
Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Dr David Robertson is a Senior Research Scientist with CSIRO Land and Water in Melbourne, Australia. Since joining CSIRO in 2008, he has undertaken streamflow forecasting research developing methods for forecasting lead-times extending from hours to 12 months. His research has led to the establishment of new seasonal and 7-day streamflow forecasting services that are delivered by the Bureau of Meteorology in Australia. Currently he leads CSIRO research into flood and short-term streamflow forecasting. Dr Robertson holds degrees in Engineering and Science from the University of Melbourne. Prior to joining CSIRO, he worked with the Victorian Department of Natural Resources and Environment while completing his PhD with the University of Melbourne in 2008. Dr Robertson was awarded the 2014 GN Alexander Medal by the Engineers Australia.

DR. ROYBOON RASSAMEETHES
Deputy Director
Hydro and Agro Informatics Institute

Dr. Royboon Rassameethes has over 10 years experience in Community Water Resources Management. She got a Ph.D. in Thai Studies at the Thai Studies Center, Faculty of Arts, Chulalongkorn University, Thailand. Currently, as a Deputy Director of Hydro and Agro Informatics, she takes the role as Director of two divisions, Agro Informatics Division, and Collaborative Management and Corporate Communication Division. Moreover, her high responsibilities with Utokapat Foundation and a specialist in community water resource management, she has led the community network for self-development on their community water resource management which enhance the communities to be strengthened and sustainable.

MR. HILTON T. HERNANDO
Assistant Weather Services Chief
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Mr. Hilton T. Hernando currently holds a position of Assistant Weather Services Chief in the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). At present, he is the Chief of the Pampanga River Basin Flood Forecasting and Warning Center (PRFFWC). He has been with PAGASA since 1982. He completed his Meteorologist Training Course in 1982. Prior to this, he received his Bachelor of Science in Management and Industrial Engineering (BSMIE) at Mapua Institute of Technology in 1980 and later on, while already with PAGASA, finished another degree at the same institute with a Bachelor of Science in Electronics and Communications Engineering (BSECE) in 1991. Mr. Hernando's specific field of focus is hydrology, particularly in the area of flood forecasting and warning and hydrographic field measurements. He was a recipient of an Australian government fellowship in 1985 for a Graduate Course in Hydrology at the University of New South Wales. He also attended an International Course in River Flow Forecasting at the University College Galway, Ireland in 1995. Lately, he has been actively involved in the promotion of Local Flood Early Warning Systems. He authored a report entitled "General Guidelines for Setting-Up a Community-Based Flood Forecasting and Warning System (CBFFWS)" published by WMO in 2008. His advocacy and passion in community-based programs on flood early warning systems has led to several sustainability programs he thought of and organized, some of which are now adopted in several communities in the country; programs such as the School Hydrological Information Network (SHINe) and the Network of Flood Warning Systems (NetFLOWS). In 2010, SHINe was chosen by OXFAM as one of the good practices in DRR and CCA.

DR. DONNA MITZI D. LAGDAMEO
Technical Adviser and Focal Point
Asia Red Cross Red Crescent Climate Centre

Since 1995, Dr. Donna Mitzi Lagdameo has been doing work in the fields of Policy Research and Development, Risk Governance, Evidence-Based Advocacy on Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and Resilience Building in the Philippines and the wider Asia region. Her professional career includes more than 10 years in the Philippine government, working at the Philippine Senate, House of Representatives, Department of National Defense, and the Development Academy of the Philippines. After that, Ms. Lagdameo moved to international development work with Oxfam and various consulting assignments with UNDP, UNISDR, ECHO, GIZ, and other organizations and donors.

She joined the Climate Centre in 2013 as technical adviser and is currently its focal point in Asia. With focus on linking science, policy and practice, she supports National Societies and the International Federation of Red Cross and Red Crescent Societies in Asia through capacity building; integration of climate risk management into policy and planning; program and strategy development; use of climate and weather forecast across different timescales with the end in view of reducing the risks of the most vulnerable groups and communities.

Ms. Lagdameo obtained her Bachelor of Arts in Political Science and Master of Arts in International Studies both from the University of the Philippines, wherein she also started taking her Doctor in Public Administration degree. She is a mother of four girls and is married to a lawyer.

MS. LUCY HARMAN GUERRA
Social Anthropologist
CARE Peru

Ms. Lucy Harman Guerra works in CARE Peru as Disaster Risk Reduction Program Manager. She leads projects related to Humanitarian Response and DRR, addressed to strengthen institutional capacities, and include scientific knowledge for the better understanding of information needs for practical use. All her initiatives advocate and pave the inclusion of the risk management and adaptation to climate change approaches as essential to sustainable development. Ms. Harman represents CARE Peru at different national coordination and advisory committees: Humanitarian Network, the DRR Platform, the Risk Management Working Group of the Poverty Alleviation Roundtable (MCLCP) and the DRR Secretariat at the Prime Minister's Office. She has been invited as speaker in different events related to the DRR and ACC community of practice.

MS. SUSAN ASAM
Principal
ICF International

Ms. Susan Asam is a Principal at ICF International, based in Honolulu, Hawaii. Ms. Asam has over 15 years of experience evaluating the physical impacts of climate change on transportation and other infrastructure, water resources, and sensitive ecosystems; developing climate resilience strategies; and quantifying greenhouse gas emissions and sinks. She has managed numerous projects assessing climate change impacts and translating climate science information for use by decision makers, developing and testing climate risk screening approaches, and building decision support tools to support community climate resilience and climate-related disaster management. She has led or supported projects for the U.S. Environmental Protection Agency, National Park Service, U.S. Fish and Wildlife Service, Federal Highway Administration, Centers for Disease Control and Prevention, Agency for International Development, World Bank, Department of Energy, General Services Administration, the European Commission Directorate-General for Climate Action, Hawaii Department of Business, Economic Development, and Tourism, Hawaiian Electric Company, California Energy Commission, regional and local agencies, and other clients. Ms. Asam holds M.E.M. and M.P.P. degrees from Duke University and a B.A. in American Studies and Studies in the Environment from Yale University.

DR. PAUL GREGORY
Seasonal Prediction Scientist
Climate Monitoring and Prediction Section,
Australian Bureau of Meteorology

Dr Paul Gregory has a BEng(Mechanical)/BSci(Mathematics) and PhD (Fluid Dynamics) from the University of Melbourne. Before joining the Bureau of Meteorology, he worked in the defense, automotive and aerospace sectors on projects such as infra-red radiation modeling, submarine hydrodynamics and aerodynamic optimization and design.

Since joining the Bureau in 2008, he has worked on several projects including solar and wind energy forecasting, improved tropical cyclone forecasts for oil and gas industry stakeholders and satellite data assimilation. Dr Gregory joined the Climate Information Services Branch in September 2015. As part of the Climate Prediction Team, his main focus will be to implement a dynamical model-based tropical cyclone seasonal prediction product.

DR. JANE E. ROVINS
CEO
Disaster Reduction & Resilience Solutions, Limited

Dr. Jane E. Rovins is the CEO of Disaster Reduction & Resilience Solutions, Limited and a Senior Lecturer at Massey University (New Zealand) with expertise in international disaster risk management, risk reduction, training and policy development for all hazards with melded experience encompassing the full spectrum of corporate, academia, consulting, federal, and private stakeholders. Throughout her career, she has received prominent awards for her expertise and leadership, including induction into the International Women in Emergency Management Hall of Fame; the Innolec Lectureship in Disaster Risk Reduction award at the Faculty of Science, Masaryk University, Brno, Czech Republic in December 2012, among others. Previously, she was Executive Director of Integrated Research on Disaster Risk (IRDR) — Beijing, P.R. China; an Associate Professor at the Emergency & Disaster Management Department, American Public University System/American Military University; a Disaster Specialist for the Association of Southeast Asian Nations (ASEAN) Regional Forum; Senior Operations Planner for All About Training, Inc. where she planned and developed training programs, tools, and credentialing plans for disaster risk and recovery personnel nation-wide; and worked for the United States Federal Emergency Management Agency during the four 2004 hurricanes in Florida, Hurricane Katrina and Hurricane Rita. She has lived and worked in 40 different countries.

Dr. Rovins is a member of several prominent organizations including the co-chairing of the World Metrological Organization (WMO) Working Group on Societal and Economic Research Applications; International Association of Emergency Managers (IAEM); and IAEM China Region Expert and Advisor Committee; among others. She has a Doctor of Philosophy inInternational Development fromTulane University, Law School (New Orleans, Louisiana, USA); a Master of Public Health in International Health and Complex Emergencies from Tulane University, School of Public Health and Tropical Medicine; a Bachelor of Science in Health Appraisal and Enhancement/Exercise Science, Miami University (Oxford, Ohio, USA); and is a Certified Emergency Manager (CEM).

DR. VENKATESH MERWADE
Associate Professor
Purdue University

Dr. Venkatesh Merwade is an associate professor in the Lyles School of Civil Engineering at Purdue University. His research and teaching interests include surface water hydrology with specific focus on flood modeling and mapping. Most of his research involves the use of geographic information systems, computer modeling and hydrologic information systems. He has authored more than 50 peer reviewed journal articles and conference proceedings in the area of river channels, watershed hydrology and flood modeling. Currently he is working on projects related to flood modeling and mapping, soil moisture data assimilation and cyber infrastructure development for hydrologic modeling. Prior to joining Purdue University, Dr. Merwade worked as post-doctoral fellow at the Center for Research in Water Resources at the University of Texas at Austin.

Dr. Merwade obtained his Bachelor of Engineering in Environmental Engineering Degree from Shivaji University, India, MSc in Engineering Hydrology from the National University of Ireland, Galway, and PhD in Civil Engineering from the University of Texas at Austin.

DR. MAKSYM GUSYEV
Research Specialist
International Centre National Isotope Centre of Water Related Hazards and Risk Management (ICHARM)

Dr. Maksym Gusyev is currently a Research Specialist at the International Centre National Isotope Centre of Water Related Hazards and Risk Management (ICHARM) under the auspices of UNESCO and a Lecturer at the National Graduate Institute for Policy Studies (GRIPS), Japan. His key expertise is the development and application of modelling technology to answer practical questions from the robust scientific prospective. In his current position, Dr.Gusyev is developing and utilizing modelling technology to characterize flood and drought risks in Asian river basins for present and future climates. As a Lecturer of GRIPS, Dr. Gusyev co-teaches Master level courses and supervises Master students of the Japanese International Cooperation Agency (JICA) scholarship program. Prior to ICHARM, Dr. Gusyev led and participated in various national projects at GNS Science, New Zealand, and developed a new methodology of environmental tracer applications in river waters currently being applied in Japan. For his academic background, Dr. Gusyev obtained Doctoral of Philosophy Degree at Indiana University (IU), Bloomington, USA, while teaching undergraduate level courses as an Adjunct Faculty of IU. Dr. Gusyev also holds a Master of Science from IU, USA, and an Engineering Diploma as well as Bachelor's Degree from the National Polytechnic University of Ukraine, Kiev, Ukraine. To date, Dr. Gusyev has conducted studies in various river basins around the globe and has given numerous talks at conferences, symposia and workshops such as the UNESCO workshop on "Strategic Strengthening for South-South Cooperation for Modelling and Managing Hydro-Hazards", August 31st - September 1st, 2015, in Jakarta, Indonesia.

DR. WEIHUA FANG
Professor
Beijing Normal University

Dr. Weihua FANG is a professor of the Academy of Disaster Reduction and Emergency Response, Ministry of Civil Affairs and Ministry of Education, Beijing Normal University. He received his Masters Degree on physical geography from Beijing Normal University and his Ph.D. on environment from Nagoya University.

His research areas include post-disaster damage and loss assessment, catastrophe risk modeling, and integrated risk governance, with applications in both government sectors and insurance industry. He has authored a book on Database, Mapping and Platform for Integrated Risk Governance and around 60 journal papers. He was the vice-editor of Atlas of Natural Disaster Risks of China (2011).

Dr. Fang is a member of National Disaster Reduction Commission Expert Committee of China, Member of Academic Advisory Committee to China Marine Hazard Mitigation Service, China Marine Administration, and a member of National Wenchuan Earthquake Expert Panel.

He was consultant to Department for International Development of UK for designing and implementing South-South Cooperation on Community based Disaster Management Project and UNDP for Assessment on Cambodia Flood 2013. He was chief expert from China for After Action Review on the 4th ARF DiREx 2015 co-organized by ASEAN/Malaysia and China.

DR. AI SUGIURA
Researcher
Uniter Nations Education Scientific and Cultural Organization (UNESCO)

Dr. Ai Sugiura was born and raised in Paris, France from Japanese parents. She studied Agronomy- Land planning and natural resource management- in Gembloux, Belgium, specialised in Hydrology in Universite Pierre et Marie Curie, Paris 6, France. Combining her two backgrounds, she was awarded her PhD from Cranfield University, UK on "WaterRenew: wastewater polishing using renewable energy crops", a EU LIFE project, in 2009. After a first NGO experience in Yogyakarta, Indonesia, she specialised in communal wastewater treatment plant and biomass energy production. Dr. Sugiura moved to Japan to work on a JICA funded UNESCO project "Strategic Strengthening of Flood Warning and Management Capacity of Pakistan" at ICHARM, the International Centre for Water Hazard and Risk Management under the auspices of UNESCO, Tsukuba from 2011 to 2014. She joined UNESCO office in Jakarta from September 2014 as the Japan Fund in Trust coordinator for Science projects.

ATTY. LESLEY JEANNE YU CORDERO
Senior Disaster Risk Management Specialist
World Bank

Atty. Lesley Jeanne Cordero is currently a Senior Disaster Risk Management Specialist at the World Bank. She manages the DRM portfolio of the World Bank in the Philippines.

Before joining the World Bank, she served as the United Nations Development Program (UNDP) Disaster Rehabilitation and Recovery Advisor working on key post-disaster recovery initiatives with the Philippine government.

A public servant for five (5) years, she served as an Undersecretary at the Office of the Presidential Assistant for Rehabilitation and Recovery, mandated to integrate the rehabilitation and recovery efforts of government for Typhoon Haiyan "Yolanda". She also served as Undersecretary at the Office of the President. She helped put together the Typhoon Bopha ("Pablo") Rehabilitation and Recovery Plan for the affected areas in Mindanao.

In 2011, Atty. Cordero served as Undersecretary at the Presidential Communications Operations Office, tasked to prepare strategic communications plans and policies for the Office of the President. She is perhaps one of the youngest appointed Undersecretaries of the Administration. She also served as a Commissioner of the National Youth Commission in 2010.

In 2001, she graduated magna cum laude with a degree of Bachelor of Philosophy at University of San Carlos and in 2005, Juris Doctor of Laws at the Ateneo de Manila University School of Law.

Abstracts

SESSION I.
KEYNOTE SPEECH: GLOBAL PERSPECTIVE – CURRENT CHALLENGES FOR DISASTER RISK REDUCTION

SENDAI FRAMEWORK: AN INSTRUMENT FOR CLIMATE CHANGE ADAPTATION AT THE APEC CLIMATE SYMPOSIUM 2015

Feng Min Kan, Chief of the United Nations Office for Disaster Risk Reduction
for Asia & the Pacific

Globally, the expected Average Annual Losses (AAL) from earthquakes, tsunamis, tropical cyclones and river flooding are now estimated at US$314 billion in the built environment alone (GAR 2015). Weather-related disasters (hydro-metrological events) alone accounts for more than 80 per cent of all events, causing 72 per cent of all economic losses and 23 per cent of fatalities. In many countries, climate change is magnifying risks and increasing the cost of disasters.

The upward trend of disaster and climate risks poses great challenge for the world to achieve sustainable development. More and more unmanaged risks turned into disasters, affecting poverty reduction, health system, social development, economic growth, and environmental protection. Addressing climate change and reducing disaster risk will be critical for sustainable development.

To address the challenges, more political and technical effort should be made to promote cooperation and collaboration between disaster risk reduction and climate change mitigation and adaptation. As it is known, disaster risk reduction offers a range of solutions that are being introduced by national and local governments, civil societies and businesses. This includes reducing disaster risk through effective adaptation plans, improving people-centred early warning systems, improving ecosystem management and enhancing disaster management capacities.

The year 2015 is a significant year for international cooperation in development where three separate global sustainable development processes aimed for long-term agreements. First, in March in Sendai, Japan, the Sendai Framework for Disaster Risk Reduction 2015–2030 laid out a pathway for the next 15 years of disaster risk reduction. Second, in September member states met in New York to adopt the "Transforming our world: the 2030 Agenda for Sustainable Development" and third, in Paris, France in December, the United Nations Framework Convention on Climate Change (UNFCCC) will pursue a legally binding treaty for dealing with climate change.

The Sendai Framework for Disaster Risk Reduction 2015-2030 is the first of the post-2015 development instruments adopted, which provides the basis for a risk-informed and resilient post-2015 development agenda. The Sendai Framework is a significant milestone in international cooperation for building resilience to climate-related disaster.

SESSION II.
SCIENCE AND TECHNOLOGY FOR FORECASTING EXTREME WEATHER

LESSONS FROM RECENT RESULTS ON TROPICAL CYCLONES AND CLIMATE

Suzana J. Camargo
Lamont-Doherty Earth Observatory
Columbia University

In this talk we will discuss the current state of the art of tropical cyclone simulations in climate models across multiple time scales, from intraseasonal, seasonal and decadal, to climate change. One of the limitations on the simulation of tropical cyclones in climate models has been, and continues to be, balancing the high resolution necessary to accurately simulate tropical cyclones themselves with the need to run simulations for many years and using many ensemble members. Several approaches to inferring tropical cyclone activity indirectly, rather than relying on the models own under-resolved tropical cyclones, are reviewed, including the use of tropical cyclone genesis indices based on the large-scale environment and downscaling methods such as the use of regional climate models and statistical-dynamical techniques. We also provide an update on the status of climate change projections from the current class of models, where it is feasible to directly track the model's tropical cyclones. While there has been great progress in the capability of climate models to simulate tropical cyclones and provide useful forecasts and projections across multiple time scales, there remains much work to be done. We will discuss some of the sources of uncertainty and model sensitivity and describe where improvements are necessary.

TROPICAL CYCLONE ACTIVITY OVER THE WESTERN PACIFIC OCEAN: IMPACT, FORECASTING AND ADAPTATION

Yuriy Kuleshov
Australian Bureau of Meteorology

Tropical cyclones (TCs) are the most extreme weather phenomena which severely impact coastal communities and island nations in the Western Pacific Ocean and Southeast Asia. To support adaptive response of small island states to the challenges of climate variability and change, particularly to assist with preparedness and risk reduction for coastal communities ahead of TC season, TC activity over the Western Pacific Ocean has been analysed and a range of climate information tools have been developed. As part of the Pacific Programs, historical TC best track data have been examined and a new satellite-era data set has been prepared. A statistical model-based approach to TC seasonal forecasting has been further developed and it was shown that the new methodology could substantially improve prediction skill in certain regions compared to that of traditional linear-regression type models. The Pacific TC Data Portal has been developed to disseminate historical information about cyclones to international community.

Keywords: Tropical Cyclones, Western Pacific Ocean

VULNERABILITY ASSESSMENT OF PRECIPITATION EXTREMES: WATER RESOURCES AND DISASTER MANAGEMENT

Eylon Shamir, Konstantine P. Georgakakos and Theresa Modrick
Hydrologic Research Center, San Diego, California, U.S.A.

Future climate impact and vulnerability studies require careful assessment and analysis that includes probabilistic concepts and is tailored to the specific regional concerns and conditions. Two examples of climate assessment studies conducted by the Hydrologic Research Center (HRC) are discussed in this presentation.

During period 7-8 December 2010, an unprecedented rainfall event produced record rainfall and flow in the Panama Canal Watershed that were about twice as much as those observed during the previously largest observed event. The event, which led to the first weather driven closure of the Canal since its opening in1914, caused 10 fatalities and extensive economic damage. The estimated return period for this event according to established extreme event analysis methods was estimated to be larger than 2000 years, implying that the event was practically unforeseen. However, a careful extreme event uncertainty analysis which considered confidence intervals resulted in estimated return periods with substantial probabilities for such an event to occur. Analyses of extreme event vulnerabilities in the Panama Canal operations with and without this event demonstrate the need for a probabilistic risk analysis approach that accounts for the large uncertainties that are associated with future climate projections of extremes.

The second climate assessment study was focused on the projected changes of flash floods frequency in Southern California. Flash floods, which are the leading cause of fatalities among natural disasters worldwide, are events that occur in relatively small basins and often caused as a response to rainfall events that are not necessarily considered as extremes. Based on the analysis of climate model projections, hydrologic modeling of relatively small basins and analysis of river geomorphological properties it was concluded that although rainfall totals are not expected to change, the projected changes in the characteristics of the rainfall, will likely yield a future increase in the frequency of occurrence of flash floods in Southern California.

RECENT PROGRESSES OF OPERATIONAL PREDICTION IN TYPHOON AND HEAVY RAINFALL IN TAIWAN

T.-C. Yeh, D.-S. Chen, J.-S. Hong, T.-S. Huang, P.-L. Chang, and coauthors
Central Weather Bureau, Chinese Taipei

Taiwan, which is situated in one of the main paths of typhoons, has experienced many disasters due to the strong wind and heavy rainfall associated with the invaded typhoons. The heavy rainfall associated with fronts, thunderstorms, and low pressure depressions also caused life and property loss. To improve the weather services and reduce the weather related disaster loss, the Central Weather Bureau (CWB), Chinese Taipei, has strengthen its observation and monitoring system, improved its numerical weather prediction system, and developed model output post processes and information dissemination system to effectively deliver information to public and related agencies for disaster mitigation. This presentation overviews the major weather system in Taiwan, introduces the weather monitoring and forecasting system in the CWB, and discusses on the recent improvement of typhoon and heavy rainfall prediction and information services.

ASSESSING THE NORTH AMERICAN MULTI-MODEL ENSEMBLE (NMME) FORECASTS FOR SEASONAL FORECASTING AND DECISION MAKING OVER AFRICA

Eric F Wood, Justin Sheffield, Nathanial Chaney, Colby Fisher, Di Tian and Niko Wanders

Hydrological and water scarcity predictions have the potential to provide vital information for a variety of needs including water resources management, agricultural and urban water supply, and flood mitigation. In particular, seasonal forecasts of drought risk can enable farmers to make adaptive choices on crop varieties, labor usage, and technology investments. Forecast skill is generally derived from teleconnections with ocean variability specifically sea surface temperature (SST) anomalies and, equally important persistence in the state of the land in terms of soil moisture, snowpack, or streamflow conditions. The Global Framework for Climate Services (GFCS) is a UN-wide initiative in which WMO Members and inter- and non- governmental, regional, national and local stakeholders work in partnership to develop targeted climate services. Thus, GFCS offers the potential for hydroclimatologists to develop products (hydroclimatic forecasts) and information services (i.e. product dissemination) to users with the expectation that GFCS will increase the resilience of the society to weather and climate events and to reduce operational costs for economic sectors and regions dependent on water.

This presentation will discuss the development of a nascent climate service system focused on hydroclimatic monitoring and forecasting, and initially developed by the authors for Africa and Latin America. The time frames for GFCS range from near real-time monitoring through the use of satellite remote sensing to months through the use of seasonal forecasts. Such climate information is central for improved decision making in areas such as drought and crop forecasting information useful for agriculture and food security. The elements of this system will be discussed, with particular focus on using seasonal forecasts from the North American Multi-Model Ensemble (NMME) forecast system over Africa, and the challenge of the delivery and effective use of the information to decision makers.

ENSEMBLE FORECASTS OF FLOODS USING NUMERICAL WEATHER PREDICTIONS

David E. Robertson, James C. Bennett, Durga Lal Shrestha, Ming Li, Yong Song, Q.J. Wang
Commonwealth Scientific and Industrial Research Organisation / Australia

Forecasting of floods is challenging. To support emergency responses, emergency managers require a range of forecast information such as the timing and magnitude of flood peaks, and the duration for which rivers are expected to exceed thresholds. The longer the lead times for which accurate estimates of this information can be provided enhances the ability of communities to prepare for expected flood events.

Flood forecasts can be made using a network of stream gauges and routing observed flows through a river channel networks. Forecasts made using these methods can only provide accurate information for very limited lead times, particularly in small or rapidly responding catchments. The improving quality of quantitative precipitation forecasts from numerical weather prediction models presents opportunities to extend the lead times for which accurate streamflow forecasts can be made.

This presentation will describe methods that underpin new deterministic 7 day streamflow forecasting services in Australia and the research that has been undertaken to support the transition of this service to one which quantifies forecast uncertainty using ensembles. While the objective of this new streamflow forecasting service is to support water resources management, the technology is equally applicable to forecasting floods and research has also evaluated forecasts from this perspective.

The forecast generation process is underpinned by semi-distributed hydrological modelling undertaken at hourly time steps using a conceptual rainfall-runoff model (GR4J, Perrin et al., 2003; Bennett et al., 2014) and the Muskingum method to route runoff through the stream network. An error correction scheme (Pagano et al., 2011) is used to update streamflow forecasts using recent observations. To generate a streamflow forecast, the model state variables are initialised using historical observations and then the model is forced by forecast rainfall for the forecast periods. Skill in streamflow forecasts arises from the initialisation of the hydrological models states and also from the skill of precipitation forecasts.

We present results that highlight the role that numerical weather predictions can play in increasing the skill of flood and streamflow forecasts. We find that flood and streamflow forecasts generated from raw quantitative precipitation forecasts from numerical weather prediction models are more skilful than forecasts generated by simple routing of observed streamflow through a channel network or using a naive rainfall forecast such as resampling historical precipitation observations or zero precipitation forecasts. Flood and streamflow forecasts that are derived from precipitation forecast products that blend predictions from a range of numerical weather prediction models, such as the Poor Man's Ensemble (Ebert, 2001) and ensemble numerical weather prediction models, are more skillful than those streamflow forecasts generated using a single deterministic numerical weather prediction model. Statistical post-processing of raw quantitative precipitation forecasts can substantially increase the skill of streamflow forecasts. Increases in forecast skill arise from the ability of the statistical post-processing method to reduce conditional and unconditional biases in the raw rainfall forecasts and reliably estimate the 'remaining' forecast uncertainty(Robertson et al., 2013; Shrestha et al., 2015).

Generating accurate ensemble flood and streamflow forecasts that reliably reflect the forecast uncertainty requires careful modelling of the errors in hydrological modelling as well as characterising the uncertainty in forecast precipitation. Without reducing and characterising these hydrological modelling errors ensemble streamflow forecasts are too emphatic.

Ensemble flood forecasting is, however, not without its challenges. Limitations on the availability of rainfall and streamflow observations and rainfall forecasts, and the infrequency of flood events mean that any evaluation of flood forecast for past events is constrained and the performance measures subject to significant sampling uncertainty.

SESSION III.
THE SHARING OF BEST PRACTICES FOR CLIMATE-RELATED DISASTER MANAGEMENT

SCIENCE AND TECHNOLOGY ADAPTATION FOR COMMUNITY WATER RESOURCE MANAGEMENT

Royboon Rassameethes
Deputy Director
Hydro and Agro Informatics Institute (HAII)

As one of the world food resource, “Water” is an essential factor for Thailand. Community Water Resource Management (CWRM) aims to increase efficiency of community for their local water management to sustainably overcome the flood and drought situation. With the adaptation of sciences, technologies, and information systems, community can collect important data, identify the significant factors, and create local planning best suited to their circumstances, which lead to the valuable development of the community.

Thailand has done the CWRM work for over 10 years, and the work has proved its success through the climate change situation. In 2015, the delay of rainfall caused farmers in Thailand to suffer from the worst drought in decades. However, most of the communities participated in the CWRM network can successfully manage their water resource and receive income during that situation.

Nowadays, CWRM is one of the National Agenda and has been recognized by Thai Government. The CWRM Network has been expanded throughout the country, and currently covers 60 main networks with more than 421 participated communities.

"SHARING EXPERIENCES IN THE PROVISION OF WEATHER AND CLIMATE-RELATED INFORMATION TO REGIONAL AND LOCAL DRRMC'S (DISASTER RISK REDUCTION & MANAGEMENT COUNCILS) IN THE PHILIPPINES"

Hilton T. Hernando
Assistant Weather Services Chief
PAGASA

Weather and climate information are two of the most sought after items that many of the local government units (LGUs) particularly the DRRMOs or Disaster Risk Reduction and Management Offices at the regional, provincial and municipal levels regularly needs. Other local government offices at both provincial and municipal levels such as the agricultural, the planning and development offices are also in need of such information. The Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA, is the lead institution in the Philippines responsible in coming-out with these information. Sharing and providing them to the public is generally not seen as a big problem (with the wide-range of info outlet / means now in place) though, but most of the time the main issue is getting people and entities to understand them and for them to act accordingly. Bridging the gap between the scientific practitioners with the end-users and decision makers remains a problem many times particularly in being able to comprehend well what these information really mean; the initiatives and burden of making this information fairly understandable to the public lies generally on the weather and climate science community. Unable to grasp and understand the underlying effects of weather and/or the climate from such information tends to lead to inaction by the community and sometimes causes a decline in public trust in the long run. Further, they will look away and tend to ignore such information eventually making the situation far worse.

As a flood forecasting and warning service office of PAGASA, the PRFFWC serves, in a way, as the frontline weather and climate disseminator for Region 3 where the center is strategically located within the regional government center compound. While the area covered by PRFFWC is just about half of the whole region, nonetheless, it has been asked quite often by various regional and local entities particularly the DRRMOs for weather and climate information, mostly requested to be explained to their own level of comprehension. It has been a bit of a challenge at the start but being able to observe and accommodate their desires and needs eventually led to a much better relationship and interactions.

ADDRESSING GAPS IN AVAILABILITY OF AND ACCESS TO CLIMATE INFORMATION IN CLIMATE-RELATED DISASTER MANAGEMENT

Susan Asam, ICF International

Critical to improved use of climate information in climate-related disaster management is ensuring that information is useful (i.e. tailored to the specific decision), accessible, and available (i.e., it exists). In many parts of the world, the availability of climate-related data and information is lacking due to non-existent and/or deteriorating observation networks and other reasons. Even when the information exists, its accessibility can be limited (e.g., paper records, remotely sensed or GCM data and information may exist but are not accessible to local decision makers). Finally, even when information is both available and accessible, it may not be presented in a form that is useful (i.e., informative, actionable) to decision makers. Decision support tools, including maps and other visualizations, data processing and other tools, compilations of information in the forms of guidance, factsheets, and case studies (when tailored to meet specific needs) can help translate complex information into a more easily accessible and useful format. This talk will provide an overview of these challenges. It will then walk through several examples from the field where these challenges have been addressed to effectively meet the needs of decision makers at the regional and local community levels.

BEST PRACTICES FOR CLIMATE-RELATED DISASTER MANAGEMENT: AUSTRALIAN EXPERIENCE

Paul Gregory, Bureau of Meteorology, Australia

The Australian Bureau of Meteorology is a federal government agency and its expertise and services assist Australians in dealing with the harsh realities of their natural environment, including drought, floods, fires, storms, tsunami and tropical cyclones. In recent years, a major component of these forecasts occur in the context of seasonal forecasts based on the broad scale climate drivers that influence the Australian climate. These include El Niño Southern Oscillation, Indian Ocean Dipole and the Madden and Julian Oscillation amongst others. A case study is presented showing how recent changes in the Indian Ocean Dipole created increased risks for the Australian agriculture sector and emergency services for the coming spring. Examples of our publicly available products are shown, along with discussions on how the Bureau presents these risks to national and regional governments and other stakeholders such as water resource managers, the Department of Agriculture and Water Resources and the Department of Foreign Affairs and Trade. Central to our capacity to communicate hazard risk and resilience is ensuring the Bureau's relevance and responsiveness with our customers. Continued scientific and technological developments combined with frequent engagement are both important factors.

SESSION IV.
THE EFFECTIVE USE OF CLIMATE INFORMATION FOR EFFICIENT DECISION MAKING AND DRR OPERATIONS

INTEGRATED RISK ASSESSMENTS: MAKING SCIENCE USABLE

Jane E. Rovins, PhD, MPH, CEM
Disaster Reduction and Resilience Solutions, Ltd.

For generations, disaster risk management practitioners have implemented protective hazard programs with the objective of making communities safer and more sustainable. For decades, academia has researched and published findings, with the expectation that their work will demonstrably contribute to making communities safer and more sustainable. If both practitioners and researchers are working for the same goal why it is we are still talking about making communities safer and more sustainable but seemingly not making much meaningful progress toward that goal? Is it that there is a fundamental relationship or communications breakdown between the two groups?

This presentation will look at how the relationship between practice and science can be improved in an effort to make real, measurable strides towards safer and more sustainable communities by utilizing integrated risk assessments. How is science influencing policy and practice? We will also examine the issues that can prevent this from happening. Why, with so many smart people dedicating their lives to the fields of practice and research, can't we get this to work? We will look at where the global agenda is going and look at whether we are forging a new path or pushing our way down the same path as we historically have.

FLOOD INUNDATION MODELING FROM REACH TO CONTINENTAL SCALE: CHALLENGES AND OPPORTUNITIES

Venketesh Merwade
Associate Professor
Purdue University

Floods are the most damaging of all natural disasters, adversely affecting millions of lives and causing financial losses worth billions of dollars every year across the globe. Flood inundation maps play a key role in the assessment and mitigation of potential flood hazards. Creating a flood inundation map is a resource intensive task in terms of data collection and modeling. However, with the availability of global topographic data in the form of Digital Elevation Models (DEM), and improved access to computational tools and resources, it is now possible to create flood inundation maps at any scale ranging from reach to watershed to continental scale. The data requirements for flood modeling and mapping vary from reach to reach, and from one scale to another. Additionally, many flood maps that are created through the engineering approach of hydrologic and hydraulic modeling also contain uncertainty arising from data, model setup and subjective decisions. This presentation will first highlight the many challenges that exist in creating an accurate flood inundation map at reach scale based on the results from several studies in the United States. Next, an integrated modeling approach that couples a large scale hydrologic model with a hydraulic model to simulate flood inundation for the Mississippi River basin in the United States will be presented. Finally, a nonconventional approach using soil information for mapping floodplains will be presented for the continental United States. While the overall flood modeling approach continues to improve with better data and computational tools, the use of nonconventional techniques also show promising results. These nonconventional techniques using soil and topography data may enable rapid mapping of floodplains in developing countries with limited resources.

USING DROUGHT INDICATORS FOR DISASTER RISK MANAGEMENT: A CASE STUDY OF DAM INFRASTRUCTURE IN THE PAMPANGA RIVER BASIN, THE PHILIPPINES

M.A Gusyev, A. Hasegawa, P.Sanchez, and H. Sawano

International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO, Public Works Research Institute (PWRI), Tsukuba, Japan

Drought disaster risk management is a challenging task due to complexity of drought disasters and requires an integrated approach including drought identification, mitigation and adaptation. Natural drought disasters slowly propagate through the water cycle making identification difficult. For example, the drought cycle starts from lack of precipitation (meteorological drought), runoff reduction (hydrological drought), soil moisture deficit (agricultural drought) resulting in low baseflows (hydrological drought). These natural droughts may cause a shortage of water needed for day-to-day human activities and result in water scarcity (socio-economic drought) a few months to years later. For the socio-economic drought identification, available water and discharge operation of a reservoir influence mitigation and adaptation strategies of disaster risk management. Therefore, one of the biggest challenges is to have a robust approach for drought identification using available information.

In the Philippines, several major droughts occurred between 1980 and 2015 (most severe in 1998), which caused major losses of rice production in the Pampanga River basin and food shortages nationwide. Both wet and dry season irrigated rice agriculture in the basin contributes about 30% of the rice production of the country and relies on the complex water infrastructure system consisting of barrages, irrigation canals, Pantabangan and Angat multi-purpose dams, and trans-basin tunnels to increase inflows into these two dams. The Pantabangan and Angat dams supply irrigation water for the rice production, while the Angat dam also supplies water to the Metro Manila population.

For drought identification, we apply standardized indices to identify natural and socio-economic droughts at the Pantabangan and Angat dams using observed hydro-meteorological and satellite-based information. In our assessment, we utilized the standardized precipitation index (SPI) to characterize meteorological droughts, the standardized inflow index (SII) for reservoir inflows, to characterize hydrological drought assessment. To characterize socio-economic droughts, we applied the standardized reservoir storage index (SRSI) computed with reservoir inflow and water volume data, and compared SRSI values with standardized discharge index (SDI) values. These SDI values were estimated from dam discharges released to meet irrigation and municipal water demands. In addition, satellite-based vegetation indices are utilized to identify agricultural droughts.

In the Pampanga River basin, our proposed indices identified several natural and socio-economic droughts that matched historical drought records. The construction of trans-basin tunnels was reflected by SII and SRSI wherein more water became available in both dams. The use of multiple standardized indices allowed us to identify the most extreme conditions based on the combined meteorological, hydrological and socio-economic droughts. Satellite-based indices highlighted the spatio-temporal behavior of drought development in the agricultural area and proved to be a useful tool for the timely implementation of drought disaster risk management strategies. As a result, this full-set of indices could be applied for near-real time monitoring of natural and socio-economic droughts. In addition, the standardized indices could also be utilized for drought forecasting using existing model outputs such as the BTOP discharge simulations with 3-month seasonal climate forecasts to provide appropriate and timely strategies for the upcoming cropping seasons.

DEVELOPMENT AND APPLICATIONS OF A TYPHOON CATASTROPHE MODEL OPEN CYCLONE

Dr. Weihua Fang
Beijing Normal University

Typhoon, one of the major disasters in the world, often causes catastrophic loss to both human life and economy. Risk financing instruments such as typhoon disaster insurance, could be of vital importance to the risk management of typhoon.

Understanding and quantification of the probabilistic distribution of typhoon loss at the level of building, location, zip-code and administrative boundary, is usually the prerequisite of risk transfer, which has been a great challenge. In the past two decades, methodology on catastrophe risk modeling has been proposed and developed to meet the challenge. In this presentation, the development and applications of a typhoon catastrophe model,Open Cyclone,will be introduced.

Open Cyclone is comprised of four components: 1). Hazard Module: an event generation model is developed to produce a large amount of stochastic events (for example 10,000 years) of typhoon track and intensity with Monte Carlo method, a parametric windfield model considering elevation/topographic effect and landuse/roughness effect is used to simulate simultaneous windfield and typhoon wind footprint, and a parametric rainfield model considering the orographic effect is developed to model typhoon rainfall: 2). Exposure module: an internal exposure classification system is defined according to the construction type, occupancy type, age of construction, etc. of exposure, for use in Open Cyclone. Besides, an exposure exchange interface is developed to link external exposure types from the end users: 3). Vulnerability module: vulnerability curves and matrices of all internal exposure types defined in Open Cyclone are developed based on the analysis on empirical datasets, such as government statistics, field survey, and insurance claims: 4). Financial module:firstly physical damage is to be derived based on hazard and vulnerability modules with customized exposure input from the users, and secondly economic loss is to be computed considering insurance policy structure (deductible and limit, etc.).

Open Cyclone has applications in both government sectors and insurance industry. In the presentation, the detailed risk assessment for Hainan province of China, and an index-based insurance program design and pilots supported by the Ministry of Finance of China and World Bank will be introduced in detail.

HYDRO-METEOROLOGICAL DATA AND MODELING FOR FLOOD FORECASTING AND LEADING TO BETTER RESPONSE FOR FLOOD MANAGEMENT IN INDUS RIVER BASIN IN PAKISTAN, A JICA FUNDED UNESCO PROJECT

A.Sugiura[1], J.Naseem[2], A.Younas[2], R.Shah[2], K.Yoshida[3] and S.Khan[1] as project leader.
[1]UNESCO Office Jakarta, [2]UNESCO Office Islamabad, [3]formerly UNESCO Paris)
Acknowledgement to ICHARM, JAXA, SUPARCO and PMD colleagues and partners of the project.

In current climate projections, water related disasters are forecasted to become more frequent and more extreme. This is particularly true for floods as it is observed in recent devastating floods in Pakistan with the notably deadly 2010 flood claiming close to 2,000 victims. Therefore, it is essential to strengthen soft and hard adaptation measures in order to increase local and global resilience and reduce fatalities as well as negative impacts of floods. The case of Indus, a 1.12 million km^2 transboundary river is challenging in many ways. First it is a very large river basin, second, its transboundary character needs international cooperation and coordination during floods and finally its lack of sufficient observed hydro-meteorological data as input data for modelling. This paper will present how flood forecasting and early warning as well as management capacity was strengthened in Pakistan during a JICA funded project, which was implemented by UNESCO from 2011 to 2014 and how hydro-meteorological data are then used for flood forecasting and alert issuance in Pakistan. This project was articulated around three main components: 1) a data and hydrological modelling component which introduced two tuned hydrological models (IFAS and RRI) on main Indus river basin, 2) a Software Platform PIFMIS for Transboundary and domestic data sharing component and 3) a local capacity building component including MSc and short training courses in Japan. In order to strengthen flood forecasting and early warning on main Indus, two ICHARM hydrological models were tuned on main Indus River from its very upstream in the Himalayas to its outlet in the Arabian Sea. The models can provide discharges forecast at key points and inundation maps based on different breaching scenarios. Moreover, the models can rely on tuned satellite based rainfall estimates GSMaP developed by JAXA. That information is then used for flood forecast and eventually early warning issuance by the relevant organization in Pakistan.

A SMARTER WAY OF MANAGING DISASTER RISKS: THE USE OF SCIENCE AND EXISTING WEATHER AND CLIMATE INFORMATION

Lesley Jeanne Y. Cordero
Senior Disaster Risk Management Specialist
World Bank

The Philippines is among the top global disaster hotspots, ranking 8th among countries most exposed to multiple hazards. In terms of percentage of GDP, the country ranks 13th in economic risk from natural disasters, with activity amounting to at least 85% of GDP located in at-risk areas. In 2013, Typhoon Haiyan, considered as the strongest typhoon ever to make landfall struck the Philippines. The total damage and loss from the disaster was estimated at PHP 571.1 billion (USD 12.9 billion) hampering economic growth by about 0.9 % in 2013, and another 0.3 % in 2014.

Catastrophe risk assessment for the Philippines shows that during a 25-year period, there is an over 50 percent likelihood that such magnitude of loss would occur again. With disasters becoming a “new normal”, the Philippines is facing a growing threat that requires new approaches to managing these risks.The smartest way to do this is to use science and all available weather and climate information to develop simple tools and practical solutions that will help government implement disaster resilient policies and engage in risk informed investments and development planning.

The World Bank is assisting the Government of the Philippines develop a socio-economic resilience tool – a national-level tool based on welfare economics – to assess the socio-economic resilience to multi-hazards and identify the most promising policy options in different contexts to reduce the impact of hazards on well-being. The tool is applied to 90 countries using open databases, and can serve as a starting point for designing policies and more in-depth local studies. We find that improving socio-economic resilience can decouple welfare losses from asset losses. For instance, reducing poverty leads to higher asset losses but reduces their impact on well-being .

Currently the Bank is assisting government in projects such as the conduct of multi-hazard vulnerability assessment for priority cultural heritage sites, provide disaster risk reduction recommendations for revisions in the National Building Code, and develop a post-disaster shelter assistance framework. In pursuing these, the overarching thrust is to always build on the multi-hazard maps, early warning systems, and science-based data that are available as the smarter, more cost-efficient, and sustainable approach to disaster risk management.