

PROCEEDINGS

FIRST NATIONAL CLIMATE CHANGE AND HEALTH DIALOG, MARSHALL ISLANDS



JANUARY 30-31, 2020

**INTERNATIONAL CONFERENCE CENTER
MAJURO, REPUBLIC OF THE MARSHALL ISLANDS**

HOSTED BY:

RMI MINISTRY OF HEALTH AND HUMAN SERVICES

RMI OFFICE OF ENVIRONMENTAL PLANNING AND POLICY COORDINATION

EAST-WEST CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

UNIVERSITY OF HAWAI'I SEA LEVEL CENTER

WORLD HEALTH ORGANIZATION WESTERN PACIFIC REGIONAL OFFICE

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OBJECTIVES & OUTCOMES

RMI NATIONAL CLIMATE CHANGE AND HEALTH DIALOG

The overall objectives of the dialog were to:

- Raise awareness of the state of knowledge of climate science, impacts, and adaptation for all key stakeholders in RMI, with an emphasis on the health sector.
- Explore and learn about climate and weather service products and services that can be used to support health-related planning and response In RMI.
- Inform the providers of climate products and services about the unique requirements in terms of format, content and timing of information necessary to inform decision-making as it pertains to the health sector in the RMI.
- Jointly identify improvements can be made with respect information flow, decisions and actions that can be used to enhance situational awareness and support decision-making as it pertains to the health sector in the RMI.

The expected outcomes of the dialog were:

- Improved ability to generate accurate, timely and regionally-relevant information about climate change and variability and climate impacts to the health sector in RMI
- A user community that is better informed about the current state of knowledge about climate variability and change and its impacts on human health in the RMI, and as a result are able to make better decisions as they set priorities and allocate resources
- A provider community that is better informed about what problems and questions are most relevant with respect to human health in the RMI and, as a result, are better able to match climate and weather-related products and services to user requirements.
- Identification of key messages and best practices for the health sector and key stakeholders in the RMI in responding to climate impacts

AGENDA

January 30, 2020

Time	Activity	Facilitator(s)
8:30AM	Coffee and Registration	
Opening		
9:00	Opening Ceremony	Laura Brewington, Francyne Wase-Jacklick
9:45	Morning Tea and Photo	
10:00	General Introductions and Welcome	Laura Brewington, Francyne Wase-Jacklick
10:15	Overview of Climate Services and Dialog Process	John Marra
Session 1: Share Climate Stories		
10:30	Share Local Climate and Health Stories <i>Small group exercises</i>	Laura Brewington, Francyne Wase-Jacklick
11:30	Identify Key Messages and Best Practices	Dan Ervin
12:00PM	Lunch	
1:00	Document Historical Climate-Related Events and Impacts	John Marra, Francyne Wase-Jacklick, Reginald White
2:00	Report Out Timelines, Synthesis	John Marra
3:00	Break	
3:15	Share Technical Knowledge – Understanding the Climate of RMI <i>Part 1: Climate and weather</i> <i>Part 2: Variability and change</i>	Matthew Widlansky, Reginald White, John Marra
4:15	Question and Answer about the Climate of RMI and Existing Sources of Information	Matthew Widlansky, Reginald White
4:30	Wrap-up	Laura Brewington, John Marra

RMI NATIONAL CLIMATE CHANGE AND HEALTH DIALOG

January 31, 2020

Time	Activity	Lead/Presenters
8:30AM	Coffee and Registration	
9:00	Overview of Climate Services and Dialog Process	John Marra
Session 2: Diagnose Climate Services Delivery		
9:15	Diagnosis: Climate and Health in the RMI <i>Small group exercises</i>	Laura Brewington, John Marra
10:15	Morning Tea	
10:30	Remedy: Climate and Health in the RMI <i>Small group exercises</i>	Laura Brewington, John Marra, Dan Ervin, Francyne Wase-Jacklick
11:00	Report Out Timelines, Synthesis <i>Group representatives, entire group</i>	
12:00PM	Lunch	
1:00	Health Within the Larger National Disaster Management and Climate Adaption Construct <ul style="list-style-type: none"> • RMI Structure for Integration and Coordination of Climate and Resilience Activity – Office of the Chief Secretary, Kino Kabua • RMI National Adaptation Plan – Office of Environmental Planning and Policy Coordination, Broderick Menke • Mitigation Working Group – Angeline Heine-Remiers • NDCP Working Group – Office of Environmental Planning and Policy Coordination, Jane Ishiguro • WHO Findings from November 2019 Consultation – World Health Organization, Dr. Mohammad Nassir 	Francyne Wase-Jacklick
2:30	Question and Answer	
2:45	Break	
Session 3: Build Climate Stories		
3:00	Build Climate Stories <i>Small group exercises</i>	Laura Brewington, John Marra
3:45	Share Climate Stories <i>Group representatives</i>	
4:15	Next Steps <i>Entire group</i>	
4:30	Wrap-up	John Marra, Laura Brewington



Official conference participant photo

SESSION SYNOPSIS

Session 1: Share Climate Stories

“The RMI has been in a state of health emergency for seven months.” During his opening remarks for the Dialog, Secretary of Health Jack Niedenthal described the resounding health impacts that are being observed in the RMI: “This is not about waiting for the sea level to rise, weather to change, that’s not what’s driving this. It’s climate change health impacts. This is the new normal; this is something we have to be leery of.” The RMI and nations of Micronesia are especially severely affected by climate change because they already have very high rates of diabetes and tuberculosis, so a new and novel disease requires additional protections. He estimated that the dengue outbreak that began early summer 2019 has cost over US\$2 million – “think of all the things we could have done with that money [had we contained the outbreak],” he said. “Climate change is not just rising sea level and weather change. It’s health, it’s disease, and it’s impacting people right now.” Health Secretary Niedenthal’s remarks were followed by an introduction by Dr. Eunyoung Ko, World Health Organization (WHO) Liaison for Palau, the Federated States of Micronesia (FSM), and RMI, and welcoming remarks by Dialog organizer Dr. Laura Brewington from the East-West Center (Honolulu, USA) and the RMI Minister of Health, Bruce Bilimon.

RMI NATIONAL CLIMATE CHANGE AND HEALTH DIALOG



RMI Secretary of Health Jack Niedenthal (left); WHO Liaison Dr. Eunyoung Ko (right)

Dr. John Marra from the US National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information provided some background information on climate services and an overview of the climate dialog process. Climate services can provide an outlook for expected patterns of change or long term trends, depending on the climate variables a user is interested in. Specific objectives for the Dialog included the following:

1. Achieve a better understanding of how climate change impacts could be relevant to the RMI health sector;
2. Improve the two-way exchange of information between health policy decision makers and climate services professionals; and
3. Enhance the ability of the RMI health sector to utilize information and respond to environmental threats to health.



Dr. John Marra introducing the Dialog process

Share Climate and Health Stories

Story tellers were selected by the conference organizers to describe some of the relationships they have seen in the RMI between climate change and health. Participants were given a list of key messages to guide climate services and delivery, to consider as they listened to the story tellers. These seven messages, though generic in nature, were captured through previous Dialog processes in the Pacific across many sectors:

1. **Engage with the community and other stakeholders early and often** – building community ownership and participation from the beginning leads to more positive, sustainable outcomes.
2. **Know your physical/environmental setting** – using locally-relevant indicators to understand and predict the impacts of a changing climate will help to ensure that products and services are appropriate to time and place.
3. **Know your social/cultural setting** – understanding community values, aspirations, and perspectives, as well as the sensitivity of assets critical to and the adaptive capacity of the community will drive adaptation from a grassroots level.
4. **Tailor information to the needs of the user** – commitment to an iterative process involving the ‘co-production of knowledge’ at multiple levels will ensure that products and services are specific to sector and locale as well as the nature and timing of decision-making.
5. **Commit to robust and sustained monitoring and assessment** – the maintenance and expansion of existing monitoring networks will lead to an improved ability to understand and predict a changing climate and associated impacts over both the short and long term.
6. **Be aware that impacts due to a changing climate exist along with (and often exacerbate) impacts from a myriad of other non-climate stressors** – climate adaptation will be most effective when it is integrated with disaster risk reduction, sustainable development, ecosystem-based management and other such multi-sectoral approaches to planning and policy development.
7. **Direct attention to the alignment and coordination of activities** – integrated program planning and product development will maximize efficiency and effectiveness (by minimizing gaps and overlaps and maximizing consistency of information and messaging), as well as enrich potential for local to regional capacity development.

Yetla Aliven of the RMI National Disaster Management Office described the processes required to prepare for and respond to vector-borne disease outbreaks in Majuro, which seem to occur in response to drought and inundation events. Her small team identifies and treats sites that are potential breeding grounds for mosquitos, such as unregistered dumping sites for trash, for example. They also send out text messages and alerts to remind residents to reduce sources of standing water and other mosquito breeding grounds outside their homes. The Water, Sanitation, and Hygiene (WaSH) cluster is activated with health representatives who conduct vector control and the local Environmental Protection Agency identifies unregistered dumping areas that are potential mosquito breeding sites. The Red Cross and the International Organization for Migration (IOM) assist with public awareness campaigns for diseases like dengue fever, Zika

virus, and chikungunya. The office faces consistent lack of funding and a lack of public compliance after clean-up campaigns are carried out.

Jill McCreedy has worked as a consultant epidemiologist for the RMI Ministry of Health for the past three years, and has assisted in the development of a climate change plan for the Ministry. Reporting on the regularity of disease outbreaks that are transported through food, water, or by vectors, she recounted some of the most serious outbreaks that have occurred in the last decade: dengue fever chikungunya, and Zika virus (vector-borne); typhoid, gastroenteritis, and conjunctivitis (water-borne); rotavirus and hepatitis (food-borne); and influenza (respiratory). She noted that diseases that are transmitted through food, water, or vectors have a certain temporal regularity to them, and these diseases can be especially severe in children who already suffer from malnutrition.

Gino David is a Councilman from the Majuro Local Government Council and a project manager for Jo-Jikum (“your home”), a Marshallese non-profit youth organization. He discussed working with Women United together Marshall Islands (WUTMI) and the Ministry of Health on awareness campaigns from Laura to Majuro for Zika virus and dengue fever. Campaign materials were translated into Marshallese for dissemination. During 2019, he worked with the Ministry of Health and the local Majuro government on messaging and outreach for vector-borne disease. They selected six to eight “Zika warriors” from each village and educated the youth members on diseases, disease prevention, elimination of vector habitat, and health improvements. Churches were also encouraged to initiate their own clean-up campaigns.

Linda Chutaro from the Ministry of Health described their efforts on vector disease prevention. Whenever there is a suspected disease related to a water, food, or insect vector, they conduct an investigation prior to an outbreak. Vector control is part of their normal daily activities and environmental health is always linked to the lab. Now Linda’s team is working with the WaSH cluster to encourage people to keep the environment around their homes clean. The Secretary of Health is also meeting with traditional leaders to try to get them more involved with the dengue control efforts.

Dr. Eunyong Ko, the WHO Liaison for Palau, FSM, and RMI, shared a video produced by the Ministry of Health and the World Health Organization Fiji Office that follows Bobson Solomon and Jackson Jacklick, Environmental Health Officers, in their mosquito control efforts in Majuro. They trap individual mosquitos from various sites in the communities to identify what species are present, spray dumping sites that provide breeding grounds for mosquitos, and report urgent findings to prepare for response. The uncertainty of life in the RMI under climate change is underscored by the urgency of health responses to mosquito-borne threats that may become more severe as temperatures warm and sea levels rise. The video can be found here: <https://www.youtube.com/watch?v=FYfWjfp72So&feature=youtu.be>.



Sharing climate and health stories

Summary of key messages and best practices from climate stories:

- Engage with the youth early and often. Sharing knowledge about climate change is a lot easier when you first empower the youth through what they already know – students might be insecure about climate knowledge, but they share relevant experiences;
- Validate people's local knowledge about the environment and their surroundings;
- There are short- and long-term impacts of climate change, which can be both intense and slow-moving;
- It's important to encourage individuals to be responsible (for their surrounding environment, as an example);
- Disease prevention and control activities should be better aligned, and good coordination between agencies is key.

Document Historical Climate-Related Events and Impacts

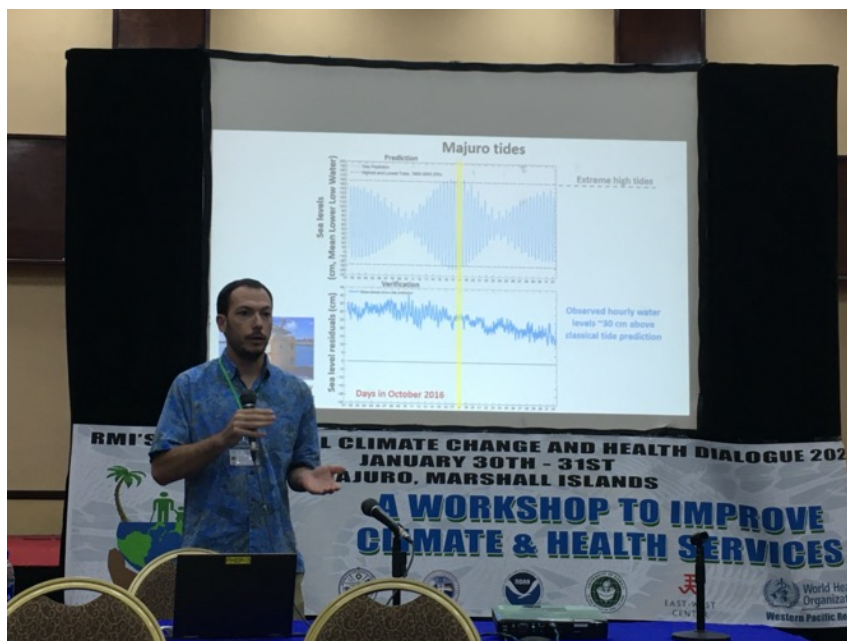
During the second half of Day 1, participants broke into small groups to document historical climate-related events and impacts, through sharing their experiential knowledge. Dr. Marra led the activity and team members facilitated the individual groups as they created two historical timelines: the first timeline documented all historical disease outbreaks as remembered by group participants. Outbreaks included diseases such as cholera, mumps, measles, dengue fever, typhoid, gastrointestinal illnesses, rotavirus, conjunctivitis, Zika virus, and chikungunya. The second timeline documented all historical climate events, again as remembered by participants. These events included droughts, tropical cyclones, and coastal flooding, related to king tides, high sea levels, and/or heavy rainfall. Next, the two timelines were compared to identify similarities and differences between climate-related events and health issues or disease outbreaks. Maps of the RMI were used to document any spatial aspects of these events; for example, outbreaks that only occurred on certain islands or events that only impacted certain sites or regions.



Small groups document historical climate and health timelines

Share Technical Knowledge – Understanding the Climate of RMI

Dr. Matthew Widlansky from the University of Hawai‘i Sea Level Center gave a brief technical overview of scientific knowledge about climate variability and change in the RMI. This technical knowledge exchange focused on three climate variables: sea level, temperature, and rainfall. Observations of the annual cycle and year-to-year variability of the RMI climate were presented, especially in the context of the El Niño-Southern Oscillation (ENSO). The processes involved in generating seasonal climate forecasts were then described using NOAA’s Climate Forecast System-version 2 (CFSv2) as an example of opportunities for providing seasonal climate outlooks to the RMI. The CFSv2 provides information out to nine months in the future about the likelihood for drought or flooding, higher or lower sea levels, and abnormal temperatures. Looking at past forecasts, the presentation showed that high sea levels that occurred in southern Micronesia during 2016 and 2017 were well predicted with a three-to-six month lead time, as was the 2015 drought event. The technical summary concluded with a discussion of existing climate early warning resources for the Pacific Islands region, such as the US Drought Monitor, the US National Weather Service “Current Hazards” website, the Climate Prediction Center Global Tropics Hazards and Benefits Outlook, the Marshall Islands Climate Outlook from the Asia-Pacific Data-Research Center, and the University of Hawai‘i Sea Level Center seasonal forecasting product.



Dr. Matthew Widlansky, University of Hawai'i Sea Level Center

Reginald White from the Majuro National Weather Service Office (WSO) presented a summary of the RMI climate and impacts of climate change on health, as well as existing weather and climate prediction services that are available for the RMI. The RMI has a maritime tropical climate that is humid year-round, with moderate temperatures that vary more from day to night than from season to season. The northern islands experience a wet and a dry season, while the southern islands remain wet year-round. Various climate phenomena impact the RMI's climate in different ways: In an El Niño year, impacts typically last from July to March, bringing drought and more tropical cyclones to the region. The northwest monsoon occurs from September to January and brings heavy rainfall. The Madden Julian Oscillation, the Inter-tropical Convergence Zone, and the northeast subtropical high further influence rainfall patterns at different times of the year. These same phenomena lead to both acute and chronic health impacts: low rainfall and sea levels associated with El Niño events result in scarce drinking water, which elevates incidence of diarrheal disease, conjunctivitis, scabies, and influenza. The La Niña conditions that often follow an El Niño (above-average rainfall and higher sea levels) have been associated with dengue fever outbreaks and ciguatera. Mr. White concluded by sharing some of the existing sources of climate information for the Pacific Islands Region (Table 1). He invited RMI health officials to work with the WSO to determine what new climate prediction products are needed.

Table 1. Sources of climate information for the Pacific Islands

Managing Entity	Product	Website
National Oceanic and Atmospheric Administration	Pacific ENSO Applications Climate Center (PEACC)	https://www.weather.gov/peac/
US Drought Monitor	US Affiliated Pacific Islands	https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?usapi
US National Weather Service Climate Prediction Center	Global Tropics Hazards and Benefits Outlook	https://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/ghaz_verif.shtml
University of Hawai‘i at Mānoa	Pacific Islands Ocean Observing System (PacIOOS)	http://www.pacioos.hawaii.edu/shoreline/runup-majuro/
University of Hawai‘i at Mānoa Sea Level Center	Seasonal Forecasting Product	https://uhscl.soest.hawaii.edu/sea-level-forecasts/
Asia-Pacific Data-Research Center	Marshall Islands Climate Outlook	http://apdrc.soest.hawaii.edu/dashboard_RMI/
Australian Bureau of Meteorology	Long-range weather and climate	http://www.bom.gov.au/climate
Pacific Meteorological Desk & Partnership	Online Climate Outlook Forum (OCOF)	https://www.pacificmet.net/products-and-services/online-climate-outlook-forum
Secretariat of the Pacific Community (SPC)	Pacific Ocean Portal	http://oceanportal.spc.int/portal/ocean.html
New Zealand National Institute of Water and Atmospheric Research (NIWA)	Island Climate Update (ICU)	https://niwa.co.nz/our-science/climate
Asia-Pacific Economic Corporation (APEC)	APEC Climate Center (APCC)	https://www.apcc21.org/climate

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To conclude Day 1 of the Dialog, participants were invited to a social mixer and dinner at the Marshall Islands Resort, hosted by the RMI Ministry of Health and Human Services.

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Session 2: Diagnose Climate Services Delivery

During the first part of Day 2 of the Dialog, breakout groups convened to focus on two primary disease types whose outbreaks may be related to climate variability and extreme events: vector- and water-borne disease.

Diagnosis: Climate and Health in the RMI

During the diagnosis, groups first recapped the climate events and health-related impacts that were identified the previous day during historical timeline development. They were then asked to detail the existing preparation and response systems for vector- and water-borne disease outbreaks. Guiding questions included the following: What are the existing climate services that support situational awareness leading up to an outbreak? What actions are taken before, during, and after an outbreak, and what are the strengths and weaknesses associated with them? What other parameters or information did you wish you had to take action or make decisions? The goal

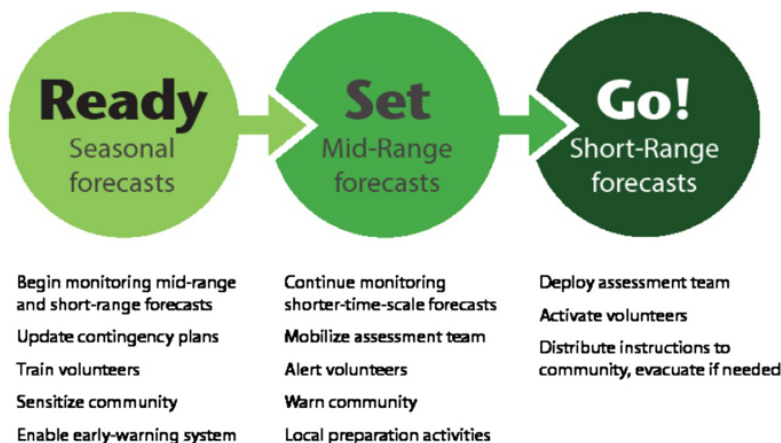
of this session was to begin to “diagnose” the strengths, weaknesses, and opportunities for existing climate services to support climate early warning for the health sector.



Small groups diagnose preparation and response systems

Remedy: Climate and Health in the RMI

During the remedy session, breakout groups considered the current capacity for RMI to deliver end-to-end climate services for the health sector. Key messages and best practices were consolidated from the previous session, to be incorporated into climate and weather information systems for related vector- and water-borne health risks. Small group representatives noted that there were many things that were triggered in the “during” and “after” stages of a health outbreak, but very little is prepared to launch in the “before” stage. This highlighted the need for a climate early warning system for the kinds of events that seem to trigger vector- and water-borne diseases, such as drought and extreme rainfall events. Dr. Marra provided examples of existing products and tools for climate services in the Pacific that can be used to enhance situation awareness and support decision-making, such as the RMI Agroforestry Dashboard, the Solomon Islands Malaria Rainfall Watch, and the Guadalcanal Rainfall Prediction Tool. He also described how Columbia University’s “Ready-Set-Go” framework can be used to create a climate action plan that links climate prediction tools at different timescales to various stages of preparation and response.



The Ready-Set-Go climate action plan framework developed by the International Research Institute for Climate and Society at Columbia University

Youth Participation

Students from the College of the Marshall Islands, Marshall Islands High School, and Kwajalein Atoll High School performed songs and read poems that they wrote for the Dialog. Their moving performances described their lived experiences of growing up under a changing climate in the RMI and hopes and fears they feel toward the future. The Kwajalein Atoll High School Health Club also shared their experiences teaching hand washing techniques to local elementary school children, community public health outreach, and community recycling and up-cycling programs.



Students from Kwajalein Atoll High School present songs and poems

Health within the Larger National Disaster Management and Climate Adaptation Construct: Presentations

1. Tile Til Eo Committee (TTEC) – Office of Environmental Planning and Policy
Coordination, Director Clarence Samuel

Mr. Samuel described how RMI's National Determined Contribution (NDC) level was determined by the 2015 Paris Agreement targets and the nation's goal to reach net zero greenhouse gas emissions by 2050. The TTEC is responsible for developing the RMI National Adaptation Plan (NAP), a cross-cutting initiative that incorporates all sectors and ministries, including health. The TTEC is made up of three working groups (Mitigation, Adaptation, and NDC working groups) for the overall management of climate change and its impacts.

2. RMI National Adaptation Plan – Office of Environmental Planning and Policy
Coordination, Broderick Menke

Mr. Menke described the 2050 Climate Strategy that was published in 2018 by OEPPC and the process outlined to develop the RMI National Adaptation Plan (NAP), which is designed to reduce vulnerability to the impacts of climate change and facilitate the integration of climate change adaptation into national policy. The NAP is based on the best available science and traditional and local knowledge, without duplicating existing adaptation planning efforts. It will

be an inclusive, cross-sector plan that should be ready for review by the RMI Cabinet in September 2021.

3. Mitigation Working Group – National Energy Office, Director Angeline Heine-Reimers
Ms. Heine-Reimers described climate mitigation efforts in RMI, an issue that is of particular concern because currently more than 90% of energy in RMI is fuel-based. The RMI National Energy Policy (NEP) was developed in 2009 to improve the livelihoods of Marshallese people through access to clean, sustainable energy sources. NDCs from the Paris Agreement were used to develop the “RMI electricity roadmap” with key technical, human resource, and financial pathways. The Climate Mitigation Working Group ensures that NEP goals are met, such as the installation of more than 4,000 solar home systems in the outer islands. Climate mitigation and energy resources are intertwined with health, so the National Energy Office is an essential component of climate-resilient health systems.

4. NDC Working Group – Office of Environmental Planning and Policy Coordination, Jane Ishiguro

Ms. Ishiguro represented the NDC Working Group (RMI) and the NDC Partnership Coalition (international), of which RMI is a member. The Partnership focuses on six outcome areas: mitigation, adaptation, gender, human rights and health, capacity development, and climate finance, using Intergovernmental Panel on Climate Change (IPCC) guidelines. Under the existing NDC, the RMI is committed to reducing emissions to 45% below 2010 levels by 2030, and to reach net zero emissions by 2050. This will involve significantly reducing emissions from electricity generation, as well as waste and transportation. The RMI NDC Partnership Working Group forum is mandated to provide integrated support services to cross-cutting issues such as gender and human rights application to climate change, health and climate capacity development on climate issues, climate finance management and global leadership. Because the Ministry of Health and Human Services is a key member of the Working Group, an example of this coordination in action was the collaboration to ensure key participants across RMI attended the Dialog, including the youth.

5. WHO Findings from November 2019 Consultation – World Health Organization, Dr. Saori Kitabatake

Dr. Kitabatake summarized WHO’s work in climate change and health in the Pacific, along with the findings from the November 2019 WHO mission to RMI. WHO is currently working with member states in the Pacific to combat communicable disease, protect the health of Pacific people from the impacts of climate change and environmental hazards, and strengthen Pacific health systems. The mission to RMI identified the following themes:

- Recurring outbreaks of climate-sensitive diseases
- Lack of human resources across many sectors
- Challenge to maintain basic infrastructure needs in health facilities
- Limited awareness of health impacts of climate change

They also identified the following health sector needs:

- Establish a baseline to produce evidence-based solutions
- Build capacity for leadership and governance
- Strengthen climate and health early warning systems
- Consider the mental health impacts of climate change

- Develop sustainable business models for indigenous and traditional medicines and therapies

Session 3: Build Climate Stories

The final session of the workshop focused on exploring techniques in climate communication. In Session 2, breakout groups used vector- and water-borne disease outbreaks as examples to diagnose existing climate services available to the health sector and identify the best practices and key concepts for communicating climate change information. Key messages, following the template provided during Session 1, were determined based on participants' input. The second day of the dialog concluded with a set of next steps for organizers and participants who synthesized the outputs of the dialog into the following two climate stories that built on the narratives, timelines, and key messages outlined in the previous sessions. The climate stories followed the format found in the Pacific Island Climate Storybook (http://pacificislandsclimate.org/storybook/Pacific_Islands_Climate_Storybook.pdf) developed by NOAA and the US Agency for International Development (USAID).

Water-borne Disease Climate Story

In late 2012, the months leading up to the dry season were much drier than normal in the northern atolls of the Republic of the Marshall Islands (RMI), known as the outer islands. Wotje and Utrik Atolls received only 28% and 25%, respectively, of their normal rainfall for September through November. By the beginning of 2013, precipitation in the outer islands was already at a huge deficit. "We were looking at the seasonal outlook for rain and it was saying by January, February, March, it's not looking like it's getting any better," recalled Reggie White of the National Weather Service Office (WSO) in Majuro. "You have to realize that the people from the outer northern islands were calling in and saying, 'We are in need of water,'" said White. In January 2013, 13 local governments in the outer islands requested assistance from the national government in dealing with the drought. The ground was cracking and the leaves were turning; the lower atmosphere became drier and the groundwater saltier. The government declared a state of emergency on April 19. On the heels of the emergency declaration, assessment teams sent to the outer islands found that groundwater was too salty and people were suffering associated health problems including gastritis, diarrhea, vomiting, abdominal pain, fever, and hepatitis.



Drought on Ailuk Atoll in 2013. Photo: UNDP

In the early hours of Monday, March 3, 2014, officers from the local police on the low-lying atoll of Majuro, RMI's capital, began knocking on doors to alert residents to the large waves now overtopping seawalls and flooding their properties. Families were evacuated from their homes in the dark of Monday morning. A high tide, which would exacerbate the already significant flooding from high swells, was a few hours away. Almost 1,000 people were relocated to shelters on Majuro, along with around 250 on Arno, Majuro's less populous neighboring atoll. Meals were served in these shelters and bottles were filled with desalinated water in case the flooding further compromised Majuro's fresh water resources.

The RMI experiences regular outbreaks of water-borne disease, and participants in the First National Dialog for Climate Change and Health documented all of the historical outbreaks they could remember. They included diseases such as cholera, typhoid, gastrointestinal illnesses, conjunctivitis, and rotavirus. Certain water-borne (and food-borne) disease outbreaks in the RMI appear to be related to certain types of climate and weather events. For example, low rainfall and sea levels associated with El Niño events result in scarce drinking water, which elevates incidence of diarrheal disease, conjunctivitis, scabies, and influenza. The La Niña conditions that often follow an El Niño (above-average rainfall and higher sea levels) have been associated with ciguatera.

RMI's climate is classified as maritime tropical, which means it is humid with moderate temperatures year-round. It is also characterized by spring and fall transitions between "wet and wetter" for the southern islands, whereas the northern islands experience "wet and dry" seasons. In addition to tropical cyclones, other types of extreme events include drought, which tends to be associated with El Niño events, and coastal flooding that occurs when high tides combined with large waves. Well-recognized periods of drought occurred in 1982-83, 1991-92, 1997-98, 2015-16, and 2018-2019. The occurrences of such events are likely to change in frequency, magnitude, and duration in light of a changing climate. Coastal flooding (or inundation) also occurred in 1979, 2008, 2010, 2013, 2014, and 2019. At the Kwajalein tide gauge for example, high water

events that occurred less than once a year, on average, in the 1960s occurred 22 times a year, on average, during the 10 year period beginning in 2005.

Currently, there are a range of actions, sources of information and partnerships in play before, during, and after water-borne disease outbreaks. When an outbreak is suspected, for example, officials from the RMI Ministry of Health and Human Services inform their national and international partner agencies, procure supplies, and initiate clean-up campaigns to prepare communities and households. The Ministry of Health also analyzes data available from previous water-borne disease outbreaks. In the existing system, however, most of these mechanisms are not operationalized until there is already a diagnosed outbreak.

While certain water-borne (and food-borne) disease outbreaks in the RMI appear to be related to certain types of climate and weather events, such relationships are not clearly established. Further research is need to identify not only the causal relationship but thresholds, time lags and other such information necessary to support decision-making. Recognizing that climate and weather is one of many stressors, such research should also consider other social, economic and environmental factors. This information would inform the development of monitoring and early warning systems.

Increased stakeholder engagement and making people more aware of climate/weather phenomena and associated health risks would also help support a more pro-active, preventative-based response system. Content needs to be culturally appropriate, linked to traditional knowledge, tailored to diverse audiences and be delivered by trusted messengers through established pathways. This includes training for practitioners at national level to help understand and use climate and weather information, training where, as a primary provider of climate and weather information, the National Meteorological Service plays a leading role. It might also include expanding the extension agent model currently employed by the Red Cross by training people, particular in the outer islands as “climate/weather champions”. It might also include the formulation of a quarterly newsletter that provides information about drought, tropical cyclones, and coastal inundation packaged for the health care sector.

Alert Level			
◀ Increasing chance of drier 3 months		Increasing chance of wetter 3 months ▶	
Alert Level	Divisions with <u>Below</u> Normal Rainfall favoured in the coming 3 months	Alert Level	Divisions with <u>Above</u> Normal Rainfall favoured in the coming 3 months
	Samoa		Solomon Is. (Western Region)
	Cook Islands (Southern) Vanuatu (Southern)		Cook Islands (Northern), Solomon Is. (Central and Eastern Regions)
			Tuvalu

The Red Cross produces a seasonal “rainfall watch” for the Pacific Islands region

Considerable information is collected by multiple agencies, institutions, and organizations throughout disease outbreaks. Debriefings that occur after such events could be expanded to include additional analysis leading to the development of lessons learned. Such information could be used to enhance preparation for and response to subsequent outbreaks, and as warranted support modifications to policy.

Key messages and recommendations: Be aware that impacts due to a changing climate exist along with (and often exacerbate) impacts from a myriad of other non-climate stressors. Direct attention should be paid to the alignment and coordination of activities. National Meteorological Service offices are ideally placed to play a major role in climate services delivery by: Serving as a national source for high-quality weather and climate observations that are archived into climate databases and available for analysis to underpin climate services; and collecting and managing climatological data and producing many seasonal climate outlooks for climate variability.

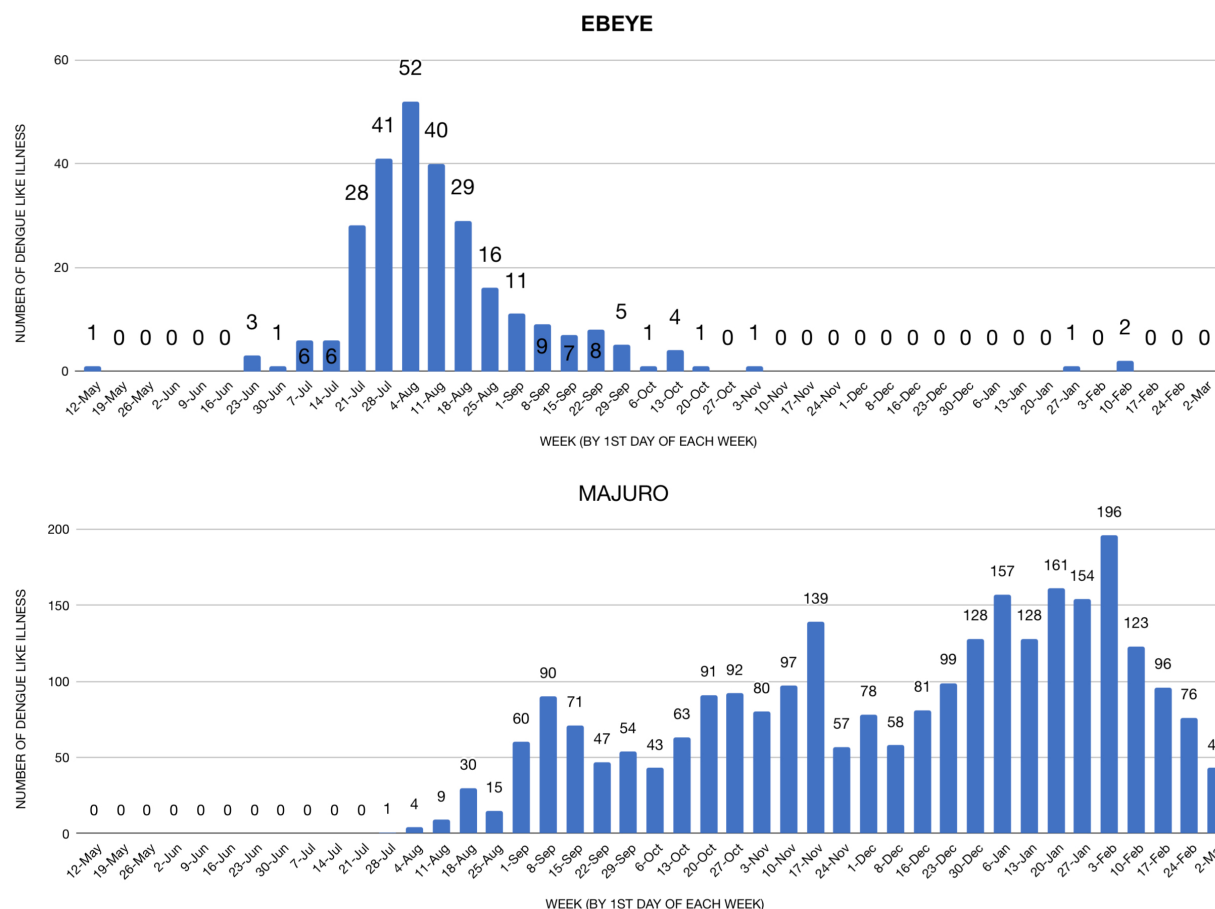
Vector-borne Disease Climate Story

In May 2019, a passenger returned to Ebeye in the Republic of the Marshall Islands (RMI) from the Federated States of Micronesia (FSM). Unknown to them, they were infected with dengue fever (type 3). The RMI had just begun to recover from a recent drought event following some of the driest and hottest years on record. During such periods, many households store water in outdoor receptacles that become breeding grounds for mosquitos. Cases of dengue fever multiplied rapidly, first on Ebeye and then in nearby Majuro, the capital of RMI and home to half of the nation's 53,000 citizens.

The RMI has documented recurring vector-borne disease outbreaks since the early 1990s, including dengue fever, Zika virus, and chikungunya. Over the same time period, repeat drought and inundation events were also recorded. Climate change is a threat multiplier and may lead to increases in the number and type of events that trigger or elevate the risk of a disease outbreak. The Pacific Islands region is prone to prolonged periods of drought, particularly in the western Pacific during El Niño events. In addition, heavy rainfall as a result of changing storm patterns leads to local or widespread regional flooding. Certain climate and weather events, such as drought and extreme rainfall or inundation, appear to be related to vector-borne disease outbreaks in the RMI.

Throughout the hottest months of 2019 (July, August, and September), the number of new dengue cases increased exponentially, first on Ebeye and then on Majuro. Some of the Dialog participants described wearing long sleeves and using insect repellent at first, but then they tired of the discomfort and stopped taking these preventative measures. Emergency protocols were put in place to respond to the unprecedented outbreak, including the creation of a dengue ward at the Majuro Hospital and the arrival of foreign doctors and nurses to relieve sick and exhausted local staff members. Vector surveillance and control activities inspected and fumigated homes, vessels, schools, and churches. Twice-weekly Health Alert radio broadcasts, regular mass text messages, and the Ministry of Health Facebook page provided information about ongoing activities, situation reports, and warnings.

RMI NATIONAL CLIMATE CHANGE AND HEALTH DIALOG



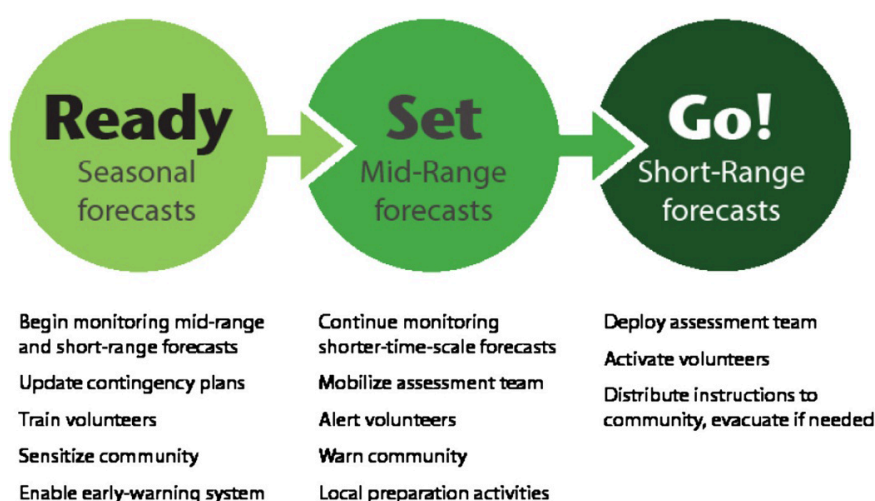
Weekly dengue cases for Ebeye and Majuro, from May 2019 to March 2020. Source: RMI Ministry of Health

As the outbreak evolved into a national state of emergency, a travel restriction was put into place that restricted the movement of individuals between the nation's islands and atolls, stranding many away from their homes, families, and jobs. This decision resulted in a brief drop in the number of new cases until the government lifted the restriction in early December. Public health officials were deployed to outer island health centers to ensure testing and treatment continued; at the same time, widespread public celebrations for the upcoming holiday season caused cases in Majuro to increase sharply once again. By January 2020, it was believed that over 8,000 Marshallese (15% of the population) had contracted dengue fever, and one death, a child, had been attributed to the outbreak.

To better understand how the RMI health sector receives and utilizes climate information, and to improve the provision of climate services in the context of health, the first RMI National Climate Change and Health Dialog was held in Majuro in January, 2020. During the Dialog, participants from the RMI national government, the Ministry of Health and Human Services, the World Health Organization and other policy and youth organizations were divided into small groups and asked to describe the actions that are currently in place for before, during, and after a vector-borne disease outbreak such as dengue fever. When an outbreak is suspected, for example, officials inform their national and international partner agencies, procure supplies, and initiate

clean-up campaigns to prepare communities and households. The RMI Ministry of Health also analyzes data from any previous vector-borne disease outbreaks. In the existing system, however, most of these mechanisms are not operationalized until an outbreak has already been diagnosed.

It is possible to develop early warning systems for the climate conditions that tend to occur prior to vector-borne disease outbreaks, and the Pacific Islands region has good examples of such products. Given that we know periods of drought can lead to increased vector populations in RMI, it's possible to forecast a drought up to three months in advance and begin to prepare supplies and other resources (the “Ready” component of Columbia University’s Ready-Set-Go framework). Quarterly outlooks from the National Weather Service Office in Majuro and the Asia-Pacific Data-Resource Center can also contribute to health sector readiness.



The Ready-Set-Go climate action plan framework developed by the International Research Institute for Climate and Society at Columbia University

Further underscoring the need for climate early warning systems in the RMI, it can take at least three months to order and receive health supplies ahead of an outbreak. With a three to six month lead time for an El Niño event, which typically brings drought, the government can put in requests to partners for aid and supplies in time to receive them before a subsequent outbreak. While waiting for long-term supplies and aid, the World Health Organization can provide emergency supplies for two to three weeks, and the US Centers for Disease Control and Prevention can provide a month’s worth of supplies, to cover any temporal gaps. Weekly drills during the “Ready” stage could help residents prepare for behavioral changes that will need to occur during the outbreak and encourage regular local clean-ups. Meanwhile, in addition to public and media messaging, the government should coordinate outreach to community groups (schools, churches, etc.) who would then communicate directly with their constituents. Once the drought occurs (the “Go” stage), information from past outbreaks and experiences can guide changes in behavior by linking knowledge, skill, and practice.

Key messages from Majuro: Know your setting – engage traditional knowledge and work at both the local and national levels to improve public health awareness. Communication plans need to be formalized and implemented. Most people have access to the radio, so this is the most

effective form of media for disseminating news of a health outbreak or emergency. The weather station is part of the RMI National Disaster Management Council. Social media and Facebook pages also provide users with important public health-related information. Those who don't have access to radio, television, or the internet need community outreach through school groups, peer to peer connections, or churches. Councils for each district hold their own regular meetings, and monthly village meetings with traditional leaders then report to the Mayors to generate a regular information sharing platform.

Key messages from Ebeye: Obtain support from the community early and often. Involving the traditional leaders was key in controlling the dengue outbreak on Ebeye. Monthly clean-ups were spearheaded by the local leaders: every Saturday, residents of Ebeye were required to spend the mornings or afternoons cleaning around their personal homes and areas to reduce mosquito breeding grounds. Traditional leaders are very powerful in RMI and the same efforts could be repeated in Majuro.

Recommendations for how to reduce the impacts of water- and vector-borne disease through climate early warning:

- **Improve coordination** between government agencies in response to health threats. Currently there is no sector-wide coordination mechanism for health and international partners in RMI, whereas in other countries they meet every six months, three months, or even monthly.
- **Train the health sector** to take advantage of advance climate information. The Majuro National Weather Service Office and the Asia-Pacific Data Research Center RMI Climate Outlook already offer online quarterly outlooks for precipitation in time to anticipate a drought. Taking early action based on these and other tools can help reduce the impacts and severity of recurring disease outbreaks.
- **Incorporate climate education** and information into the K-12 education curriculum. Students who participated in the Dialog are eager to be more involved in climate-related activities and want to encourage their peers and family members to be more vigilant about the health-related risks of climate change.