CLIMATE STORIES

From the RMI National Climate Change and Health Dialog

Water-borne Disease

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, 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 rotovirus. 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 Below Normal Rainfall favoured in the coming 3 months	Alert Level	Divisions with Above 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.

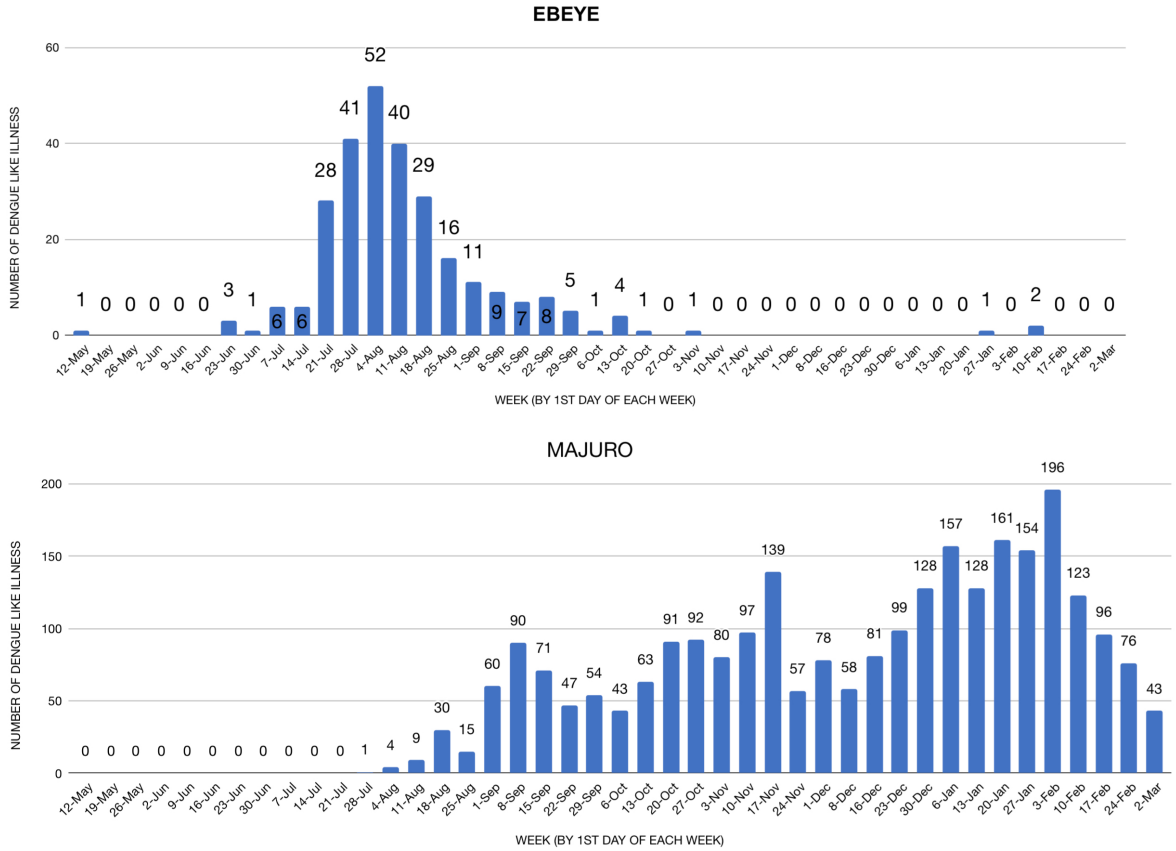
Key messages and recommendations: Be aware that impacts due to a changing climate exist along with (and often exacerbate) impacts from a myriad of other non-climate stressors. Direct attention should be paid to the alignment and coordination of activities. National Meteorological Service offices are 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

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 repellant 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.

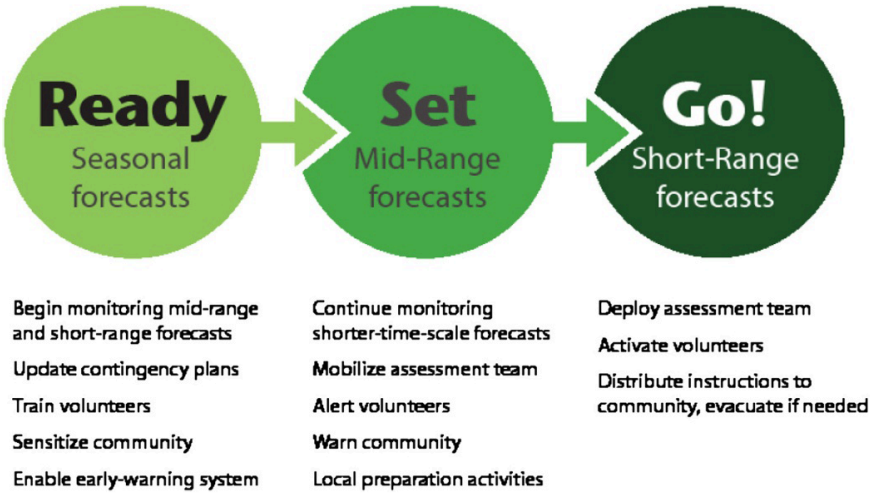


Weekly dengue cases for Ebeye and Majuro, from May 2019 to March 2020. Source: RMI Ministry of Health

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 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.