

Republic of the Marshall Islands
Oceans and Tides
Capacity Report
2015

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Executive Summary

The people of the Republic of the Marshall Islands have a very strong connection with the oceans and tides surrounding their country and the region. Being a country made up of atolls and low lying islands, the Marshallese place a high value on the marine environment for their livelihoods, customs, and way of life.

The capacity to understand, develop and utilise oceans and tides information and services, exists on many levels in RMI. From communities and women’s groups, through to the Weather Service Office, the National Disaster Committee and the College of the Marshall Islands, many individuals and organisations have extensive capacity in understanding, sharing, and communicating information and knowledge about oceans and tides.

Stakeholder engagement and communicating information is particularly extensive in the RMI, with many organisations continually working to find innovative ways to mobilise resources and to improve and expand outreach to communities and stakeholders in Majuro and the outer islands. The Coastal Management Advisory Council is a good vehicle for supporting this collaboration and for the organisations involved to use their knowledge and stakeholder engagement skills to tailor and share valuable information.

Recommendations for future development opportunities have been identified and include focusing on expanding outreach, training, communication and collaboration in:

- Inundation planning, preparation, monitoring and reporting
- Tide and sea level information and its impacts
- Oceanography, including technical knowledge of the digital elevation of the islands and surrounding ocean
- Coral Reef monitoring and reporting

Issues around development project cycles continue to pose a substantial risk to productivity. Resource availability remains an ongoing issue, and sustainability should be a key consideration in all development decisions. It is hoped that the process of developing this document, and its ongoing use, will assist in identifying opportunities and priorities in advance.

1. Background

Context

This document seeks to explore the oceans- and tides-related development priorities for the Republic of the Marshall Islands (RMI).

Priorities were identified through a capacity mapping process. This process occurred at a subregional level, and involved discussions with three representatives from the RMI – one from the NOAA (US National Oceanic and Atmospheric Administration) Weather Service Office, and two based at the College of the Marshall Islands (CMI), including from the University of Hawai'i Sea Grant College Program (UH Sea Grant) and from the Marshall Islands Conservation Society (MICS). The discussions and exercises undertaken sought to establish a big-picture understanding of the existing capacity and strengths in the area of oceans and tides work in-country, and opportunities for further development.

The mapping process was very fruitful, with much information collated and discussed. An incidental benefit of the process was the strengthened relationship between country representatives, and also between regional representatives. Participants expressed that they learned a lot from sharing ideas with each other.



Photo: Reginald White (WSO) and Karl Fellenius (UH Sea Grant, based at CMI) participating in the capacity mapping discussion.

It is prudent to note the limitations of the process. Most prominently, it is difficult (if not impossible) for three representatives – however skilled and knowledgeable – to be able to represent all the information and perspectives of an entire nation on a particular topic/area. While representatives were conscious of the need to present a variety of perspectives, and did so, it should be expected that programs, projects, and needs evolve and certain views or information may be missing from this report – as such, it should be seen as an evolving document and should continue to be built upon into the future.

The capacity mapping process was conducted in partnership with the Australian Government's Climate and Ocean Support Program in the Pacific.

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Regional picture

The ocean plays into many aspects of development in the Pacific region. From larger scale economic development based on fisheries and tourism to local livelihoods reliant on the small boats that transport copra and other goods from remote villages into towns and ports for sale, the ocean provides a foundation for prosperity and growth.

In predominantly coastal-based societies, sea level and tides have a strong influence on daily living and future planning. With much of what happens in island life based firmly within the coastal zone, monitoring sea level and being informed about the normal to extreme range of the tides and wave inundation can inform activities ranging from catching fish to planning resilient infrastructure. Understanding the risks associated with gradual sea level rise (SLR) and climate variability is important to inform commensurate action, in the context of widespread misinformation and anxiety. It is particularly important that residents understand that the climate variability of the El Nino Southern Oscillation (ENSO) can dwarf issues of SLR and king tides due to elevated storm surge risk from tropical cyclones during El Nino, and increases of sea level during La Nina. Moreover, that the Pacific Decadal Oscillation (PDO), Interdecadal Pacific Oscillation (IPO), and shifts in the Intertropical Convergence Zone (ITCZ) all contribute to sea level variability.

It should be recognised from the outset that both regionally and at a local level there are an array of very successful projects and initiatives already operating in this area. This ranges from locally-driven community outreach on coastal management and adaptation, to the regional Pacific Sea Level Monitoring (PSLM) project, which has now been running for more than 20 years and has allowed for the collation of baseline sea level data across Pacific nations.

There is a long history of successful regional approach to projects and regional organisations have often provided resources and support in this area. However there is a common misconception that US-affiliated states are completely “provided for” by NOAA and should thus not be seen as priority countries for the provision of additional support. NOAA continues to work closely with these countries and does provide significant support, but this should not be seen as sufficient for fulfilment of their development requirements in the oceans and tides space.

Common strengths and challenges across many Pacific nations, particularly those that are geographically close, mean that continued dialogues and conversations between key actors in different Pacific countries have enormous value and allow for the sharing of ideas and solutions. It is essential to remember, however, that every Pacific nation has its own **unique strengths and challenges** – which it must leverage or mitigate in the context of development opportunities.

2. Mapping existing capacity

Introduction



The Republic of RMI is an island nation located in the northern Pacific Ocean.

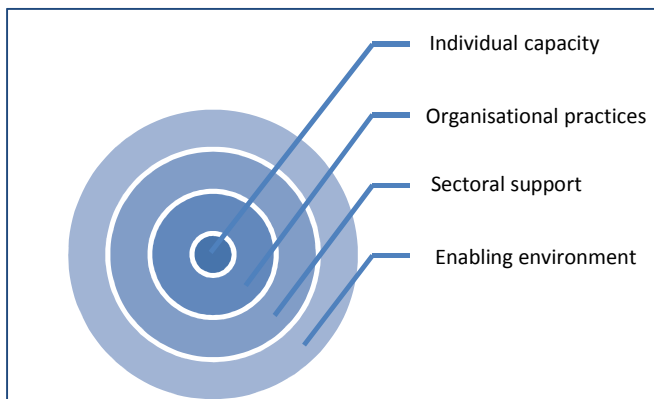
It is made up of 29 low-lying atolls and four low-elevation islands without lagoons, with an approximate total land area of 130km² over 2 million km² of ocean, which forms the Exclusive Economic Zone. Some atolls have lagoons that are less than 1km wide, but most are at least 2-4km at their narrowest point. The highest point above sea level is 3m.

Marshallese people have a deep connection to the ocean, and tides are a daily consideration in most activities. The oceans provide a way of life for them through traditional, coastal, and oceanic fishing and over half of the population live only metres from the high tide mark. The other half live 'inland' and this entails only 50-100m from the shore. Thus all resource management in the RMI is coastal management, there is no distinction despite there being some arbitrary and narrow definitions of the coastal zone in specific legislation and regulation. There is virtually no opportunity to move back from eroding shorelines, especially in urban areas, so setbacks and similar proposed adaptation measures are impractical. Marine resources are the backbone of the modern economy in the RMI, with the government's development priorities focusing on fishing, flagging of ships, agriculture, tourism, handicrafts, and aquaculture. It also has a subsistence economy of fishing, banana, breadfruit, pandanus, and taro cultivation. This has greatly incentivised an approach of care and protection towards the oceanic terrestrial and nearshore environment, not just from governing bodies but also from communities. While the RMI continues to make significant strides forward via the *Reimaanlok* or "Looking to the Future" approach to conservation and sustainable use in rural areas, urban areas and the built environment is largely environmentally-degraded with the population lacking in this conservation ethos.

Some of the major priority issues in the RMI in the tides and oceans space include :

- Minor to Severe wave inundation hazard events - Extratropical cyclones (XTC), tropical cyclones (TC), and tsunamis
- Sea Level Rise
- Drought, Food, and Water Security
- Conservation and Resource Management

Levels of capacity



Capacity in oceans and tides work exists in the RMI on many levels, from individual capacity/skills (both technical and soft skills) of key actors, to organisational practices, and broad sectoral support for initiatives.

The RMI has a particularly strong enabling environment with a very active political and community base already sensitised to the importance of oceanic and tidal factors on the Marshallese way of life. Although there is a tendency to rely on the same group of high capacity people, who are consequently overworked, there is a need to invest in locally-suitable training opportunities and further develop capacity to help share responsibility – this is something that stakeholders in-country are working to address.

At the organisational level, many of the organisations in the RMI are well coordinated in the oceans and tides space. This is particularly evident with the Coastal Management Advisory Council (CMAC), which provides a mechanism for national level collaboration, integration, and technical advice on nearshore marine and terrestrial resource management in the RMI. CMAC provides a mechanism for the *Reimaanlok* (translated: "Looking to the Future") Conservation and Community-Based Resource Management Framework. The accompanying 265-page *Reimaanlok* Field Guide, which some practitioners refer to as the "cookbook," includes guidance on community outreach and awareness, coastal resource management, and island flood risk analysis as part of the holistic process.

It is important to note that although CMAC does not engage in deep ocean fisheries or matters concerning the EEZ and issues of sovereignty, some noteworthy linkages with the oceanic trade sector do exist. CMAC has been asked to comment on development proposals for offshore seabed mining and sustainable marine transport. Funding for these activities is largely driven by significant tuna fishery revenues within the oceanic trade sector. Moreover, the RMI maintains the third largest international ship registry in the world, has a domestic network of interisland transport. There are traditional and innovative ship designs, as well as a coordinated community-based network to implement activities across atolls stretching across a large area of the North Pacific.

In terms of community outreach and awareness, women's and men's NGO groups in the RMI are particularly active in the oceans and tides space. The Women United Together Marshall Islands (WUTMI) organisation works to support the empowerment and advancement of women, through protection of cultural knowledge and human rights, and safeguarding their island environment and inherent resources via community-based atoll resiliency planning. Among men, NGOs that are active in this space include the *Waan Aelon in Majel* (WAM translated: "Canoes of the Marshall Islands"),

Marshalls Billfish Club and Urök (Bottom Fishing) Club. Both sports fishing clubs have rich local knowledge and experience and provide a channel for outreach and awareness in the oceans and tides space.

Indeed, both Marshallese men's and women's groups are deeply connected to their sense of community, which is one of the main drivers behind *Reimaanlok* stakeholder engagement practices. The other driver is the high priority and value placed on correct and up-to-date information - and its effective communication - for decision making at all levels. Future development activities will greatly benefit from utilising these established engagement processes.

Types of capacity

Hard Skills – (Technical)

The WSO has a very high capacity in accessing, interpreting, and using tide, sea level, and climate/wave models and data to generate accurate and timely forecasts for wave inundation in the RMI from a variety of different coastal hazards such as typhoons, tsunamis, and extra-tropical storms. Complementing the WSO, the National Government maintains the national datum through its Ministry of Internal Affairs Lands & Survey Division, which adds significant value to all initiatives that aim to interpret oceanographic risks on low-lying coastlines and communities. UH Sea Grant, CMI, and MICS are active organisations with a high capacity for monitoring impacts and developing capacity within the RMI to provide useful and usable information to agencies and communities. In particular, MICS is actively developing the geospatial analytics capability at CMI to house high-resolution, localized island height survey datasets via the *Reimaanlok* process, and UH Sea Grant is working to advance the Pacific Islands Oceans Observing System (PacIOOS).

The WSO is a part of NOAA and has access to timely and accurate data and forecasts. Through their local understanding of RMI's oceans and tides issues, they are able to add significant value through interpretation of the data and information they receive from the NOAA network. This can be quite challenging given the variety and quantity of data coverage necessary to forecast conditions for over 2 million km² of ocean.

Additionally, NOAA provides some support in technical (knowledge) capacity by providing training opportunities to WSO staff.

Soft skills

Communication skills and stakeholder engagement skills appear strong in-country – both have been demonstrated to be effective in the *Reimaanlok* framework implemented by CMAC members in particular, as well as in WSO and other agencies. The WSO are involved in a range of different networks and projects, which provide them with the ability to communicate their information to a range of audiences (e.g. they carry out outreach in the outer islands and are limited by support resources to do this in all the atolls that need their presence, and so rely on CMAC agencies to supplement their efforts).

The National Emergency and Disaster Management Office (NEDMO) via the National Disaster Committee (NDC) are mandated to disseminate the early warning information they receive from the WSO. Due to limited resources and infrastructure (i.e. Chatty Beetle is only on 5 atolls with limited monitoring) this can often prove to be difficult and therefore impacts the timeliness of the information being disseminated, received, and acted upon.

Cross-cutting issues

Gender: There is a good representation of both genders within government agencies and other stakeholder groups. As highlighted above, WUTMI is an example of active women's groups wielding influence and having impacts across all sectors, thus contributing significantly to decision making.

Traditional culture: Much emphasis is put on preserving traditional culture. This continues to play an active role in encouraging community buy-in by ensuring that decisions align with long-established values. Traditional knowledge in wave refraction dynamics are being pursued by the WAM Program, with support via CMI to integrate this knowledge into shoreline change and wave analysis.

Education: Efforts are underway at CMI in to introduce shoreline change analysis course material focusing on erosion and accretion rates using the GIS-based Digital Shoreline Analysis System (DSAS). It would require, by definition, some amount of GIS ability, so must to be designed in a culturally relevant manner for atoll society pedagogy, including wave refraction analysis, participatory GIS methods, and applications.

Waste Management: Several meetings to discuss waste reduction and management have taken place in recent years with government agencies and non-government entities, potential donors, contracted engineering firms, and communities in Majuro. Jenrok Village in Djarrit has been identified as the new municipal solid waste landfill site to replace the current one on Long Island. In response, Majuro Local Government (MalGov) and the Djarrit Reimaanlok Committee have consulted with various experts on what scientific data gathering activities are needed to better inform a comprehensive Environmental Impact Assessment (EIA). They have learned that the PacIOOS wave buoy data is among those critical datasets which make a comprehensive EIA possible for the site comprising Jenrok and its surroundings (i.e. Djarrit and Uliga areas).

3. Key considerations for future vision-creation and implementation of opportunities

Key stakeholders

There are many stakeholders (and stakeholder groups) involved in oceans and tides work in the RMI. Some key stakeholders include:

NOAA Weather Service Office in Majuro (WSO) - plays a crucial role in informing both public and government departments about oceans, tides, and waves (as well as the weather). Their continued partnership with NOAA and its National Weather Service (NWS) Weather Forecasting Office (WFO) in Guam (whose area of responsibility includes the RMI) also means they are the first recipients of weather-event (emergency) warnings, which they pass on to relevant in-country actors.



National Disaster Committee (NDC) and Emergency Operations Center (EOC)

National Disaster Committee (NDC) - is made up of representatives from government ministries and departments that coordinate and implement emergency response.

Emergency Operations Center (EOC) – is responsible for the oversight of emergency response, as well as the long-term planning around emergencies (including TC and XTC wave inundation, tsunami, drought, and typhoon hazards).



The NDC acts upon the information provided by the WSO by activating the EOC and alerting the public via local media. In the cases of wave inundation and typhoons the NDC also directs the Ministry of Public Works to build berms in vulnerable areas. All resources within the national disaster management structure are utilized and response plans are put into action.

Chief Secretary's Office (CSO) and Office of Environmental Policy and Planning Coordination (OEPPC)

The NDC is chaired by the CSO. Both the EOC National Emergency and Disaster Management Officer (NEDMO) and the Coordinator for the JNAP (Joint National Action Plan) for CCA and DRM (climate change adaptation and disaster risk management) are located at the CSO. The CSO and OEPPC jointly manage the JNAP Secretariat.



Republic of the Marshall Islands
Joint National Action Plan for
Climate Change Adaptation &
Disaster Risk Management
2014 - 2018

Office of Environmental Policy & Planning (OEPPC) – is responsible for coordinating policy and planning to mitigate the effects of global warming and climate change on biodiversity, land degradation, sea level rise, and further threats to sustainable development, livelihood, and human health.

It is the CSO and OEPPC, via the decisions taken at the NDC and implemented through the JNAP Secretariat and the WSO, which drive the RMI national support for oceans and tides programs and projects.

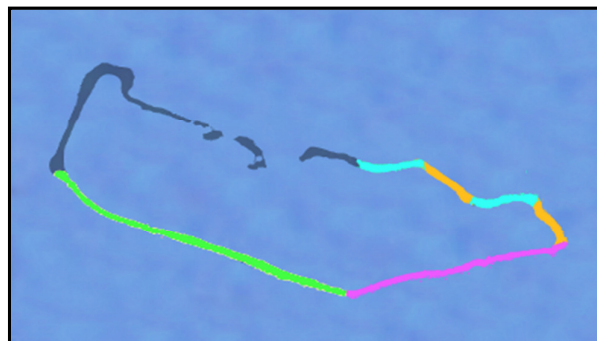
Coastal Management Advisory Council (CMAC) - provides a mechanism for national level collaboration, integration and technical advice on nearshore marine and terrestrial resource management in RMI, including *Reimaanlok*. It is responsible for facilitating cooperation and information sharing among the following organizations:

- Marshall Islands Marine Resources Authority (MIMRA)
- RMI Environmental Protection Authority (RMIEPA)
- Ministry of Internal Affairs (MoIA)
 - Historic Preservation Office (HPO)
- College of the Marshall Islands (CMI)
 - Land Grant
 - UH Sea Grant
- Marshall Islands Visitors Authority (MIVA)
- Office of Environmental Policy, Planning and Coordination (OEPPC)
- Ministry of Resources and Development (MoRD)
- Marshall Islands Conservation Society (MICS)
- Women United Together Marshall Islands (WUTMI)
- International Office of Migration (IOM), RMI Office
- University of South Pacific (USP), RMI Campus

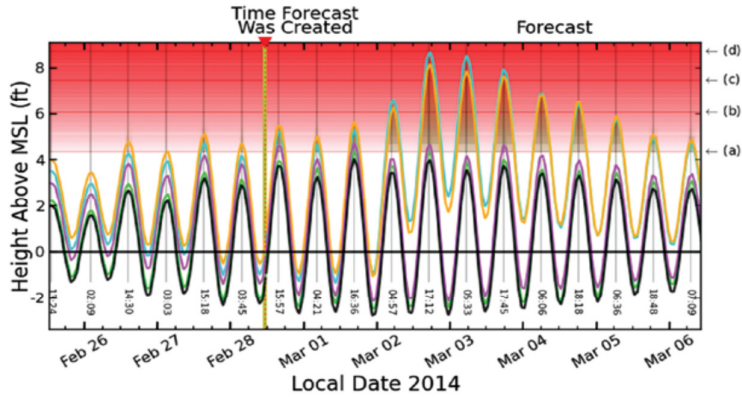
Pacific Islands Oceans Observing System (PacIOOS) – works to develop the observational, modelling, data management, and outreach components of an end-to-end ocean observing system to generate products that help to ensure a safe, clean, and productive ocean and a resilient coastal zone for the U.S. Pacific Islands. PacIOOS has a forecast inundation tool for sea level that includes tides and swells. The tool for the Marshall Islands is available at:

http://pacioos.org/data_product/SLpred/Maj_Exc.php

Forecast of the Potential for High Sea Level and Wave Inundation Along the Ocean-facing Shorelines of Majuro Atoll, RMI



Synopsis: Four separate color-coded forecasts of potential inundation are provided for the ocean-facing shorelines of the most populous islands of Majuro Atoll. A sea level forecast without swell effects is also provided for Uliga Dock inside the atoll at its eastern end.



Jenrok Community Early Warning National Coordinating Team (FINPAC Project)

This Pilot Project focuses on developing and testing a community-based early warning system, linked to the provision of relevant and timely information about imminent weather and climate hazards from the WSO. The Marshall Islands Red Cross (MIRC) and the International Federation of the Red Cross (IFRC) in Micronesia are leading collaborators in the effort along with the WSO. Other members include CSO, EOC, JNAP, Marshall Islands Police Dept., USP, and UH Sea Grant at CMI. MICS is contracted to conduct the integral community baseline survey and analysis.



College of the Marshall Islands (CMI)

CMI via a partnership with UH Sea Grant houses the PacIOOS Liaison, and is a founding partner of the PacIOOS program in the RMI. Students at the CMI Library engage in learning at a Kiosk that displays wave buoy information along with other aspects of the program. The College coordinated a focused inundation modelling effort for the densely-populated portion of Majuro atoll for inclusion in the *RMI Homeowners Handbook to Prepare for Natural*



Hazards. Integral to the chapters on hazard risk and emergency protocols is a discussion on early warning via the inundation forecast and wave buoy.

Marshall Islands Conservation Society (MICS)

CMI also houses MICS which, through a grant provided by the US Department of Interior, is seeking to enhance the holistic *Reimaanlok* Community-Based Resource Management Planning Framework using quantitative GIS tools for climate vulnerability assessments including high-accuracy island height and flood risk analysis. MICS is part of the interagency CMAC which champions the *Reimaanlok* Framework and operates under the purview of the National Climate Change Committee (NC3) chaired by the CSO. Benefits from this interagency partnership are evident specifically in terms of having available quantitative marine, terrestrial, and socioeconomic monitoring protocols including the climate vulnerability assessment tools mentioned above.



UH Sea Grant in the RMI (UH Sea Grant) – plays an important role in information collection, analysis, and provision to both government and community stakeholders alike. Run out of CMI, their coastal management extension agent is particularly involved in coastal resource monitoring and management and very active in related networks. UH Sea Grant partners with PaCLOOS to fund the liaison position as part of their extension activities.

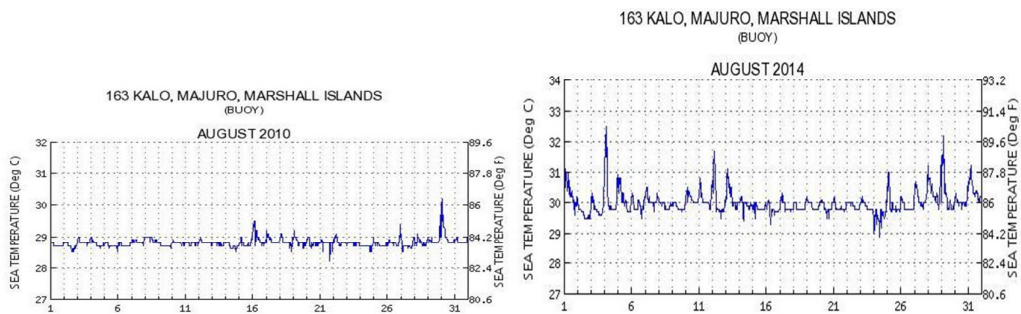
RMI Environmental Protection Authority (RMI EPA) and Ministry of Public Works (PWD) -The Coastal, Land and Conservation Division of the RMI EPA needs oceans and tides information to better assess landowner applications for proposed development along shorelines. There is an effort led by the RMI EPA to produce coastal protection guidelines from reef to ridge that encompass a range of soft and hard options informed by both coral reef managers and coastal engineers. Such guidelines will enable the PWD to make better and more environmentally-friendly berms in preparation for wave inundation events, beyond the current practice of using sand only.



Marshall Islands Marine Resources Authority (MIMRA)

MIMRA is responsible for coastal and oceanic fisheries, as well as the management of all living marine resources in the RMI. They work closely with the Marshall Islands Conservation Society (MICS) and Micronesia Conservation Trust (MCT) to realize the protected areas targets established

through the Micronesia Challenge (MC). One other benefit to MIMRA of oceans and tides information outside of its obvious fisheries and protected areas mandate is Sea Surface Temperature (SST) data. Ocean and lagoon side monitoring via the PaCIOOS wave buoy and water quality sensor yields a time series of data that provides on-the-ground validation of SST satellite products from NOAA's Coral Reef Watch to give early warning of coral bleaching events. Significant information from both the wave buoy and water quality sensor comparing Aug-Dec in 2010 and 2014 was used in a recent national coral bleaching report for the RMI.



RMI Ports Authority (RMIPA) - is responsible for the development, maintenance, and operations of all sea ports, including Ebeye, Uliga, and Delap in Majuro, and the Amata Kabua International Airport located on Majuro Atoll.



Billfish Club, Mico Beach Yacht Club, and WAM (Waan Aelōñ in Majel - Canoes of the Marshalls)

These not-for-profit organizations are located in Majuro but are active throughout the RMI. They are likely the most-informed local users of weather information notably wind and swell conditions and small craft warnings coming out of the WSO.



US Embassy, USAID and International Organization for Migration (IOM) in Majuro

The US Embassy in Majuro has repeatedly expressed their support for oceans and tides information in the RMI since its inception.

USAID through IOM has the responsibility for response during, and reconstruction after significant disasters in Compact of Free Association countries. IOM relies on effective coordination with the WSO, NDC, CSO, and EOC described above. The early warning and forecast validation provides them with additional confidence in the timing and coordination of preparations for the prepositioning of emergency supplies and the implementation of standard operating procedures and other emergency protocols.

Marshall Islands Red Cross Society (MIRCS)

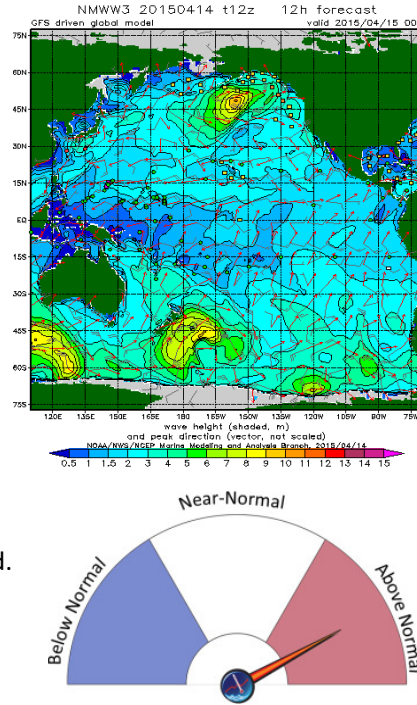


The MIRCS recently established its headquarters in Majuro. Similar to IOM, relies on effective coordination with the WSO, NDC, CSO, & EOC described above. The FINPAC Early Warning System (EWS) Demonstration Project being piloted in Jenrok Village is being supported by the MICS in conducting a baseline assessment of traditional knowledge on weather and climate information and usage, with forthcoming project phases to develop an EWS and expand to other communities in the Marshall Islands. MIRCS has also recently established formal grassroots response capacity acknowledged by the CSO.

NOAA Pacific Region Climate Information Services and Pacific ENSO Applications Climate Center

http://www.pacificcis.org/dashboard_freshwater/

Over the last couple of years there has been an effort to further generate, transform, and transmit relevant climate information to the Pacific Region by NOAA, COSPPac, and partners. In the RMI there was an April 2014 workshop on Freshwater Security and Drought, and a conversation series in April 2015 on Water, Disaster Management, and Agroforestry. All of these sector approaches have a common theme – the need for longer-term early warning of weather and climate indicators related to wave inundation from a variety of coastal hazards. The work strives to link specific sector responses to the provision of timely climate forecast variables in the form of an easy-to-understand dashboard.



Other important stakeholders include:



Information flow & decision-making processes

Information flow in relation to ocean and tides events in RMI are in the process of being mainstreamed at the grassroots community level (e.g. FINPAC Community-based Early Warning System Project), although are seen to be generally well established and understood by relevant stakeholders at the national level.

In terms of information flow prior to and with regard to inundation events, the WSO are the key information providers and gather much of their information and forecasts from NOAA and PacIOOS tools and models to understand the event, which is all readily available and increasingly accessible. The WSO provides information to the CSO, via the NDC for notification and approval of official notice. The NDC activates the EOC, which is managed via the NEDMO. A key area that may benefit from being strengthened would be the capacity of senior government response and coordinating agencies to communicate the relevant science and content of the emergency to communities, to support understanding and action. Working more closely with CMAC may be a vehicle for supporting

the achievement of this through consolidating resources, interagency learning, and working with other agencies to mobilise this valuable information to the outer island communities.

Information flow could further be enhanced in the outer islands by mobilising resources to engage communities to analyse historic trends in coastal change. Communities need to monitor, capture, map, and report on the impacts of tides and oceans wave inundation and coral bleaching events, and assess their impacts. This would be a significant benefit and contribution to further institutionalising such coastal planning and monitoring programs in the RMI.

With regard to the sharing of information and recommendations on coral reefs, the key actor is CMAC, primarily working through *Reimaanlok* and the NOAA/MCT Coral Reef Monitoring Program. Local Government, MIMRA and the RMI EPA have regulatory responsibilities, and look to MICS, CMI, UH Sea Grant, PacIOOS, and Micronesia Conservation Trust/Micronesia Challenge for guidance.

In terms of fisheries, MIMRA works closely with CMAC, Marshall Islands Mayors Association (MIMA) and local government to mobilise resources in support of limiting herbivore fishing and other stressors, such as during thermal stress periods. NOAA Coral Reef Watch disseminates official alerts.

The main methods of communication are through phone, fax, email, and Chatty Beetle (Hazard message to outer atolls, although this method is limited due to number of units available)

Key strengths

There are many strengths evident in the oceans and tides work space in the RMI, and these should both be recognised and leveraged. Key strengths include:

- ❖ There are a number of established and effective outreach activities targeting a range of stakeholders in Majuro and the outer islands, including women's groups and children. Opportunities exist to expand, collaborate with organisations, and consolidate resources to support further outreach in the outer islands.
- ❖ Many in-country actors have strong communication skills, with a robust understanding of the need to tailor communication to different audience groups (e.g. *RMI Homeowner's Handbook to Prepare for Natural Hazards*, the *Reimaanlok* community outreach materials, MIRCS early warning system, IOM school-based emergency management plans, and WSO briefings to the CSO, NDC, and EOC).
- ❖ Active networks in this area are well established, and communication is strong between stakeholder groups. CMAC is an example of an effective facilitation and coordinating body.
- ❖ The stakeholder engagement process around decision making and policy implementation provides for a strong enabling environment. RMI organisations are well connected with each other and open to sharing information and learning from one another.
- ❖ These elements have also contributed to the continued development of strong community ownership of conservation and management of the terrestrial and marine environment, with identification of cross-cutting issues and areas that need to be addressed holistically (i.e. pollution of Majuro and Ebeye, further protected areas under *Reimaanlok* and the Micronesia Challenge)

Past and present projects – lessons learned

Much can be gleaned from the successes and challenges met by past projects.

Elements of most successful projects

- Well-funded
- Responsive to needs / locally relevant stories
- Local ownership and involvement drives the project
- Information is easily understood and accessible for communities
- Supports existing decision-making tools
- Engagement process with community groups works within their roles/responsibilities/resources
- Outer Island/Atoll engagement is essential

Elements of projects that struggled to succeed

- Inconsistent funding
- Non-sustainability in projects ('dumping' tools or cash)
- Development of legislation to support change/action is slow
- Overburdened key stakeholders

Key risks & mitigation

Many of the key risks to consider in designing and delivering development opportunities in the oceans and tides space in the RMI are those that also apply to development opportunities at large.

Issues around development project cycles (i.e. donor-funded projects) continue to pose a substantial risk to productivity. Resource availability remains an ongoing issue, and sustainability should be a key consideration in all development decisions. Funding cycles also mean sometimes the 'cart is put before the horse' in terms of planning, with actors keen to leverage funding opportunities when they arise (sometimes at the expense of longer-term strategising around best use of funds).

Mitigation: It is expected that this document intended for the provides an international audience, in partnership with local stakeholders familiar with ongoing domestic funding cycles and trends, the impetus to identify opportunities and priorities well in advance.

Additionally, while development funding has a strong 'climate change' focus at present, in-country actors are very aware that people's priority is meeting their basic, everyday needs – such as providing shelter and food for their immediate and extended families. There is however, significant concern in the community regarding climate, and uncertainty to what degree their basic needs will be further compromised by "the big elephant in the room" in coming years.

Mitigation: Where possible, development opportunities should capitalize on holistic solutions such as the *Reimaanlok* Community-based Resource Management Framework and consider how outcomes might impact their everyday lives and basic needs. Communication around projects should clearly express these links.

There is also a tendency for community members to attribute all wave inundation events or unusual ocean activity to SLR, which is misleading and quite common as it is one of the more well-known climate risks across the Pacific.

Mitigation: Atoll societies hold a rich language, experience, and traditional knowledge related to gravitational tidal fluctuations which offer a pedagogical opportunity to fashion the scientific concepts of sea level variability and anthropogenic forcing, i.e. SLR. More nuanced aspects of the science and management implications of ENSO, PDO, and IPO climate variability and wave-driven inundation can be “scaffolded” into the collective Marshallese consciousness. This would allow atoll communities to discern differences in the natural variability of bōkā (tides) and flooding from SLR signals, including ocean thermal expansion and glacial melt. Increased outreach in this area would assist in public understanding of the relative contributions and timing of SLR in relation to other climate and ocean risks/processes.

4. Recommendations for future development opportunities in this space

Theme/focal area	Activity	Approach for capacity development/ method/ description	Who will be involved?	Objective / projected impact	Comments
Inundation/ erosion	Outreach	Outreach/awareness activity – inundation planning/preparation [topics: extra-tropical storm surge, king tides, tsunamis, tropical cyclone events, and heavy rainfall].	Communities and groups in all atolls; National & Local Govt., CMAC, and PaCIOOS	<i>Greater quantitative understanding of and community participation in this topic will assist communities, Govt. and agencies in preparing for inundation events and lead to better planning practices and mitigate future risk.</i>	<i>Identified as high priority. Consolidate resources and collaborate with organisations for maximum outreach.</i>
	Outreach and training	Outreach/awareness and training activity – to further develop and enhance the monitoring, capturing, mapping, and reporting of inundation events.	Communities and groups in all atolls; National & Local Govt., CMAC, and PaCIOOS	<i>Greatly contribute to the institutionalisation of a monitoring and impacts system to assist in future planning.</i>	<i>Identified as high priority.</i>
	Outreach and training	Work together to develop Standard Operation Procedures for Community Early Warning Systems.	WSO, NDC, EOC, IOM, MIRCS, CMI, UH Sea Grant, and communities	<i>Greatly improve the preparation of communities for events.</i>	<i>Identified as high priority.</i>
Sea level	Outreach	Outreach/awareness activity – better understand island height and flood risk for planning purposes, conservation purposes, and adaptation [topics: SLR, flood risk, elevated SSTs].	National & Local Govt., CMAC, MICS, and communities	<i>Greater quantitative understanding and community participation in this topic will assist communities and Government in attributing risk, and address misunderstanding of SLR and climate/ocean processes, as well as assist in long-term planning measures.</i>	
Tides	Attachment/ targeted training	Targeted training to build the capacity of 1 or 2 officers in understanding and use of tide data.	WSO officer	<i>As the ‘middle-man’ of tide data, the WSO often acts as a translator. Their understanding of tide data and how to use it correctly will aid in further outreach.</i>	

Theme/focal area	Activity	Approach for capacity development/ method/ description	Who will be involved?	Objective / projected impact	Comments
	Outreach	Developing and distributing tidal calendars/data interlinked with selective fishing practices to relevant stakeholders.	WSO, CMAC, MIMRA, MICS, and communities	<i>Avoid confusion in interpreting multiple tidal calendars using both different datums and units of measurement.</i>	<i>Work must be done between NWS + NOAA + BoM to harmonise available tidal calendar info.</i>
Oceanography	Technical	Technical understanding – Creation/sourcing of coastal topography and bathymetry data to better understand digital elevation of the islands and surrounding ocean.	WSO, MICS, and Lands & Surveys Division of Min. of Internal Affairs	<i>Greater understanding of the coastal topography and bathymetry of RMI will assist in mapping the how and when of wave inundation events.</i>	<i>This activity includes many co-financing opportunities and modular atoll-by-atoll features per the Reimaanlok Framework, making it inexpensive expandable, and sustained.</i>
	Outreach	Creation/sourcing of pedagogical content knowledge (PCK) resource guides for teachers which focus on the different physical contributors of sea level variability.	National & Local Govt., WSO, CMAC, MICS, and communities	<i>Deeper public understanding of the relative contributions and timing of sea level rise and in relation to other climatic climate and oceanic processes.</i>	<i>This activity builds on an existing model for building rigorous and relevant scientific learning materials for teacher and students being practised by MICS.</i>
	Attachment/targeted training	Targeted training to contribute to the capacity of 1 or 2 officers in the area of oceanography.	WSO officer	<i>Address deficit in understanding oceanographic processes.</i>	
Coral Reef	Outreach and training	Outreach/awareness and training activity – to further develop and enhance coral bleaching monitoring and data gathering on impacts, including macroalgal growth.	CMAC and communities	<i>Greatly contribute to reef monitoring and community ownership in protecting the coral reef ecosystem for food security and coastal protection.</i>	<i>Identified as a priority.</i>

Theme/focal area	Activity	Approach for capacity development/ method/ description	Who will be involved?	Objective / projected impact	Comments
	Collaboration	Collaboration to develop geospatial capacity and technical guidelines for coastal protection linked to coastal profiles based on geospatial information.	CMAC, RMI EPA, MICS, Alele, WAM, UH Sea Grant, PWD, Local Govt.	<i>Significantly contribute to integrated coastal management via data-driven decisions on the design and location of hard and soft protection options.</i>	<i>Identified as a priority.</i>