Global Water Security Center

Marshall Islands: By 2050, Rising Sea Levels Will Increase Recurrent Flooding, Inundation.

Capital city Majuro is becoming less habitable as flooding and sea level rise occurs. El Niño droughts exacerbate rainwater-dependent freshwater supply, and oceanic warming threatens vital fisheries.

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Facing decreasing habitability on the 29 atolls and five islands at an average 2-meter elevation that make up the Republic of the Marshall Islands (RMI), many who have not emigrated have moved to Majuro for resources and safety. Rising seas and inadequate infrastructure threaten this adaptation strategy.

A 0.2 m sea level rise (SLR) since 1993 in the RMI has already submerged portions of the islands. Global mean sea level is projected to **increase further 0.2-0.3 m by 2050**[1].

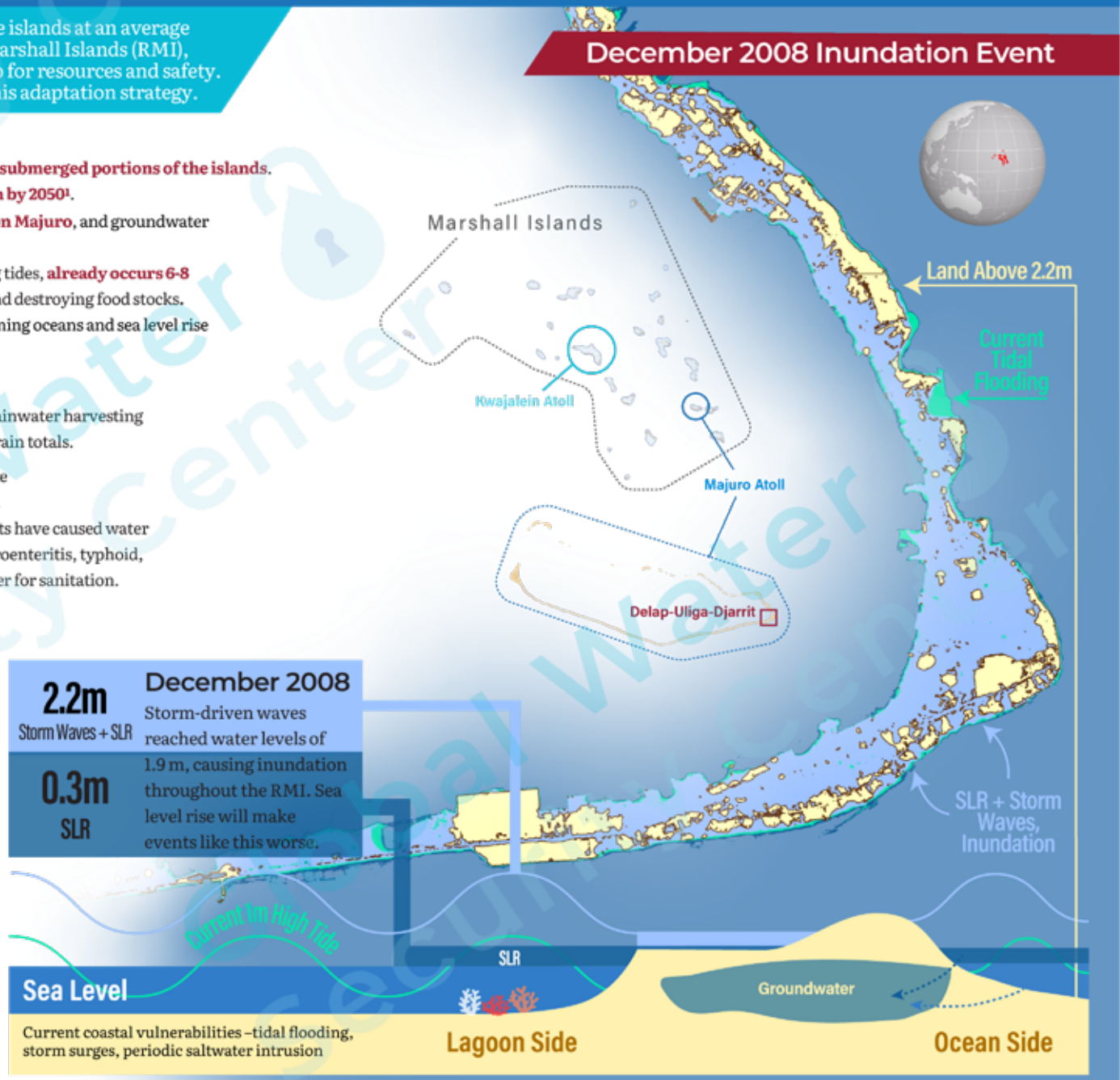
- **Sea level rise and extreme tides have caused land loss on Majuro**, and groundwater is frequently contaminated by salt water.
- **Extensive flooding from extreme high tides,** called king tides, **already occurs 6-8 times a year**, damaging homes, triggering evacuations, and destroying food stocks.
- **Natural wave and storm protection will be lost** as warming oceans and sea level rise **damage coral reefs.**

Drought threatens Majuro's water system, which relies on rainwater harvesting and groundwater (for non-potable water), despite high annual rain totals.

- 75% of households rely directly on rainfall as a water source and have **only two to four weeks of freshwater storage.**
- **El Niño causes severe droughts in the RMI;** past droughts have caused water shortages, agricultural losses, and disease outbreaks (gastroenteritis, typhoid, and pink eye) when households do not have sufficient water for sanitation.

Warming oceans could jeopardize the vital tuna fishery in Majuro and across RMI as tuna may move from their Economic Exclusion Zone (EEZ) to the high seas. **Tuna accounts for more than 50% of non-aid income.**

Higher temperatures will acutely impact the 33% of Marshallese people with type 2 diabetes, which can prevent the body from cooling and cause faster dehydration. Average temperatures are projected to increase by 1.5 C by 2050[2].



Footnotes:

1. Projections are based on the extreme warming scenario, SSP585. Projections that include more complex elements or are locally focused are less developed but project higher sea level rise.

2. The CMIP projections for 2050 under SSP585 do not show a substantial increase in extreme heat days; calculations that account for humidity show elevated heat index, which reflects how hot it feels.

Sources:

Army Corps of Engineers, Institute for Water Resources, Engineer Research & Development Center, and International Center for Integrated Water Resources Management. "Rapid Arias, P.A., et al., 20 21: Technical Summary. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 33–144. doi:10.1017/9781009157896.002.

Bell, Johann D., Inna Senina, Timothy Adams, Olivier Aumont, Beatriz Calmettes, Sangaalofa Clark, Morgane Dessert, et al. "Pathways to Sustaining Tuna-Dependent Pacific Island Economies during Climate Change." Nature Sustainability 4, no. 10 (October 2021): 900–910. https://doi.org/10.1038/s41893-021-00745-z.

Freestone, David, and Çiçek, Duygu. 2021. Legal Dimensions of Sea Level Rise: Pacific Perspectives. Washington, D.C. : World Bank Group. https://openknowledge.worldbank.org/server/api/core/bitstreams/6ae3f9d7-4d5f-55ce-bfee-1b124561e486/content

Gale, Allen, and Halston deBrum. "WATER CHALLENGES IN THE MARSHALL ISLANDS." Water E-Journal 2, no. 2 (2017): 1–12. https://doi.org/10.21139/wej.2017.018.

Kane, Haunani H., and Charles H. Fletcher. "Rethinking Reef Island Stability in Relation to Anthropogenic Sea Level Rise." Earth's Future 8, no. 10 (2020): e2020EF001525. https://doi.org/10.1029/2020EF001525.

Khojasteh, Danial, Milad Haghani, Robert J. Nicholls, Hamed Moftakhari, Mahmood Sadat-Noori, Katharine J. Mach, Sergio Fagherazzi, et al. "The Evolving Landscape of Sea-Level Rise Science from 1990 to 2021." Communications Earth & Environment 4, no. 1 (July 14, 2023): 1–11. https://doi.org/10.1038/s43247-023-00920-4.

Lam, Vicky W. Y., Edward H. Allison, Johann D. Bell, Jessica Blythe, William W. L. Cheung, Thomas L. Frölicher, Maria A. Gasalla, and U. Rashid Sumaila. "Climate Change, Tropical Fisheries and Prospects for Sustainable Development." Nature Reviews Earth & Environment 1, no. 9 (August 4, 2020): 440–54. https://doi.org/10.1038/s43017-020-0071-9.

Merrifield, M. A., J. M. Becker, M. Ford, and Y. Yao (2014), Observations and estimates of wave-driven water level extremes at the Marshall Islands, Geophys. Res. Lett., 41, 7245–7253, doi:10.1002/2014GL061005.

The World Bank Group. "Climate Risk Country Profile: Marshall Islands," 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15817-WB_Marshall%20Islands%20Country%20Profile-WEB.pdf.

Map Sources:

Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community. Scale Not Given. "Human Geography Base" and "Human Geography Detail". March 20,2024. https://basemaps.arcgis.com/arcgis/rest/services/World_Basemap_v2/VectorTileServer. (March, 25, 2024).

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap, and the GIS user community. "World Hillshade". February 10, 2022. https://services.arcgisonline.com/arcgis/rest/services/Elevation/World_Hillshade/MapServer. (May, 15, 2023).

Palaseanu-Lovejoy, M., Poppenga, S. K., Danielson, J. J., Tyler, D. J., Gesch, D., Kortmeier, M., Jalandoni, A., Thatcher, C., & Barbee, M. (2017). One Meter Topobathymetric Digital Elevation Model for Majuro Atoll, Republic of the Marshall Islands, 1944 to 2016 [Data set]. U.S. Geological Survey. https://doi.org/10.5066/F7416VXX