

Supplementary Materials for

Most atolls will be uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding

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Supplementary Materials

table S1. Overview of SLR (4) and wave (19) projections per climate change scenario for each year used in the XBEACH wave-driven flood modeling.

Conditions	Year							
	2035	2045	2055	2065	2075	2085	2095	2105
<i>Sea-level Rise Scenario</i>								
RCP4.5 (m)	0.2	0.3	0.3	0.5	0.5	0.6	0.7	0.7
RCP8.5 (m)	0.4	0.5	0.8	1.0	1.2	1.5	1.8	2.0
RCP8.5+icesheet collapse (m)	0.5	0.6	0.9	1.3	1.6	2.0	2.4	2.9
<i>Wave Parameters</i>								
Wave height, mean (m)	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2
Wave period, mean (s)	11	11	11	11	11	11	11	11
Wave direction, mean (°)	346	347	346	347	347	346	346	346
Wave height, storm (m)	5.3	5.2	5.2	5.1	5.1	5.0	4.9	4.9
Wave period, storm (s)	15	15	15	15	15	15	15	15
Wave direction, storm (°)	351	353	352	352	352	351	351	351

table S2. SLR scenarios and their contributions by year and climate change scenario (4).

IPCC-AR5 Scenario	RCP4.5					RCP8.5					RCP8.5+ice sheet collapse				
CARSWG (by 2100)	+0.5 m					+1.5 m					+2.0 m				
Year	Glob (m)	VLM (m)	DSL (m)	Ice (m)	Total (m)	Glob (m)	VLM (m)	DSL (m)	Ice (m)	Total (m)	Glob (m)	VLM (m)	DSL (m)	Ice (m)	Total (m)
2025	0.1	0.1	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.3	0.2	0.1	0.0	0.0	0.3
2035	0.1	0.1	0.0	0.0	0.2	0.3	0.1	0.0	0.0	0.4	0.4	0.1	0.0	0.0	0.5
2045	0.2	0.1	0.0	0.0	0.3	0.4	0.1	0.0	0.0	0.5	0.5	0.1	0.0	0.0	0.6
2055	0.2	0.1	0.0	0.0	0.3	0.6	0.1	0.0	0.1	0.8	0.7	0.1	0.0	0.1	0.9
2065	0.3	0.2	0.0	0.0	0.5	0.7	0.2	0.0	0.1	1.0	1.0	0.2	0.0	0.1	1.3
2075	0.3	0.2	0.0	0.0	0.5	0.9	0.2	0.0	0.1	1.2	1.2	0.2	0.0	0.2	1.6
2085	0.4	0.2	0.0	0.0	0.6	1.1	0.2	0.0	0.2	1.5	1.5	0.2	0.0	0.3	2.0
2095	0.5	0.2	0.0	0.0	0.7	1.4	0.2	0.0	0.2	1.8	1.8	0.2	0.1	0.3	2.4
2105	0.5	0.2	0.0	0.0	0.7	1.6	0.2	0.0	0.2	2.0	2.2	0.2	0.1	0.4	2.9

Global scenarios (Glob) values based upon quadratic equation (4) outputs, rounded to the nearest 0.1 m.

Vertical land movement (VLM) values based upon linear equation (4) outputs, rounded to the nearest 0.1 m.

Dynamic sea level (DSL) based upon conservative interpolation/extrapolation from available values (4) at 2035, 2065, and 2100, rounded to the nearest 0.1 m.

Ice melt (Ice) values based upon conservative interpolation/extrapolation from available values (4) at 2035, 2065, and 2100, rounded to the nearest 0.1 m.

table S3. List of GCMs analyzed and used as input data for the regional climatic (37) and oceanographic (19) models and local oceanographic (15) and hydrogeologic (18, 38) models. The subset of models in italics denote those used in the future simulations presented here based on a suite of performance metrics.

Effort	Models	
Future wave modeling	<i>BCC-CSM1.1</i>	<i>INM-CM4</i>
	<i>GFDL-ESM2M</i>	<i>MIROC5</i>
Future climate modeling	ACCESS1.0	GISS-E2-H
	ACCESS1.3	GISS-E2-CC
	BCC-CSM1.1	GISS-E2-R
	BCC-CSM1.1.M	GISS-E2-R-CC
	BNU-ESM	HadCM3
	CanCM4	HadGEM2-AO
	CanESM2	HadGEM2-CC
	<i>CCSM4</i>	HadGEM2-ES
	CESM1-BGC	INM-CM4
	CESM1-CAM5	ISPL-CM5A-LR
	CMCC-CM	ISPL-CM5A-MR
	CMCC-CMS	ISPL-CM5B-LR
	<i>CNRM-CM5</i>	<i>MIROC4h</i>
	CSIRO-Mk3.6.0	<i>MIROC5</i>
	EC-EARTH	MIROC-ESM
	FGOALS-g2	MIROC-ESM-CHEM
	FIO-ESM	MPI-ESM-LR
	<i>GFDL-CM3</i>	MPI-ESM-MR
	GFDL-ESM2G	MRI-CGCM3
	GFDL-ESM2M	NorESM1-M
	NorESM1-ME	