

Supplementary information for “Groundwater vulnerability on small islands” by S. Holding, D.M. Allen, S. Foster, A. Hsieh, I. Larocque, J. Klassen, and S.C. Van Pelt

Table S1: List of 43 small island developing states included in assessment.

Small Island Developing State	Representative Island	Small Island Developing State	Representative Island
Anguilla	Anguilla	Nauru	Nauru
Antigua and Barbuda	Antigua	Netherlands Antilles	Curacao
Aruba	Aruba	New Caledonia	Grande Terre
Barbados	Barbados	Niue	Niue
British Virgin Islands	Tortola	Palau	Koror
Cape Verde	Santiago	Puerto Rico	Puerto Rico
Comoros	Njazidja	Saint Kitts and Nevis	Saint Kitts
Cook Islands	Rarotonga	Saint Lucia	Saint Lucia
Northern Marianas	Saipan	Saint Vincent and the Grenadines	Saint Vincent
Dominica	Dominica	Samoa	Upolu
Federated State of Micronesia	Pohnpei	Sao Tome and Principe	Sao Tome
Fiji	Viti Levu	Seychelles	Mahe
French Polynesia	Tahiti	Singapore	Singapore
Grenada	Grenada	Solomon Islands	Malaita
Guam	Guam	The Bahamas	New Providence
Jamaica	Jamaica	Timor-Leste	Timor-Leste
Kiribati	Tarawa	Tonga	Tongatapu
Maldives	Male	Trinidad and Tobago	Trinidad
Marshall Islands	Majuro	Tuvalu	Funafati
Mauritius	Mauritius	US Virgin Islands	Saint Croix
Montserrat	Montserrat	Vanuatu	Efate

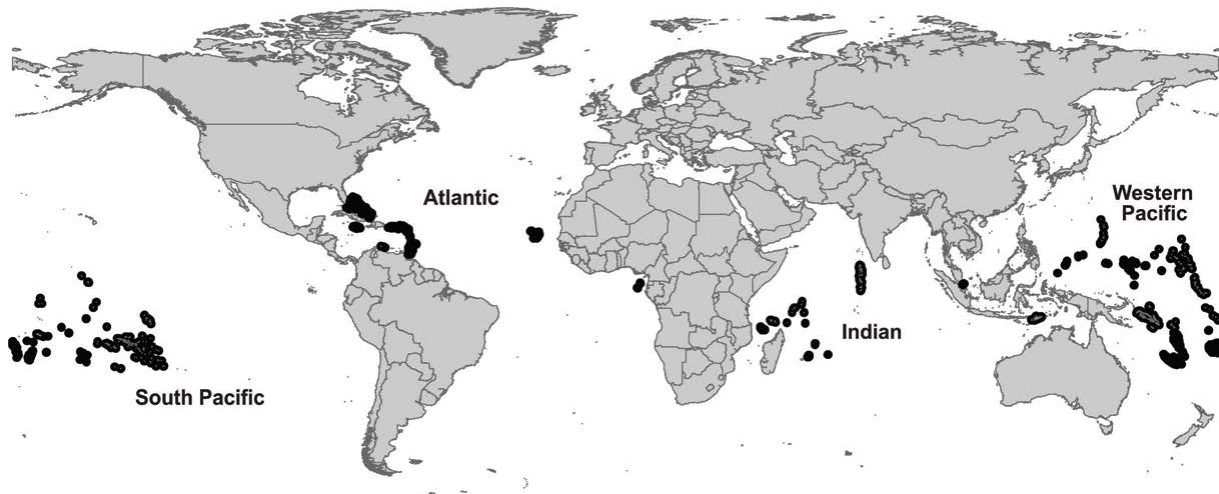


Figure S1: Map of 43 small island developing states included in assessment. The islands (shown in black) are enlarged for visibility; they are not to scale with the rest of the map.

Table S2: Ranges of aquifer hydraulic conductivity (K) values from Freeze and Cherry (Ref 20), Geometric Mean K from Gleeson et al. (Ref 21) and final K values used for recharge simulations where no K values are reported in the questionnaire.

Lithology	Freeze and Cherry K range (m/s)	Gleeson et al. Geomean K (m/s)	Values used (m/s)
Undifferentiated unfractured igneous	1×10^{-14} to 1×10^{-10}	6×10^{-5}	1×10^{-12}
Undifferentiated fractured igneous	5×10^{-9} to 1×10^{-4}	6×10^{-5}	1×10^{-6}
Permeable volcanic	1×10^{-7} to 1×10^{-2}	3×10^{-6}	3×10^{-6}
Undifferentiated unfractured metamorphic	1×10^{-14} to 1×10^{-10}	6×10^{-5}	1×10^{-12}
Undifferentiated fractured metamorphic	5×10^{-9} to 1×10^{-4}	6×10^{-5}	1×10^{-6}
Coarse alluvium (clean sand)	7×10^{-6} to 1×10^{-2}	1×10^{-6}	1×10^{-4}
Carbonate	5×10^{-10} to 2×10^{-6}	2×10^{-5}	5×10^{-8}
Karstic carbonate	8×10^{-7} to 1×10^{-2}	2×10^{-5}	1×10^{-4}
Shale	8×10^{-14} to 8×10^{-10}	3×10^{-10}	3×10^{-10}
Sandstone	1×10^{-10} to 1×10^{-6}	3×10^{-6}	3×10^{-6}

Table S3: Summary of key attributes for each small island developing state and output from the climate change simulations and recharge modeling. K is hydraulic conductivity. ACI is aridity change index.

SIDS	Area (km ²)	Population	K (m/s)	Historic Precip (mm/yr)	Future Precip (mm/yr)	Current Recharge (mm/yr)	Current AET (mm/yr)	2060s Recharge (mm/yr)	2060s AET (mm/yr)	Change in Recharge (%)	Change in AET (%)	ACI	Recharge/Pop (m ³ /pers/yr)
American Samoa	145	55876	1.4E-03	2857	2642	1379	1478	1222	1419	-11%	-4%	1.04	3579
Anguila	71	13452	4.3E-03	1547	1495	253	1294	195	1299	-23%	0%	1.04	1333
Antigua and Barbuda	280	80161	3.5E+01	2330	2284	790	1532	673	1572	-15%	3%	1.05	2759
Aruba	140	103504	8.6E+01	779	731	105	655	130	580	24%	-11%	0.94	142
Barbados	430	277821	8.6E+00	2062	1984	606	1432	516	1455	-15%	2%	1.06	938
Belau/ Palau	8	11560	8.6E-08	3261	3243	1562	1699	1439	1805	-8%	6%	1.07	1081
British Virgin Islands	54	23908	2.6E-01	2184	2079	578	1563	445	1592	-23%	2%	1.07	1306
Cape Verde	991	240000	2.6E-01	285	279	60	166	56	165	-7%	-1%	1.02	248
Comoros	1148	316600	5.9E+00	1677	1709	655	1025	658	1043	0%	2%	1.00	2375
Cook Islands	67.1	10572	8.6E-08	2194	1704	751	1442	352	1350	-53%	-6%	1.21	4767
C'wealth of the Northern Marianas	120	48220	8.8E+01	2079	2243	536	1539	967	1274	80%	-17%	0.77	1334
Dominica	751	71293	2.6E-01	3493	3445	2027	1399	1953	1450	-4%	4%	1.05	21347
Federated State of Micronesia	334.1	36196	8.6E-08	3574	3649	1906	1669	1906	1743	0%	4%	1.02	17593
Fiji	10429	661997	1.0E+00	2619	2054	1302	1277	888	1134	-32%	-11%	1.13	20519
French Polynesia	1043	183645	8.6E-08	3574	3649	1918	1656	1938	1711	1%	3%	1.01	10893
Grenada	344	103328	8.6E-08	1516	1413	213	1303	127	1286	-40%	-1%	1.06	710

SIDS	Area (km ²)	Population	K (m/s)	Historic Precip (mm/yr)	Future Precip (mm/yr)	Current Recharge (mm/yr)	Current AET (mm/yr)	2060s Recharge (mm/yr)	2060s AET (mm/yr)	Change in Recharge (%)	Change in AET (%)	ACI	Recharge/Pop (m ³ /pers/yr)
Guam	561	159358	7.3E+02	3445	2239	1209	1615	726	1125	-40%	-30%	1.07	4256
Jamaica	10991	2695543	1.7E+01	2007	1910	909	1056	810	1056	-11%	0%	1.05	3706
Kiribati	31	40529	3.5E+01	929	716	167	835	170	618	2%	-26%	0.96	128
Maldives	2	105000	4.3E-03	2087	2317	573	1514	697	1620	22%	7%	0.96	11
Marshall Islands	10	27797	6.0E+01	2550	3310	940	1596	1695	1615	80%	1%	0.78	338
Mauritius	2040	1236817	1.2E+02	2077	2078	969	1102	950	1123	-2%	2%	1.02	1598
Montserrat	103	5164	8.6E-08	2587	2525	1061	1413	938	1457	-12%	3%	1.06	21152
Nauru	21.2	10084	2.0E+03	2373	3861	1186	1186	2571	1290	117%	9%	0.67	2493
Netherlands Antilles	444	150563	8.6E-02	553	497	6	546	4	494	-35%	-10%	1.01	18
New Caledonia	16372	245580	5.5E+01	1519	1203	374	1142	161	1024	-57%	-10%	1.13	24933
Niue	260	1625	1.5E+03	2174	1833	900	1492	504	1453	-44%	-3%	1.16	144000
Puerto Rico	8868	3725789	8.6E-02	2065	1968	976	1054	882	1062	-10%	1%	1.06	2323
Saint Kitts and Nevis	176	35217	8.6E-08	2165	2095	766	1346	673	1368	-12%	2%	1.05	3828
Saint Lucia	617	165770	2.6E-01	2276	2198	821	1402	713	1430	-13%	2%	1.06	3056
Saint Vincent & the Grenadines	344	106253	8.6E-08	1581	1503	366	1176	289	1175	-21%	0%	1.05	1185
Samoa	1091	143418	8.6E-08	2953	2748	1284	1616	1337	1360	4%	-16%	0.90	9770
Sao Tome & Principe	854	157500	2.6E-01	2097	2132	892	1198	832	1294	-7%	8%	1.06	4835
Seychelles	144	78539	8.6E-02	1680	1785	539	1140	599	1186	11%	4%	0.98	988
Singapore	714	5399200	8.6E-05	2143	2211	608	1528	611	1594	0%	4%	1.01	80

SIDS	Area (km ²)	Population	K (m/s)	Historic Precip (mm/yr)	Future Precip (mm/yr)	Current Recharge (mm/yr)	Current AET (mm/yr)	2060s Recharge (mm/yr)	2060s AET (mm/yr)	Change in Recharge (%)	Change in AET (%)	ACI	Recharge/Pop (m ³ /pers/yr)
Solomon Islands	4307	137596	4.3E-03	3100	3554	1606	1439	2038	1460	27%	1%	0.88	50262
The Bahamas	207	248948	1.1E+02	1235	1175	184	1051	155	1020	-16%	-3%	1.02	153
Timor-Leste	14919	1066582	8.6E-08	1470	1956	554	914	928	1021	68%	12%	0.84	7749
Tonga	260.5	75416	1.2E+02	1788	1609	533	1362	403	1355	-24%	-1%	1.11	1841
Trinidad & Tobago	4800	1267145	8.6E-08	1640	1538	398	1243	285	1253	-28%	1%	1.07	1508
Tuvalu	2.4	6194	1.0E-01	2929	4051	1292	1636	2341	1710	81%	5%	0.76	501
US Virgin Islands	218	50601	3.0E+02	2176	2079	1063	1106	690	1382	-35%	25%	1.31	4580
Vanuatu	915	65829	8.6E-08	2718	1759	1308	1344	553	1155	-58%	-14%	1.33	18176

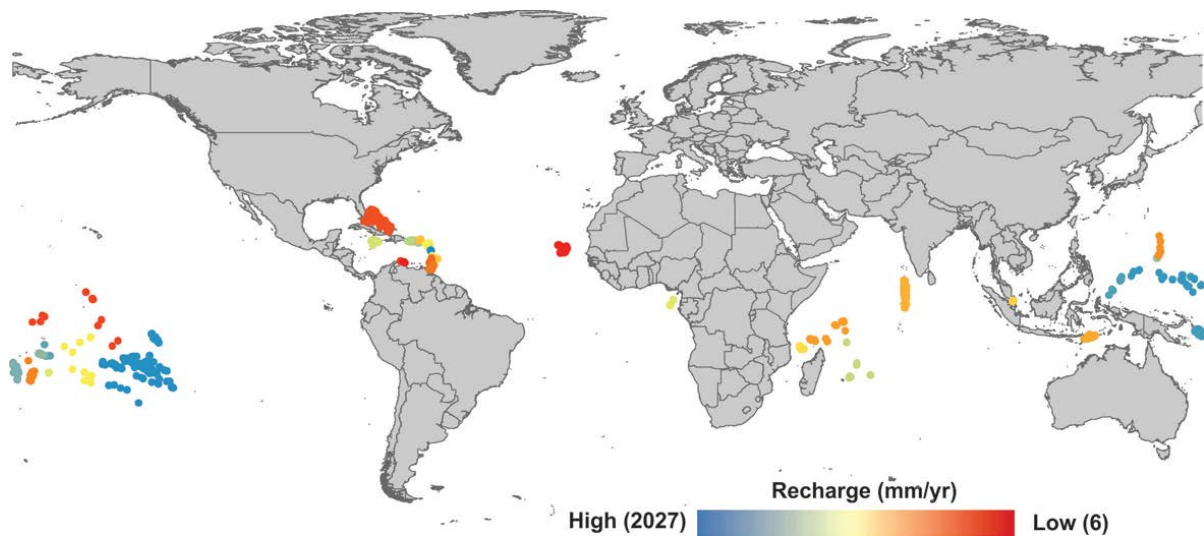


Figure S2: Estimated recharge rate (mm/yr). The recharge rates for each small island developing state are enlarged for visibility; they are not to scale with the rest of the map.