



Impact of changing climate on wind power potential at proposed Indian offshore sites using quantile mapping

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Supplementary Tables

Table S1 — List of CMIP-5 and CMIP-6 GCMs considered

CMIP-5 GCM	Lat × Long grid resolution	CMIP-6 GCM	Lat × Long grid resolution
ACCESS 1-0	1.25° × 1.25°	ACCESS-CM2	1.25° × 1.25°
ACCESS 1.3	1.25° × 1.22°	ACCESS-ESM-1-5	1.25° × 1.25°
BCC-CSM-1.1m	1.12° × 1.125°	BCC-CSM2-MR	1.12° × 1.125°
CanESM2	2.8° × 2.8°	CanESM5	2.8° × 2.8°
GFDL-CM3	2° × 2.5°	GFDL-CM4	1° × 1.25°
GFDL-ESM-2G	2.02° × 2.5°	GFDL-ESM4	1° × 1.25°
INM-CM4	1.5° × 2°	INM-CM-4-8	1.5° × 2°
IPSL-CM5A-LR	1.895° × 3.75°	IPSL-CM6A-LR	1.267° × 2.5°
MIROC5	1.41° × 1.41°	MIROC6	1.41° × 1.41°
MPI-ESM-LR	1.88° × 1.88°	MPI-ESM 1-2-LR	1.88° × 1.88°
MRI-CGM3	1.13° × 1.13°	MRI-ESM 2-0	1.13° × 1.13°

Table S2 — Seasonal analysis at Tamil Nadu zone A where V_{mp} and V_{max} are in (m/s) and WPD is in (W/m^2)

Zone A	Past			Near Future				Far Future			
	V_{mp}	V_{max}	WPD	V_{mp}	V_{max}	WPD	Change (%)	V_{mp}	V_{max}	WPD	Change (%)
<i>CMIP-5</i>											
<i>MME</i>											
Monsoon	10.313	10.56	604.27	10.246	10.496	592.49	-1.95	10.135	10.373	573.52	-5.08
Winter	7.859	8.809	296.11	7.827	8.778	292.76	-1.131	7.691	8.645	278.81	-5.844
Summer	5.941	7.895	178.74	5.945	7.733	171.06	-4.297	6.072	7.87	180.91	1.217
<i>CMIP-6</i>											
<i>MME</i>											
Monsoon	10.274	10.505	597.43	10.087	10.363	565.52	-5.34	10.08	10.404	564.92	-5.44
Winter	7.636	8.526	269.85	7.81	8.719	288.67	6.973	7.698	8.646	279.18	3.458
Summer	6.074	8.585	218.88	6.147	8.376	209.14	-4.448	6.231	8.355	210.26	-3.938

Table S3 — Mann-Kendall test results for projected GCM ensemble-based WPD (2017-2050) time series in all identified zones

Zones	Season	Model Ensemble	Mann-Kendall Test results			
			Trend in (W/m ²)/month	<i>p</i> -value	Trend in (W/m ²)/year	<i>p</i> -value
Gujarat Zone A	Winter	CMIP5-MME	-0.341	0.0031	-1.5124	4.87e-5
		CMIP6-MME	-0.108	0.2738	-0.4925	0.0108
Gujarat Zone B	Winter	CMIP5-MME	-0.0625	0.5073	-0.2751	0.1547
		CMIP6-MME	-0.0809	0.2082	-0.3699	0.0091
Gujarat Zone D	Winter	CMIP5-MME	-0.0951	0.3709	-0.4042	0.0968
		CMIP6-MME	-0.0795	0.3720	-0.3511	0.0705
Gujarat Zone E	Winter	CMIP5-MME	-0.1156	0.3680	-0.5073	0.1463
		CMIP6-MME	-0.1063	0.3539	-0.4610	0.0540
Gujarat Zone F	Winter	CMIP5-MME	-0.0413	0.4919	-0.1917	0.1821
		CMIP6-MME	-0.0587	0.2576	-0.2656	0.1463
Tamil Nadu Zone A	Winter	CMIP5-MME	-0.1878	0.2680	-0.9234	0.0242
		CMIP6-MME	-0.1151	0.4408	-0.5573	0.1305
Tamil Nadu Zone B	Winter	CMIP5-MME	-0.2033	0.3609	-1.0142	0.0262
		CMIP6-MME	-0.1636	0.2883	-0.8312	0.0753
Tamil Nadu Zone C	Winter	CMIP5-MME	-0.1766	0.2576	-0.868	0.0207
		CMIP6-MME	-0.0704	0.5843	-0.3291	0.4064
Tamil Nadu Zone D	Winter	CMIP5-MME	-0.223	0.3400	-1.1044	0.0282
		CMIP6-MME	-0.1649	0.3581	-0.8221	0.0855
Tamil Nadu Zone E	Winter	CMIP5-MME	-0.2579	0.3306	-1.2855	0.0304
		CMIP6-MME	-0.2395	0.2335	-1.2132	0.0802
Gujarat Zone A	Summer	CMIP5-MME	0.7586	0.0135	1.955	1.71e-5
		CMIP6-MME	0.1474	0.5437	0.1211	0.3738
Gujarat Zone B	Summer	CMIP5-MME	0.1027	0.8306	-0.0468	0.7669
		CMIP6-MME	0.1722	0.3985	0.1796	0.3740
Gujarat Zone D	Summer	CMIP5-MME	0.1424	0.8036	-0.0742	0.6352
		CMIP6-MME	0.288	0.3985	0.3807	0.1305
Gujarat Zone E	Summer	CMIP5-MME	0.155	0.7902	0.0421	0.9056
		CMIP6-MME	0.2449	0.3921	0.3281	0.1305
Gujarat Zone F	Summer	CMIP5-MME	0.1078	0.8261	-0.0668	0.7220
		CMIP6-MME	0.1789	0.4215	0.1718	0.4767
Tamil Nadu Zone A	Summer	CMIP5-MME	0.1156	0.7461	0.0067	0.9291
		CMIP6-MME	0.1845	0.3033	0.1176	0.8125
Tamil Nadu Zone B	Summer	CMIP5-MME	0.0979	0.7070	-0.1437	0.8588
		CMIP6-MME	0.2035	0.6313	0.0699	0.9501
Tamil Nadu Zone C	Summer	CMIP5-MME	0.1352	0.8261	0.1096	0.9763
		CMIP6-MME	0.1932	0.2694	0.1744	0.6565
Tamil Nadu Zone D	Summer	CMIP5-MME	0.1236	0.6771	-0.0889	0.9056
		CMIP6-MME	0.2182	0.5172	0.085	0.7896
Tamil Nadu Zone E	Summer	CMIP5-MME	0.1402	0.5788	-0.1377	0.7759
		CMIP6-MME	0.2665	0.7243	0.1364	0.9673

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Table S3 — Mann-Kendall test results for projected GCM ensemble-based *WPD* (2017-2050) time series in all identified zones
(*Contd.*)

Zones	Season	Model Ensemble	Mann-Kendall Test results			
			Trend in (W/m ²)/month	p-value	Trend in (W/m ²)/year	p-value
Gujarat Zone A	Monsoon	CMIP5-MME	-0.5828	0.1418	-1.7363	0.0070
		CMIP6-MME	0.1194	0.8229	0.9182	0.0968
Gujarat Zone B	Monsoon	CMIP5-MME	-0.0813	0.9898	0.2635	0.5732
		CMIP6-MME	0.1276	0.5353	0.9866	0.0150
Gujarat Zone D	Monsoon	CMIP5-MME	-0.1006	0.9206	0.4396	0.6352
		CMIP6-MME	0.1813	0.5970	1.4049	0.0163
Gujarat Zone E	Monsoon	CMIP5-MME	-0.0872	0.8082	0.3582	0.4064
		CMIP6-MME	0.1399	0.7995	1.0774	0.0855
Gujarat Zone F	Monsoon	CMIP5-MME	-0.1202	0.9206	0.1758	0.6565
		CMIP6-MME	0.1415	0.5970	1.1366	0.0075
Tamil Nadu Zone A	Monsoon	CMIP5-MME	-0.3367	0.1898	-0.992	0.0139
		CMIP6-MME	-0.2036	0.3756	-0.4183	0.4234
Tamil Nadu Zone B	Monsoon	CMIP5-MME	-0.4593	0.1588	-1.4006	0.0091
		CMIP6-MME	-0.3834	0.1512	-1.07	0.1161
Tamil Nadu Zone C	Monsoon	CMIP5-MME	-0.2706	0.2810	-0.7194	0.0328
		CMIP6-MME	-0.1285	0.5944	-0.0861	0.9056
Tamil Nadu Zone D	Monsoon	CMIP5-MME	-0.4859	0.1610	-1.4611	0.0044
		CMIP6-MME	-0.3666	0.2165	-0.9544	0.2130
Tamil Nadu Zone E	Monsoon	CMIP5-MME	-0.5549	0.1290	-1.7122	0.0040
		CMIP6-MME	-0.5152	0.1286	-1.544	0.0504

Table S4 — Mann-Kendall test results for raw downscaled GCM ensemble-based WPD (2017-2050) time series in all identified zones

Zones	Season	Model Ensemble	Mann-Kendall Test results			
			Trend in (W/m ²)/month	p-value	Trend in (W/m ²)/year	p-value
Gujarat Zone A	Winter	CMIP5-MME	-0.042	0.3360	-0.1963	0.2241
		CMIP6-MME	-0.0551	0.2786	-0.2517	0.0262
Gujarat Zone B	Winter	CMIP5-MME	-0.0225	0.4586	-0.0977	0.2599
		CMIP6-MME	-0.0312	0.2907	-0.1434	0.0753
Gujarat Zone D	Winter	CMIP5-MME	-0.0189	0.3333	-0.0819	0.1635
		CMIP6-MME	-0.0173	0.4219	-0.0774	0.1305
Gujarat Zone E	Winter	CMIP5-MME	-0.0355	0.2622	-0.1554	0.1231
		CMIP6-MME	-0.0336	0.3680	-0.1479	0.0759
Gujarat Zone F	Winter	CMIP5-MME	-0.0089	0.4902	-0.0364	0.2726
		CMIP6-MME	-0.0154	0.3122	-0.0701	0.0750
Tamil Nadu Zone A	Winter	CMIP5-MME	-0.1437	0.3400	-0.7022	0.0108
		CMIP6-MME	-0.0653	0.6029	-0.3291	0.1382
Tamil Nadu Zone B	Winter	CMIP5-MME	-0.1784	0.3414	-0.8899	0.0037
		CMIP6-MME	-0.1016	0.3718	-0.5207	0.0751
Tamil Nadu Zone C	Winter	CMIP5-MME	-0.1344	0.2957	-0.6564	0.0177
		CMIP6-MME	-0.0514	0.6181	-0.2610	0.1821
Tamil Nadu Zone D	Winter	CMIP5-MME	-0.1674	0.3387	-0.8289	0.0044
		CMIP6-MME	-0.0940	0.4472	-0.4776	0.0910
Tamil Nadu Zone E	Winter	CMIP5-MME	-0.1961	0.3373	-0.9809	0.0049
		CMIP6-MME	-0.1360	0.3122	-0.6999	0.1231
Gujarat Zone A	Summer	CMIP5-MME	0.0224	0.9355	-0.0728	0.7896
		CMIP6-MME	0.0967	0.4662	0.1327	0.1305
Gujarat Zone B	Summer	CMIP5-MME	0.0223	0.9954	-0.0576	0.5732
		CMIP6-MME	0.0627	0.4769	0.0478	0.5142
Gujarat Zone D	Summer	CMIP5-MME	0.0234	0.9401	-0.0385	0.5136
		CMIP6-MME	0.0853	0.2619	0.1332	0.1635
Gujarat Zone E	Summer	CMIP5-MME	0.02	0.9862	-0.0598	0.7220
		CMIP6-MME	0.1062	0.2770	0.1814	0.0224
Gujarat Zone F	Summer	CMIP5-MME	0.0245	0.8851	-0.0295	0.6781
		CMIP6-MME	0.0418	0.5828	0.0178	0.8356
Tamil Nadu Zone A	Summer	CMIP5-MME	0.0741	0.8487	-0.0123	0.8588
		CMIP6-MME	0.1348	0.4116	0.1659	0.5335
Tamil Nadu Zone B	Summer	CMIP5-MME	0.1124	0.6814	0.0449	0.9527
		CMIP6-MME	0.1501	0.7725	0.1235	0.7669
Tamil Nadu Zone C	Summer	CMIP5-MME	0.0944	0.8623	0.0809	0.7443
		CMIP6-MME	0.1353	0.1992	0.1876	0.4408
Tamil Nadu Zone D	Summer	CMIP5-MME	0.1002	0.6899	0.0206	0.9056
		CMIP6-MME	0.1320	0.7681	0.0949	0.7669
Tamil Nadu Zone E	Summer	CMIP5-MME	0.1405	0.5247	0.0898	0.7896
		CMIP6-MME	0.1699	0.8351	0.01134	0.9056

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Table S4 — Mann-Kendall test results for raw downscaled GCM ensemble-based *WPD* (2017-2050) time series in all identified zones
(*Contd.*)

Zones	Season	Model Ensemble	Mann-Kendall Test results			
			Trend in (W/m ²)/month	p-value	Trend in (W/m ²)/year	p-value
Gujarat Zone A	Monsoon	CMIP5-MME	-0.0888	0.8493	-0.0547	0.6999
		CMIP6-MME	0.0692	0.7850	0.5624	0.0660
Gujarat Zone B	Monsoon	CMIP5-MME	-0.086	0.6422	-0.0854	0.6890
		CMIP6-MME	0.0738	0.6049	0.5564	0.0262
Gujarat Zone D	Monsoon	CMIP5-MME	-0.0581	0.8287	-0.0085	0.8125
		CMIP6-MME	0.0525	0.7025	0.4418	0.0408
Gujarat Zone E	Monsoon	CMIP5-MME	-0.0574	0.9625	0.034	0.8588
		CMIP6-MME	0.0527	0.9325	0.4612	0.1382
Gujarat Zone F	Monsoon	CMIP5-MME	-0.0567	0.7792	-0.0179	0.9056
		CMIP6-MME	0.0428	0.6395	0.3828	0.0379
Tamil Nadu Zone A	Monsoon	CMIP5-MME	-0.2009	0.1860	-0.5553	0.0753
		CMIP6-MME	-0.0673	0.5560	-0.0377	0.9540
Tamil Nadu Zone B	Monsoon	CMIP5-MME	-0.272	0.2082	-0.8028	0.0438
		CMIP6-MME	-0.2016	0.2810	-0.5410	0.1635
Tamil Nadu Zone C	Monsoon	CMIP5-MME	-0.1718	0.1910	-0.4514	0.1231
		CMIP6-MME	-0.0573	0.5534	-0.0032	0.7220
Tamil Nadu Zone D	Monsoon	CMIP5-MME	-0.271	0.1702	-0.8034	0.0177
		CMIP6-MME	-0.1172	0.6102	-0.2095	0.5732
Tamil Nadu Zone E	Monsoon	CMIP5-MME	-0.3151	0.1633	-0.9512	0.0745
		CMIP6-MME	-0.2595	0.2397	-0.749	0.0968