

**Table S1.** Statistic descriptive of observed and CMIP5 rainfall data projection in Trentino-Alto Adige under different RCP scenarios.

Statistic	AR_Observed data	AR_RCP 2.6	AR_RCP 4.5	AR_RCP 6.0	AR_RCP 8.5
Minimum	919.11	1021.31	1039.86	1036.60	1039.86
Maximum	992.25	1061.95	1080.13	1093.64	1082.27
1 <sup>st</sup> Quartile	929.50	1036.35	1049.33	1062.27	1057.74
Median	965.96	1042.55	1055.39	1080.65	1062.77
3 <sup>rd</sup> Quartile	983.63	1053.08	1060.07	1089.79	1072.83
Sum	17247.54	18789.33	19030.34	19328.76	19140.76
Mean	958.20	1043.85	1057.24	1073.82	1063.38
CV	0.03	0.01	0.01	0.02	0.01
p-value (Beta 4)	0.95	0.76	0.17	0.87	0.81
p-value (Weibull 3)	0.31	0.96	0.32	0.67	0.96
p-value (GEV)	0.31	0.52	0.75	0.03	0.87
p-value (Logistics)	0.68	0.89	0.44	0.66	0.99

CV: Coefficient of Variation; AR: annual rainfall from 2005 to 2022.

**Table S2.** Performance analysis of polynomial regression model to downscale CMIP5 annual rainfall data projection using different iterations, followed by model's equation.

Iteration	Statistic	RCP 2.6 Downscaled	RCP 4.5 Downscaled	RCP 6.0 Downscaled	RCP 8.5 Downscaled
1 <sup>st</sup>	Equation (i=2)	$Y_1 = -112822 + 218.086 \times X - 0.10449 \times X^2$	$Y_1 = -91933 + 176.4105 \times X - 0.08375 \times X^2$	$Y_1 = -54305 + 104.529 \times X - 0.04940 \times X^2$	$Y_1 = -83754 + 159.381 \times X - 0.07496 \times X^2$
	R <sup>2</sup> <sub>1</sub>	0.4080	0.4033	0.6043	0.3901
	MSE	612.0281	510.1372	384.9673	745.1822
	RMSE	24.7392	22.5862	19.6206	27.2980
2 <sup>nd</sup>	Equation (i=4)	$Y_2 = 15190 - 30.97991 \times Y_1 + 0.01682 \times Y_1^2$	$Y_2 = 23273 - 48.701 \times Y_1 + 0.02652 \times Y_1^2$	-	$Y_2 = 70725 - 148.121 \times Y_1 + 0.07859 \times Y_1^2$
	R <sup>2</sup> <sub>2</sub>	0.6177	0.6939	0.5227 (R <sup>2</sup> <sub>2</sub> < R <sup>2</sup> <sub>1</sub> )	0.5828
	MSE	413.3067	332.9044	477.9663	480.1817
	RMSE	19.7650	18.2457	22.4414	23.0870
3 <sup>rd</sup>	Equation (i=6)	-	-	-	-
	R <sup>2</sup> <sub>3</sub>	0.4777 (R <sup>2</sup> <sub>3</sub> < R <sup>2</sup> <sub>2</sub> )	0.5543 (R <sup>2</sup> <sub>3</sub> < R <sup>2</sup> <sub>2</sub> )	-	0.3409 (R <sup>2</sup> <sub>3</sub> < R <sup>2</sup> <sub>2</sub> )
	MSE	583.3067	412.6660	-	591.4928
	RMSE	21.7650	20.3142	-	24.3206

R<sup>2</sup>: coefficient of determination; MSE: mean square error; RMSE: root mean square error; X: projected data; Y: Downscaled data; -: no data.