

Investigating the Past and Future Trends in Temperature and Rainfall Over the Coastal, Semi-Arid and Hilly Regions of Maharashtra (Western India)

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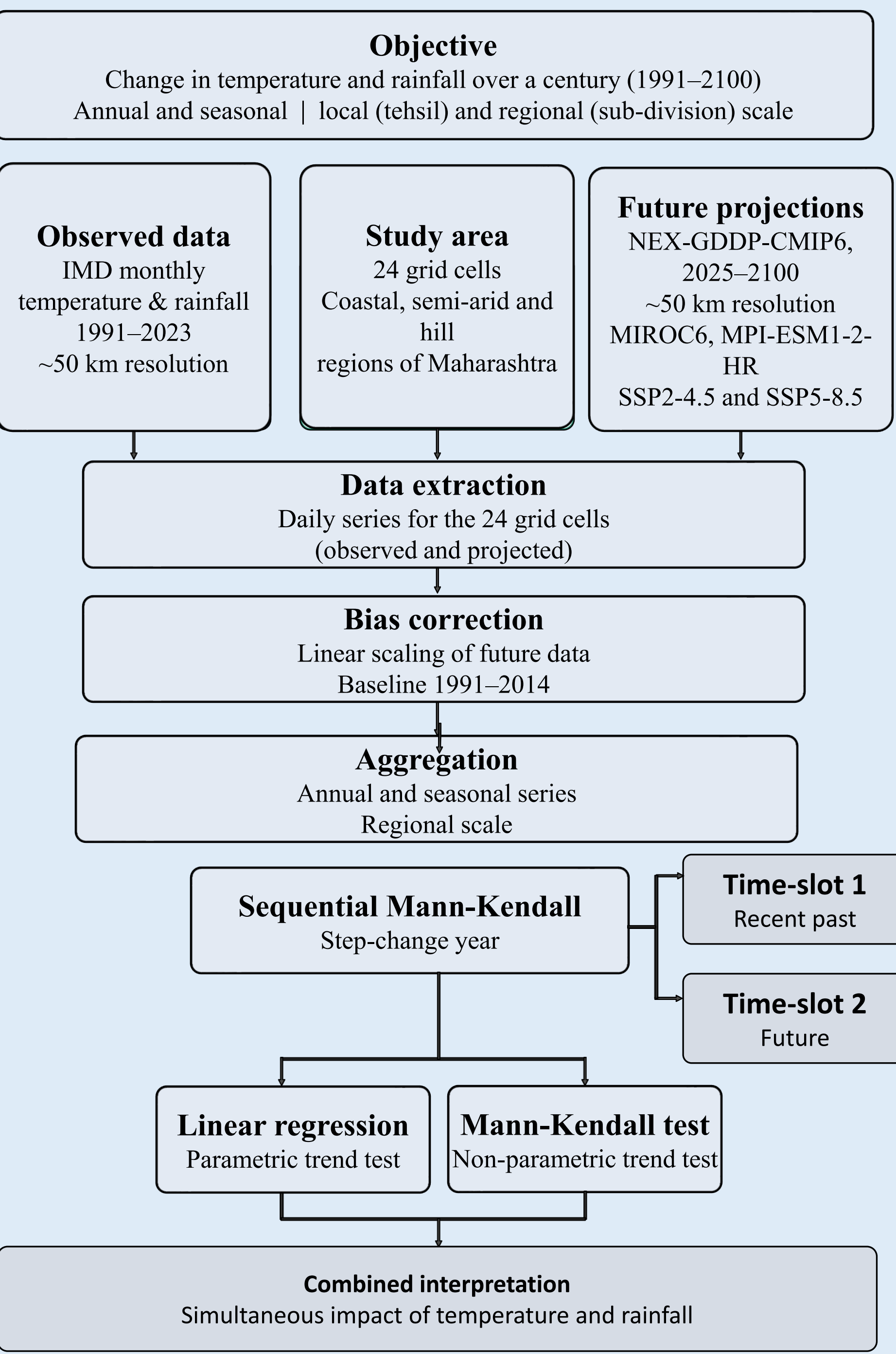
1 INTRODUCTION

- Changing temperature and rainfall impacts all three economic sectors and threatens food security and ecosystems.
- Half of the population in Maharashtra is engaged in agriculture and majority of the tourist destinations are confined in western part of the state.
- Multiple studies have worked on the national and state level while the regional study remains limited. This study investigates the climatic trends during the past and future time period considering the physiographic regions of Maharashtra.

2 OBJECTIVE

- Investigating changes and variabilities in seasonal and annual climatic trends during recent past (1991-2023) and future (2025-2100).
- Identifying the spatio-temporal trend over coastal, hilly and semi-arid regions of the state for the selected time period

3 METHODOLOGY



4 STUDY AREA

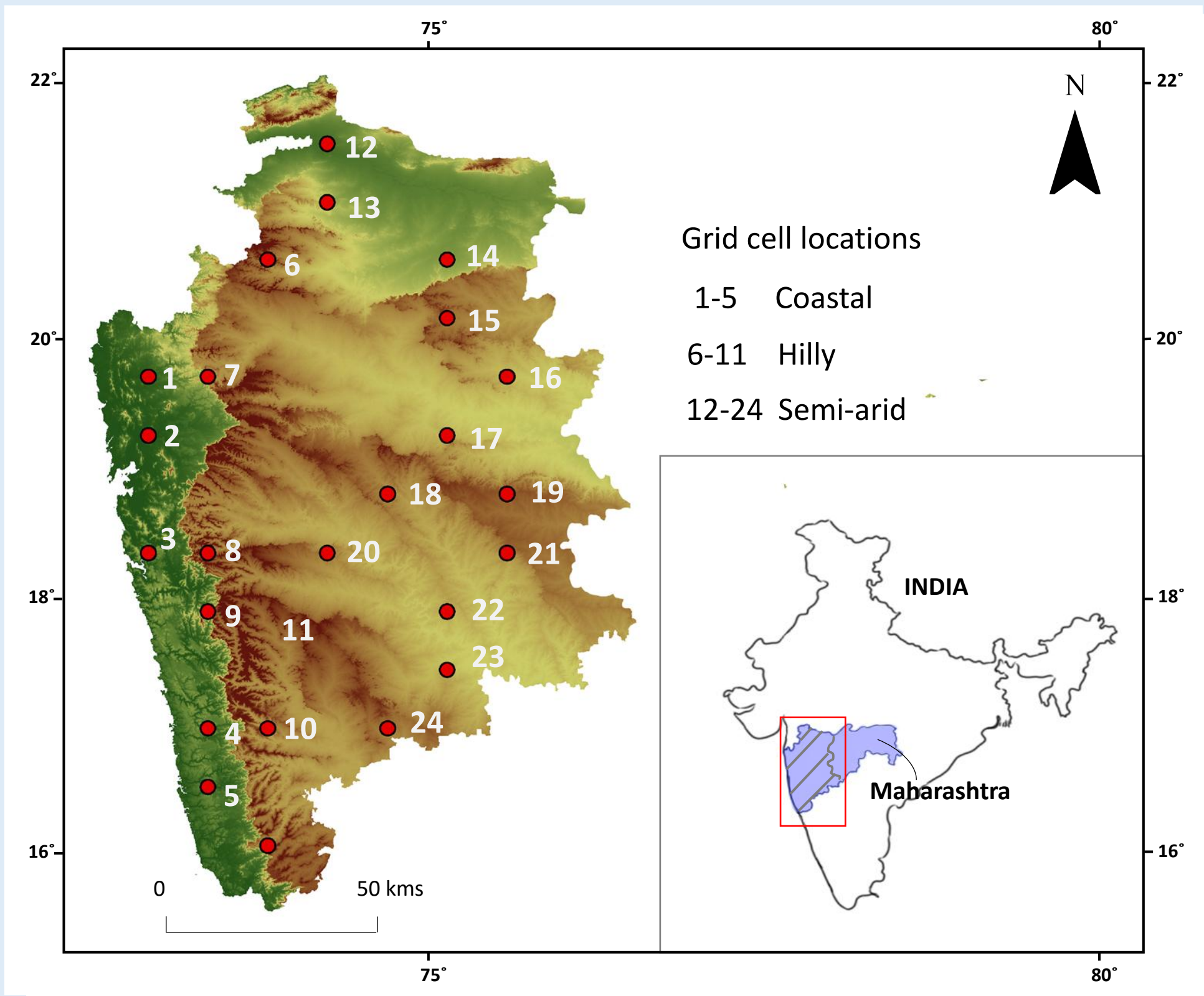


Figure 1: Location map of the study area

5 RESULTS

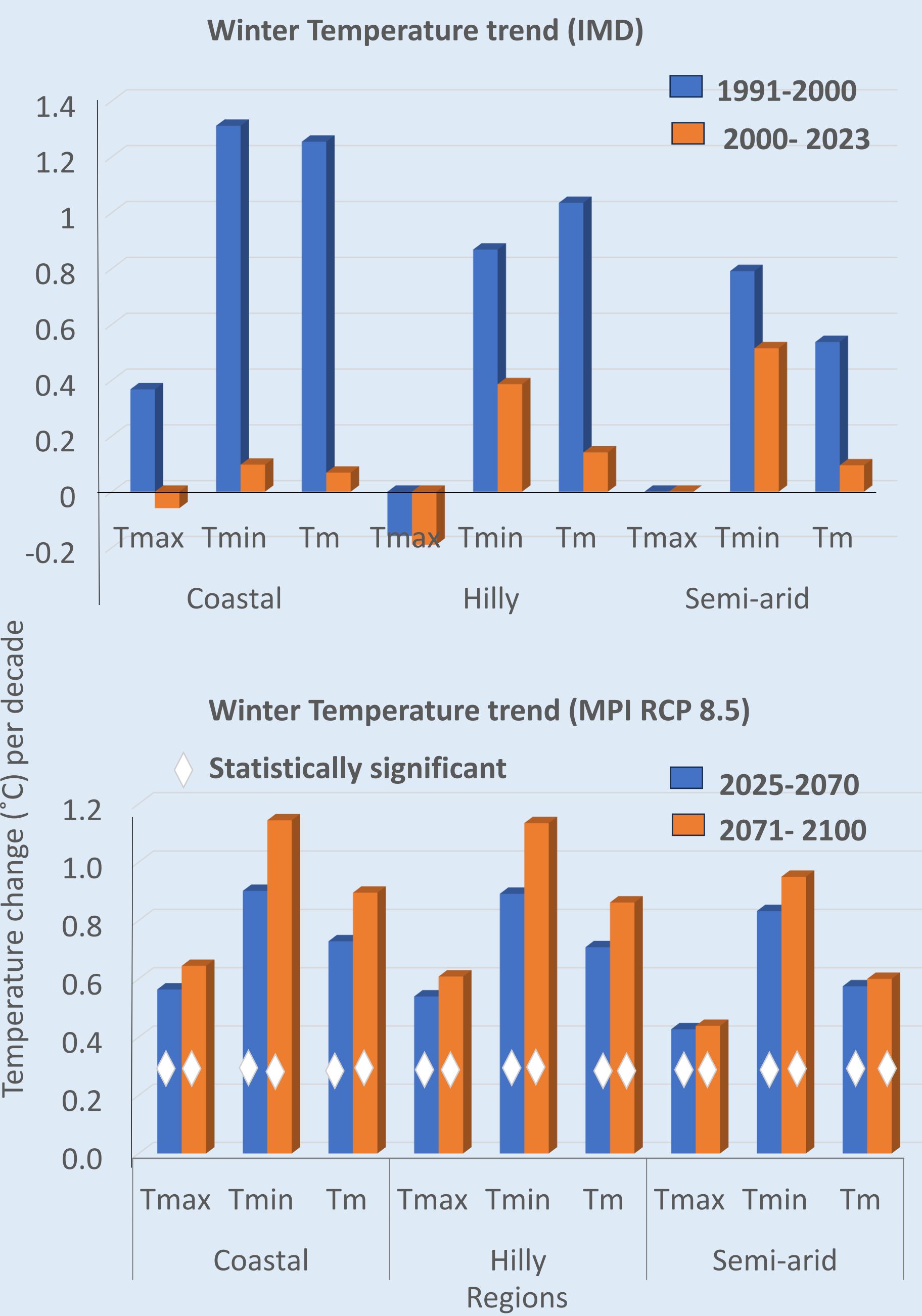


Figure 2: Temperature trends considering initial and later time intervals for past and future time period. Here maximum temperature (Tmax), minimum temperature (Tmin) and mean temperature Tm.

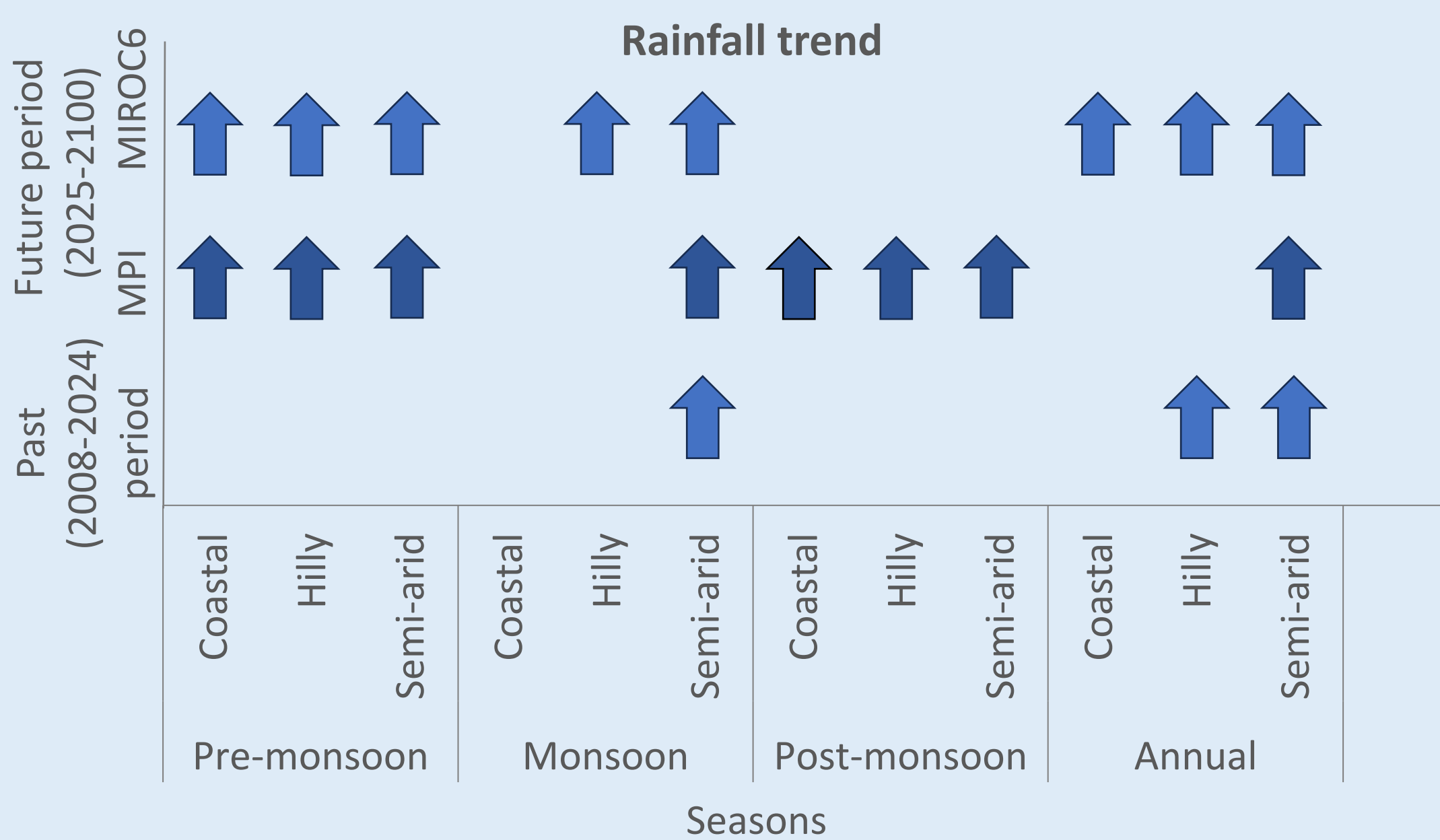


Figure 3: Season-wise rainfall trend (increasing) in past (2008-2024) and future (2025-2100) period based on MPI and MIROC6 (RCP8.5) models simulation; all the trends are statistically significant.

6 KEY FINDINGS & POTENTIAL THREATS

- The future is estimated with warming temperature, intensifying the dry-hot climate of semi-arid regions leading to increased human discomfort.
- Tourism industry is prone to decreased tourist footfall during peak tourism period (winter), negatively impacting local livelihood.
- Indigenous species of hilly region may get extinct due to threshold crossing heat events.
- Agriculture is likely to experience adverse effects on crop growth & productivity due to frequent droughts and extreme rainfall events, rising concerns of water management and food security.

Table 1: Seasonal temperature change (°C/decade) during past and future (scenario: RCP 8.5)

Region	Season	Temp	Past		Future			
			IMD		MPI RCP8.5		MIROC RCP8.5	
			1991-2000	2001-2023	2025-2065	2066-2100	2025-2070	2071-2100
Coastal	Win	Tmax	0.37	-0.06	0.6	0.6	0.37	0.38
		Tmin	1.31	0.10	0.9	1.1	0.45	0.60
	Sum	Tmax	0.50	0.25	0.41	0.52	0.25	0.41
		Tmin	0.02	-0.05	0.52	0.75	0.41	0.46
	Mon	Tmax	0.08	0.31	0.43	0.47	0.25	0.39
Hilly	Win	Tmin	0.11	0.14	0.49	0.54	0.30	0.39
		Ann	0.30	0.07	0.48	0.61	0.28	0.37
	Sum	Tmin	0.06	0.01	0.61	0.76	0.36	0.47
		Mon	-0.16	-0.19	0.5	0.6	0.46	0.44
	Ann	Tmax	0.87	0.39	0.9	1.1	0.43	0.50
Semi-arid	Win	Tmin	0.14	0.12	0.42	0.52	0.42	0.47
		Mon	0.25	0.16	0.56	0.77	0.42	0.39
	Sum	Tmax	-0.01	-0.25	0.42	0.43	0.25	0.32
		Tmin	0.00	-0.17	0.48	0.52	0.30	0.36
	Ann	Tmax	0.13	-0.03	0.48	0.57	0.30	0.35
Semi-arid	Win	Tmin	0.17	0.51	0.61	0.74	0.37	0.44
		Mon	0.00	0.00	0.4	0.4	0.49	0.20
	Sum	Tmin	0.79	0.51	0.8	0.9	0.43	0.38
		Ann	0.00	0.00	0.36	0.45	0.65	0.14
	Mon	Tmax	0.23	0.08	0.54	0.67	0.60	0.26
Semi-arid	Win	Tmin	-0.11	-0.11	0.31	0.30	0.28	0.205
		Ann	0.10	0.35	0.48	0.44	0.29	0.231
	Sum	Tmax	0.02	-0.11	0.59	0.65	0.38	0.21
		Tmin	0.25	0.51	0.51	0.54	0.44	0.36
	Ann	Tmax						

Win- winter, Mon- monsoon, Sum- summer, Ann- annual; temp- temperature; bold indicates significant trends

7 CONCLUSION

- Policy makers need to be prepared strategies to tackle climate change induced potential water and food shortage, risk to health and environment in near-term future.
- Economic activities such as agriculture, fishery, tourism etc. should be given significant importance realizing its vulnerability to climate.