ORIGINAL PAPER

Spatiotemporal changes in rainfall and droughts of Bangladesh for1.5 and 2 °C temperature rise scenarios of CMIP6 models

A. S. M. Maksud Kamal[1] · Farhad Hossain[1,2] · Shamsuddin Shahid[3]

Abstract

An alteration of rainfall variability and changes in rainfall driven extremes have been noticed across the globe with rising earth temperature. Such changes will undoubtedly be more devastating for agriculture-based developing countries. This study evaluated possible changes in rainfall and droughts in Bangladesh, a high climate change susceptible country, due to 1.5 and 2 °C temperature rise scenarios. Projections of global climate models (GCMs) of the coupled model intercomparison project phase 6 (CMIP6) for two shared socioeconomic pathway (SSP) scenarios, SSP-119 and SSP-126, were used for this purpose. The results showed an increase in annual rainfall over Bangladesh for both scenarios. However, the changes in rainfall variability would cause a drastic change in the drought pattern. Overall, drought frequency may decrease in the drought-prone western region up to -50% and increase in the east up to 50 to 70%, making droughts more homogeneously distributed over the country. However, a higher increase in the east than a decrease in the west for SSP119 indicates a possible shift in the country's drought-prone region. The drought scenarios for SSP119 and SSP126 revealed that a 0.5 °C further rise in temperature might cause an increase in extreme drought frequency by 30% in the central-eastern region. Bangladesh should take effective drought mitigation measures to sustain its agricultural development.

1 Introduction

Global climate models (GCMs) generally use mathematical equations derived from physical principles to simulate atmospheric circulation and global climate (Wright et al. 2015). The GCMs are continuously upgraded to improve their reliability by adopting new physical processes and reliable data (Zamani et al. 2020; Nie et al. 2020).

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Intergovernmental Panel on Climate Change (IPCC) coordinates the updates through Coupled Model Intercomparison Projects (CMIP). The CMIP6 is the latest version that consists of state-of-the-art GCMs with a broader range of experiments to provide a wider variety of scientific questions (Gusain et al. 2020; Narsey et al. 2020; Rivera and Gabriel 2020). CMIP6 also differs from earlier phases in terms of new future scenarios named shared socioeconomic pathways (SSPs) derived according to different socioeconomic assumptions (O'Neill et al. 2016; Veronika et al. 2016; Yukimoto et al. 2019; Boucher et al. 2020).

The SSP119 is a new scenario that provides a climate simulation for global warming below 1.5 °C by 2100 compared to preindustrial levels. This mildest scenario offers an understanding of the least likely climate changes. SSP126 provides a climate simulation for global warming of 2 °C by 2100 (O'Neill et al. 2016). Projections for SSP119 and SSP126 can tell how climate will change for 1.5 and 2.0 °C temperature rise scenarios and how the change can be due to a further rise of temperature by 0.5 °C. Studies in different parts of the globe showed significant rainfall and disaster risk changes due to 0.5 °C more warming of the globe

(Hulme 2016; Mitchell et al. 2016). Population under heatwaves are projected to increase from 14% in 1.5 °C warming scenario to 37% in 2 °C warming scenario. Nearly 61 million more people will be in water scarcity for a 2 °C warming than a 1.5 °C warming. About 32 to 80 million people would be exposed to flooding from sea-level rise under 2 °C compared to 31 to 59 million under a 1.5 °C warming (James et al. 2017; Hoegh-Guldberg et al. 2018; Schleussner et al. 2016).

The impact of half-degree more warming would not be the same over the globe (Mitchell et al. 2016). The effect may be more visible in tropical monsoon rainfall countries due to significant sea surface temperature variability. The impact will also be more in highly populated but less developed countries where a small change in droughts or floods may affect a large amount of population. Governments of those countries need to revise the climate change adaptation strategies based on projections for these scenarios. However, possible consequences for 1.5 and 2.0 °C temperature rise are still not available in many developing countries. Such projections are specifically significant for the regions where a slight rise in global temperature can cause a substantial change in the climate. Particularly, it is vital for vulnerable countries where climate changes can have severe implications.

Bangladesh is highly susceptible to any small changes in climate due to its high dependency on agriculture and the recurrence of hydrological hazards like floods and droughts (Mohsenipour et al. 2018). The damage risk to a moderate hydrological hazard is very high for the country due to high population density and low adaptation capability. Understanding possible changes in climate are the key to developing adaptation policies and building climate resiliency. Therefore, many studies projected possible changes in rainfall and temperature for different climate change scenarios (Alamgir 2019; Alamgir et al. 2020; Khan et al. 2020a; Mondal et al. 2020; Mortuza et al. 2019; Pour et al. 2018; Xu et al. 2019). All the previous studies used GCMs of CMIP5 or the earlier versions to project climate for different RCP or SRES scenarios. No study has been conducted until now to evaluate climate change for SSP scenarios using CMIP6 models. Recently, Kamruzzaman et al. (2021) evaluated the relative performance of CMIP5 and CMIP6 models in Bangladesh. However, they do not project the climate using CMIP6 models. Almazroui et al. (2020) projected precipitation and temperature changes over South Asia using CMIP6 models at a resolution 1° × 1° grid. Long and Li (2021) projected South Asian monsoon precipitation changes using CMIP6 and reported high uncertainty in projections for low emission scenarios. Mishra et al. (2020) employed CMIP6 model and showed up to a 30% increase in precipitation in different parts of South Asia. Besides, few studies evaluated the changes in droughts in South Asia using CMIP6

projected climate. Zhai et al. (2020) showed a significant increase in drought duration and frequency in South Asia using CMIP6 models. Aadhar and Mishra (2020) also projected an increase in drought frequency in South Asia using CMIP6 GCMs. Mondal et al. (2021) reported doubling the population under drought exposure at the end of the century for CMIP6 scenarios. However, all the studies were conducted on a regional scale. Due to coarse resolution, it was not possible to understand the changes in Bangladesh's climate and droughts from their studies. Besides, the previous studies did not evaluate the changes in seasonal rainfall and rainfall distribution of Bangladesh.

The objective of this is to employ CMIP6 GCMs for the projection of spatiotemporal changes in precipitation and droughts in Bangladesh for SSP119 and SSP126 scenarios to appraise the least possible alterations in droughts and its variability due to 0.5 °C further rise of global temperature. Six CMIP6 models released so far, which have projections for both SSP119 and SSP126 scenarios, were used in this study. The projected rainfall was used to assess the future spatiotemporal scenarios of drought frequency in Bangladesh. The results presented in the article can help in adaptation planning for building a climate-resilient society.

2 Study area and data

Bangladesh, situated in the deltas of mighty Himalayan rivers, covers a land of 148.46 thousand km^2, as shown in Fig. 1a. The country's topography is extremely plain, with a few elevated areas in the northeast and southeast (Fig. 1b). It has a humid tropical climate with a seasonal variation in rainfall and temperature (Rashid 1991).

Bangladesh has four distinct seasons: winter (Dec–Feb), pre-monsoon (Mar − May), monsoon (Jun–Sept), and post-monsoon (Oct–Nov). Figure 2 shows the spatial variability of annual and seasonal rainfall in Bangladesh prepared using Asian Precipitation—Highly-Resolved Observational Data Integration Towards Evaluation (APHRODITE) data for 1975–2014. Rainfall in Bangladesh is relatively low in the northwest and high in the northeast for all the seasons (Jerin et al. 2021). The majority of the rain occurs in the monsoon, while winter is mostly dry.

CMIP6 provides the simulations of climate variables by updated GCMs for different SSP scenarios. The CMIP6 GCMs, which have rainfall simulations for SSP119 and SSP126, were selected for the study. Only six GCMs in CMIP6 have rainfall simulations for both SSP119 and SSP126, and therefore, those are selected for the present study. The name, modelling centers, and resolutions of the selected GCMs are provided in Table 1.

Fig. 1 **a** Location of Bangladesh in Southeast Asia; **b** topography of Bangladesh
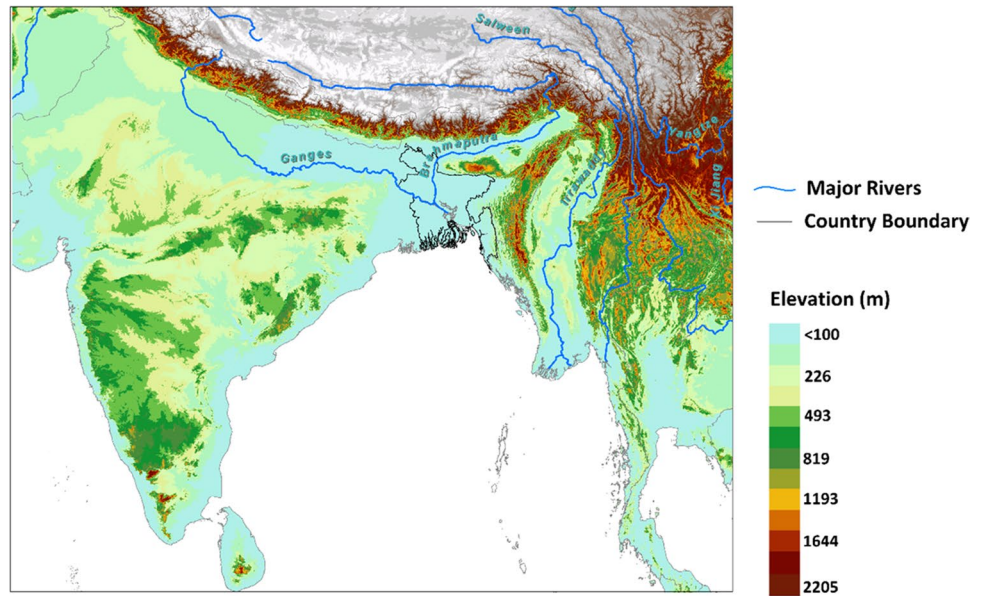
(a)
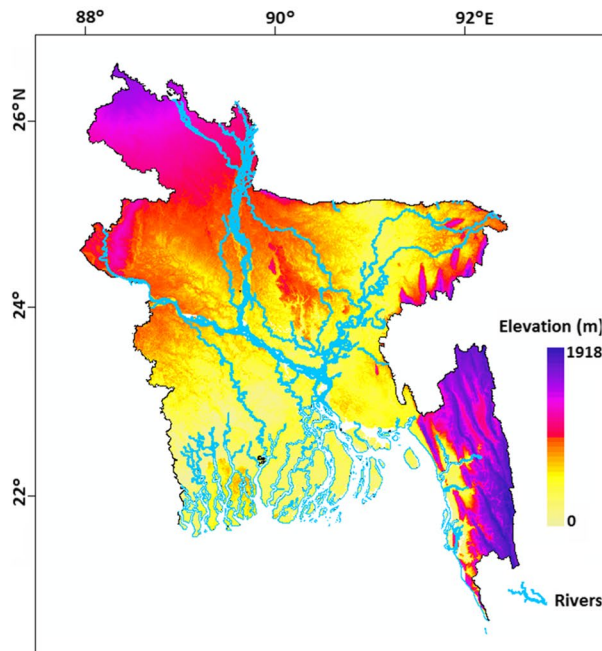
(b)

3 Methods

APHRODITE having a spatial resolution of 0.25°×0.25° was used as the reference to show the spatial changes in rainfall and droughts in Bangladesh for 1.5 and 2.0 °C temperature rise scenarios. Validation of gridded climate data is recommended before their use for climate analysis (Khan et al. 2019; Ahmed et al. 2019). APHRODITE data has been validated for Bangladesh in several previous studies (Ismal et al. 2021; Islam and Laz 2018; Nashwan et al.

2019). Islam et al. (2021) validated APHRODITE rainfall for Bangladesh and showed a higher correlation (0.85) and low bias (0.91) of APHRODITE rainfall compared to observed rainfall. Islam and Laz (2018) also reported a high performance of APHRODITE in replication rainfall and Bangladesh. Nashwan et al. (2019) compared the performance of seven widely used gridded rainfall products and Bangladesh and reported the best performance of GPCC followed by APHRODITE. However, the resolution of APHRODITE is higher than GPCC and, therefore, recommended when
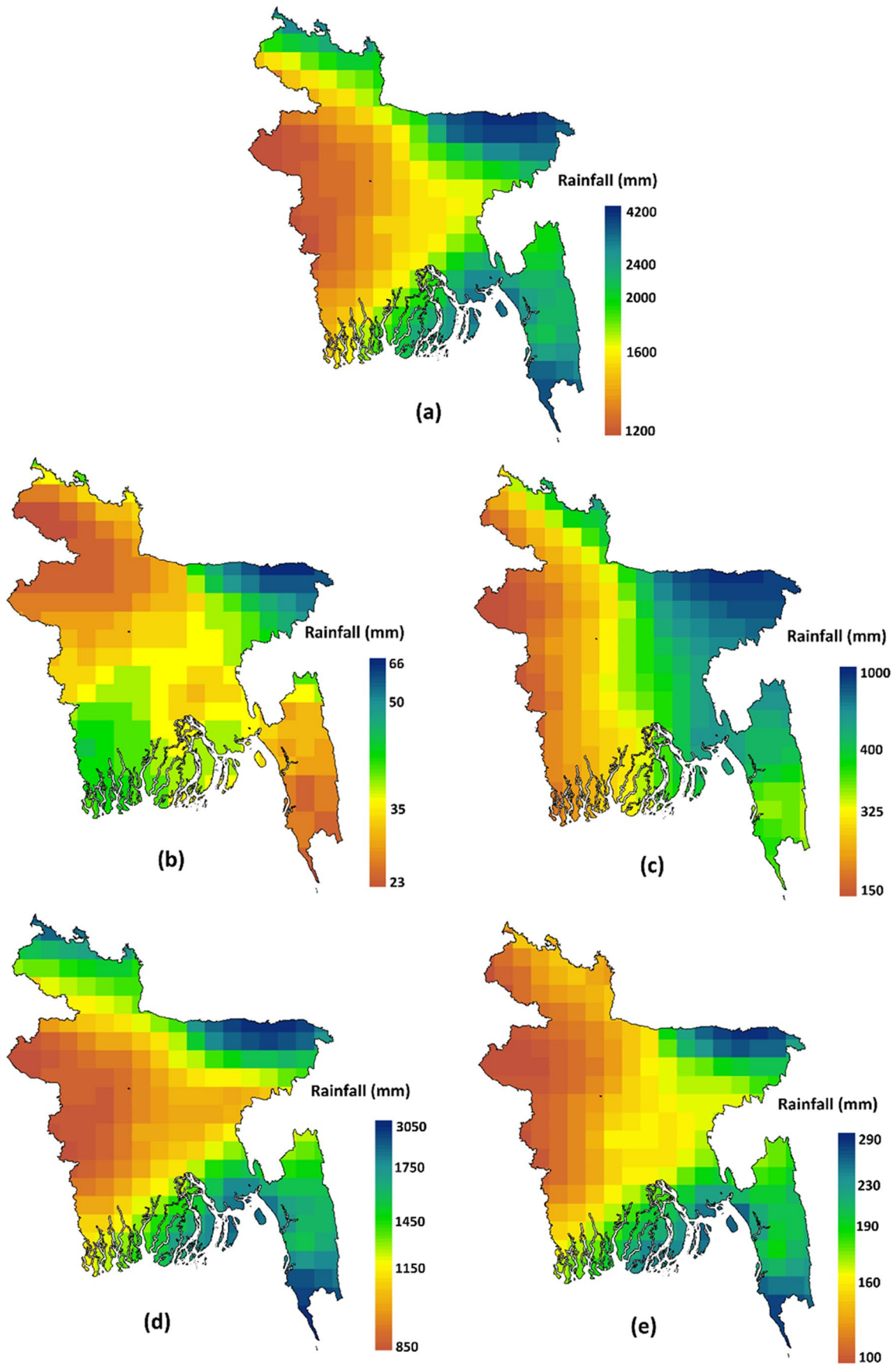
(a)

(b)

(c)

(d)

(e)

climate analysis at a higher resolution is needed. Therefore, APHRODITE has been used as reference data for the climate change projection of Bangladesh in previous studies (Caesar et al. 2015).

Historical simulations and future projections of all GCMs were re-gridded into the APHRODITE resolution using the bilinear interpolation method for this purpose. SPI was calculated from historical and future GCM simulated rainfall to estimate the variation in drought occurrence frequency. Besides, the present study used a change factor approach to calculate the changes in rainfall and droughts. Details of the methods are given below.

3.1 Bilinear Interpolation (BI)

BI estimates the value at the point of interpolation through weighted averaging of the nearest four observation points. It estimates the weight as the inverse of the distance between the interpolation and observation points. BI can translate data from a coarser resolution to a finer resolution without modifying climate signals (Ahmed et al. 2020). Therefore, it is widely used for re-gridding GCMs to present simulations at a finer resolution (Jain et al. 2019; Gusain et al. 2020).

3.2 Estimation of changes in rainfall and droughts

The percentage of change between GCM projected rainfall for a future period and the historical simulation of rainfall for the base period, both having the same period, were used to show the rainfall changes. The changes were estimated at all the APHRODITE grid points to show the geographical variability of rainfall changes for two future periods and two SSP scenarios. The multi-model ensemble (MME) mean was calculated by averaging the simulated rainfall of all GCMs for different SSPs. The percentage of change was calculated between the SPI estimated from MME projected

rainfall for a future period and MME rainfall hindcast for the base period to present the changes in drought severity. In the present study, the changes in rainfall and droughts were shown for two future periods, the near future (2020–2059) and the far future (2060–2099), compared to the historical period (1975–2014).

3.3 Standardized Precipitation Index (SPI)

SPI (Mckee et al. 1993) fits the best probability density function (PDF) to monthly rainfall data of different timescales of interest (e.g., 3 and 6 months). The gamma distribution best fitted the monthly rainfall (x) for different timescales. The present study employed gamma PDF for fitting rainfall data, as given in Eq. (1):

$$g(x) = \frac{1}{\beta^\alpha \Gamma(\alpha)} x^{\alpha-1} e^{-x/\beta} \tag{1}$$

where α and β are gamma distribution parameters and $\Gamma(\alpha)$ is the gamma function. The SPI is estimated as the standardized values of $g(x)$. A negative SPI indicates drought (moderate drought, $-1.5 \leq SPI \leq -1.0$; severe drought, $-2.0 \leq SPI \leq -1.5$; extreme drought, $-2.0 \leq SPI$).

In this study, droughts for 3- and 6-month were analyzed to represent agricultural and hydrological water scarcity in Bangladesh (Mohsenipour et al. 2018). Weibull formula was used to estimate the occurrence frequency of different severities of droughts. The percentage of change in drought occurrence frequency was used to show the drought changes due to temperature rise.

4 Results

4.1 Changes in annual and seasonal rainfall

The spatial distribution of annual and seasonal rainfall changes (%) projected by the GCMs for two future periods for SSP119 are presented in Supplementary Fig. 3.

Table 1 List of CMIP6 climate models employed in this study

| No	Modelling center	Model	Reference	Resolution (lon × lat)
1	Canadian Centre for Climate Modelling and Analysis, Canada	CanESM3	Swart et al. (2019)	2.8° × 2.8°
2	EC-Earth-Consortium, Europe	EC-Earth3-Veg	Wyser et al. (2019)	0.7° × 0.7°
3	Geophysical Fluid Dynamics Laboratory, National Oceanic and Atmospheric Administration, USA	GFDL-ESM4	Held et al. (2019)	1.3° × 1°
4	Institut Pierre-Simon Laplace, Sorbonne Université, France	IPSL-CM6A-LR	Boucher et al. (2020)	2.5° × 1.3°
5	Atmosphere and Ocean Research Institute, The University of Tokyo, Japan	MIROC6	Tatebe et al. (2019)	1.4° × 1.4°
6	The Meteorological Research Institute, Japan	MRI-ESM2-0	Yukimoto et al. (2019)	2.8° × 2.8°
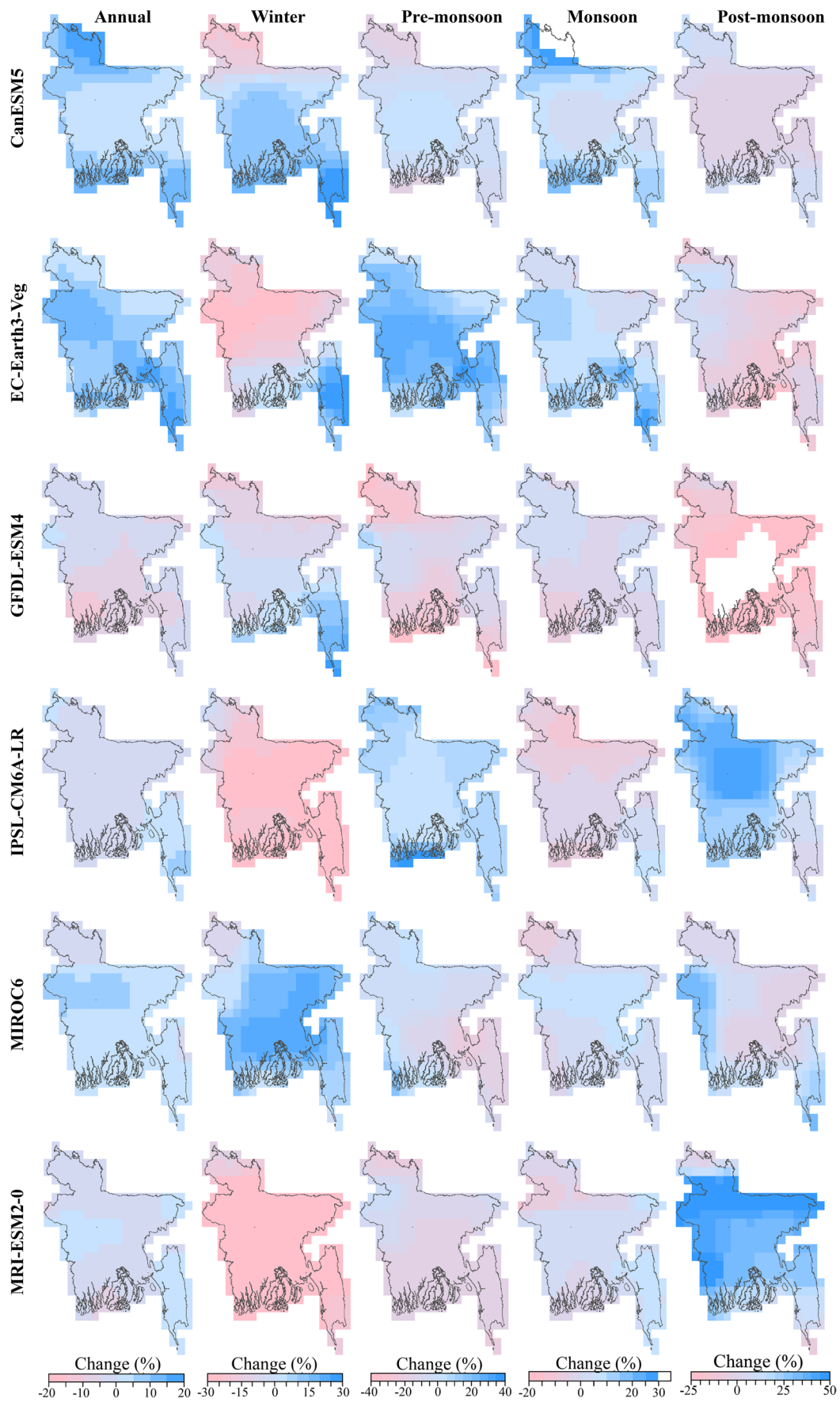
The projected rainfall showed considerable variability among GCMs. For example, CanESM5 and EC-Earth-Veg projected an increase in annual rainfall over a large area of Bangladesh, while GFDL-ESM4 and IPSL-CM6A-LR projected a decrease in rainfall in most parts of the country. The other two GCMs, MIROC6 and MRI-ES2-0, projected insignificant changes in rainfall. Seasonal rainfall projections also showed a similar large variability. Overall, most of the models projected an increase or no change in annual rainfall in the northwest of Bangladesh and a reduction in winter rainfall in the north, particularly far north. For the other three seasons, inconsistency among the GCM projections was much higher. There was no consistent increase or decrease in projected rainfall in any region for those three seasons. The highest inconsistency in rainfall projections by different GCMs was for pre-monsoon and post-monsoon seasons. For example, EC-Earth3-Veg projected an increase in pre-monsoon rainfall in the range of 20 to 40% over most parts of the country. In contrast, GFDL-ESM4 projected a decrease in pre-monsoon rainfall by -10 to—40% over the country. Therefore, MME of GCM projections for different future periods and scenarios were prepared.

The changes (%) in annual and seasonal MME mean rainfall for two future periods for SSP119 and SSP126 scenarios are presented in Figs. 4 and 5, respectively. Noticeable annual rainfall changes were observed in most parts of Bangladesh for both future periods and SSP scenarios. A slight increase in rainfall (0 − 5%) was projected over the whole country during 2020–2059 for both scenarios, except for the southeast corner, where an increase was projected up to 15%. The increasing rainfall was projected to continue in the far future in the northwest of the country. The increase in rainfall in the northwest was over a larger area for SSP126 compared to SSP119 in the far future. However, the increase in rainfall in the southeast was over a smaller area for SSP126 than SSP119 in the far future.

The winter rainfall projections in the near future showed a large difference in the spatial pattern for the two scenarios. It showed a declination up to 20% in the north for SSP119 and in the south for SSP126 during the near future. Pre-monsoon rainfall showed an increase to the west in the far future for SSP119 and to the near future for SSP126. The projected changes in monsoon rainfall were insignificant for the whole country. The pre-monsoon rainfall projection showed an increase up to 25% in the northwest for SSP119 while almost no change for SSP126. Overall, an increase in annual and seasonal rainfall was noticed in the northwestern, the least rainfall receiving region of the country, and decreased only in winter in different areas for different scenarios and
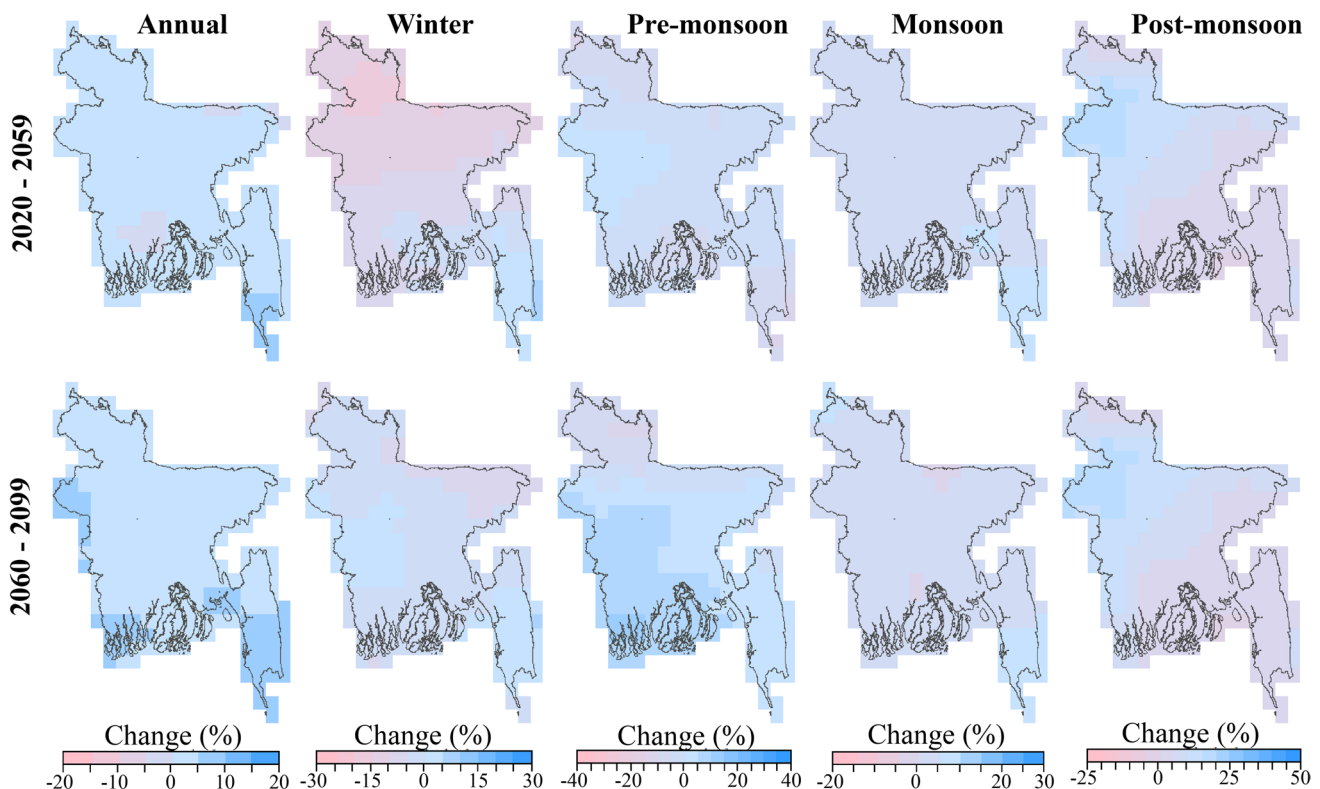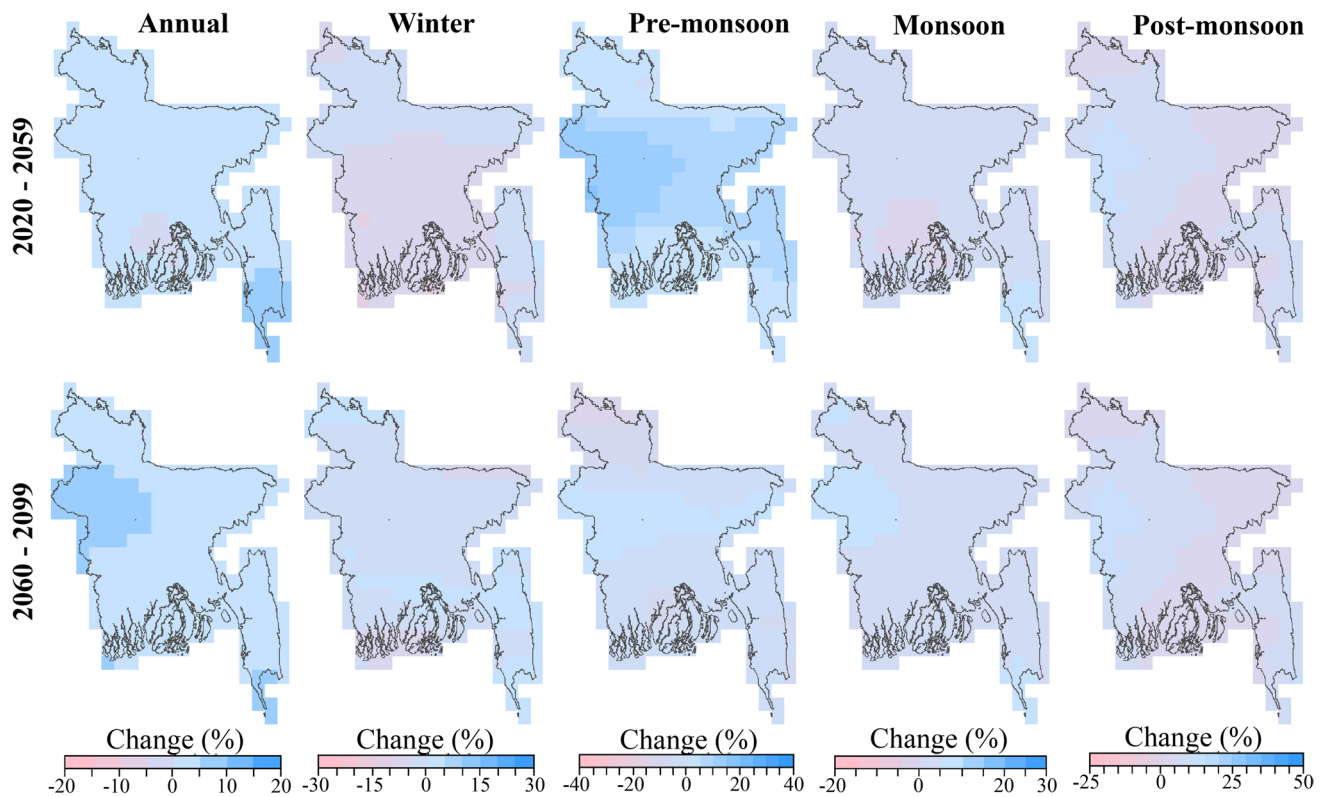

Fig. 4 Spatial distribution of annual and seasonal rainfall changes (%) for two future periods (2020−2059 and 2060−2099) compared to the reference period (1975−2014) for SSP119 scenario

Fig. 5 Spatial distribution of annual and seasonal rainfall changes (%) for two future periods (2020−2059 and 2060−2099) compared to the reference period (1975−2014) for SSP126

periods. The results revealed more spatial homogeneity in rainfall in Bangladesh for SSP119 and SSP126.

4.2 Changes in annual and seasonal rainfall distribution

Changes in the probability distribution of annual and seasonal rainfall for different GCMs in two future periods than the based period for SSP119 and SPP126 are presented in Figs. 6 and 7, respectively. The black line in the plots presents the probability distribution function (PDF) of rainfall for the reference period, while the red and blue lines represent the rainfall PDFs for near and far futures. The results revealed almost no change in mean rainfall over Bangladesh for any seasons or future periods for both scenarios. But the changes in variability, particularly the increase in skewness in the positive direction, were noticed in the majority of GCMs' projected rainfall for both future periods. The more variability in projected annual and seasonal rainfall was for SSP126 compared to SSP119. Rainfall variability is the major driver of hydrological disasters. The increased rainfall variability can cause more hydrological hazards in Bangladesh. Therefore, the projected rainfall was used to estimate the recurrence frequency of different severities

of droughts in Bangladesh to show how a small change in global warming can affect drought recurrence.

4.3 Changes in drought frequency

Spatial distributions of occurrence frequencies of different severities of 3- and 6-month droughts are presented in Fig. 8. The MME of GCM simulations for the base period was used to estimate the occurrence frequency of droughts. The results show a higher occurrence of all severities of both 3- and 6-month droughts in the northwest region of Bangladesh. This matches well with the drought maps generated using observed data by Shahid and Behrawan (2008). The maps in Fig. 8 also show the high occurrence of different severities of 6-month droughts in southeast Bangladesh. Moderate and severe droughts for both timescales occur less in the south, while extreme droughts occur less in the central east.

The SPI was estimated using MME mean rainfall projections for two future periods, 2020−2059 and 2060−2099, and individually compared with the MME estimated for the reference period (Fig. 8) to estimate the changes in the occurrence frequency of drought in two future periods. Obtained results for SSP119 and SSP126 are presented in Figs. 9 and 10, respectively. Drastic changes in
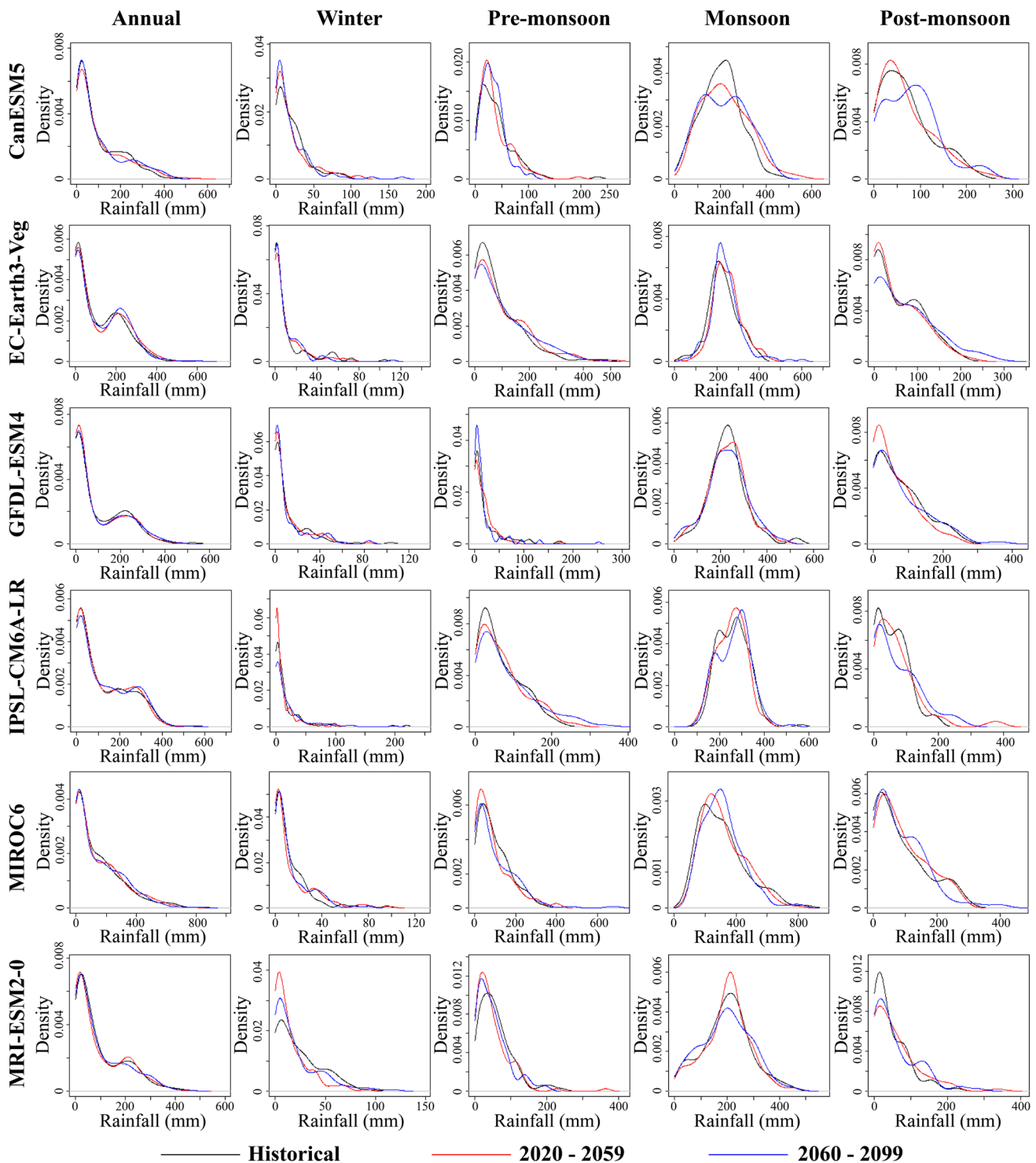
Fig. 6 The probability distribution of monthly rainfall for the reference period (1975 − 2014) and two future periods, 2020 − 2059 and 2060 − 2099, for the SSP119 scenario

the occurrence frequency of different severities of droughts were noticed in Bangladesh. Projections showed both an increase and decrease in drought frequencies for both SSPs. It showed a large decrease (up to -50%) in extreme drought

frequency in the drought-prone north and northwest Bangladesh for SSP119. The areal coverage of decrease was much higher for far future compared to near future. The severe and moderate droughts also showed a decrease in those regions.
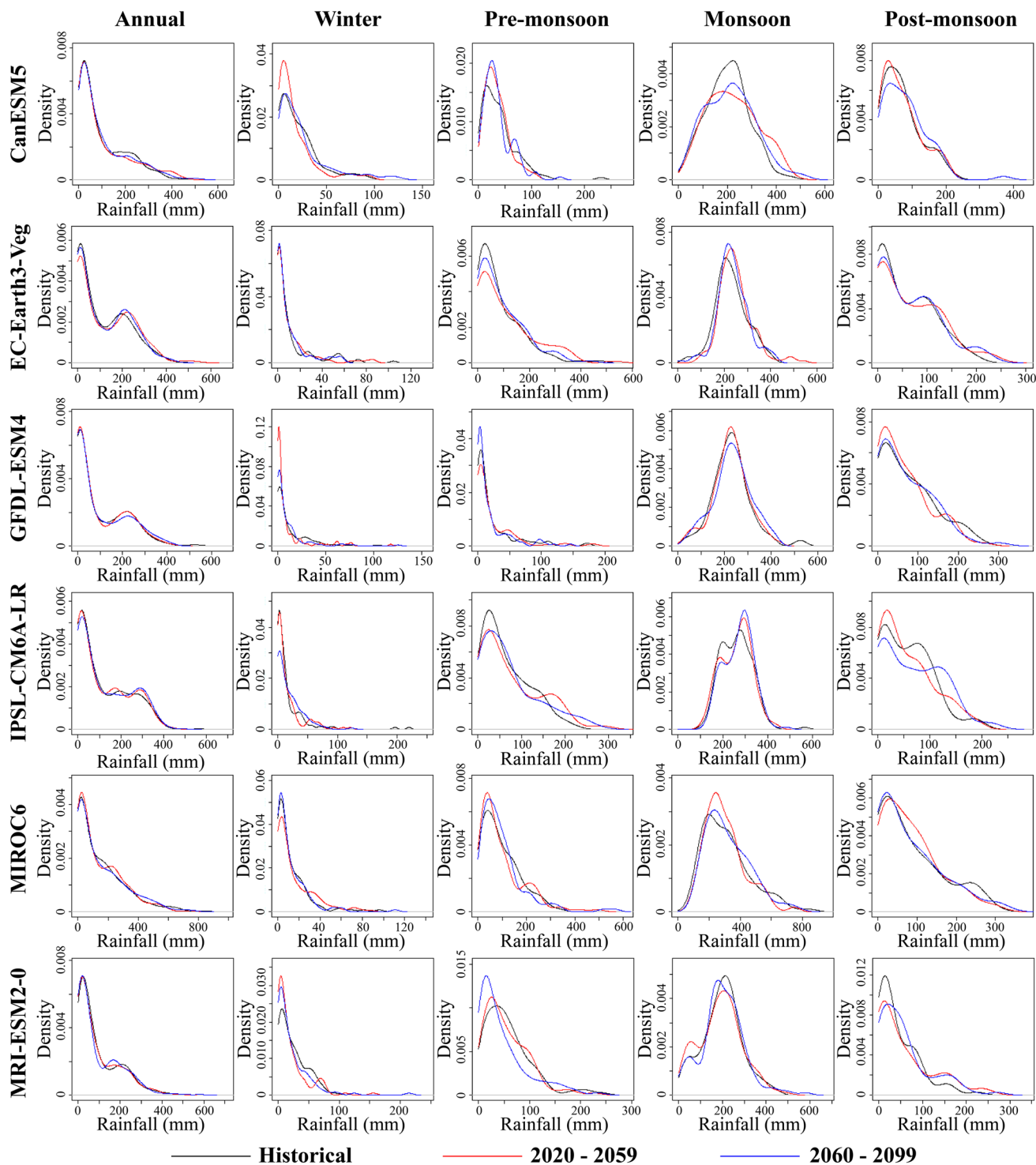
Fig. 7 The probability distribution of monthly rainfall for the reference period (1975 − 2014) and two future periods, 2020 − 2059 and 2060 − 2099, for SSP126

Besides, the projections of all categories of droughts showed to decrease in the southeast of Bangladesh. The decreases in this region were also found much higher in the far future compared to the near future. It indicates a gradual decrease in drought frequency in drought-prone regions of Bangladesh for SSP119. On the other hand, a large increase (up
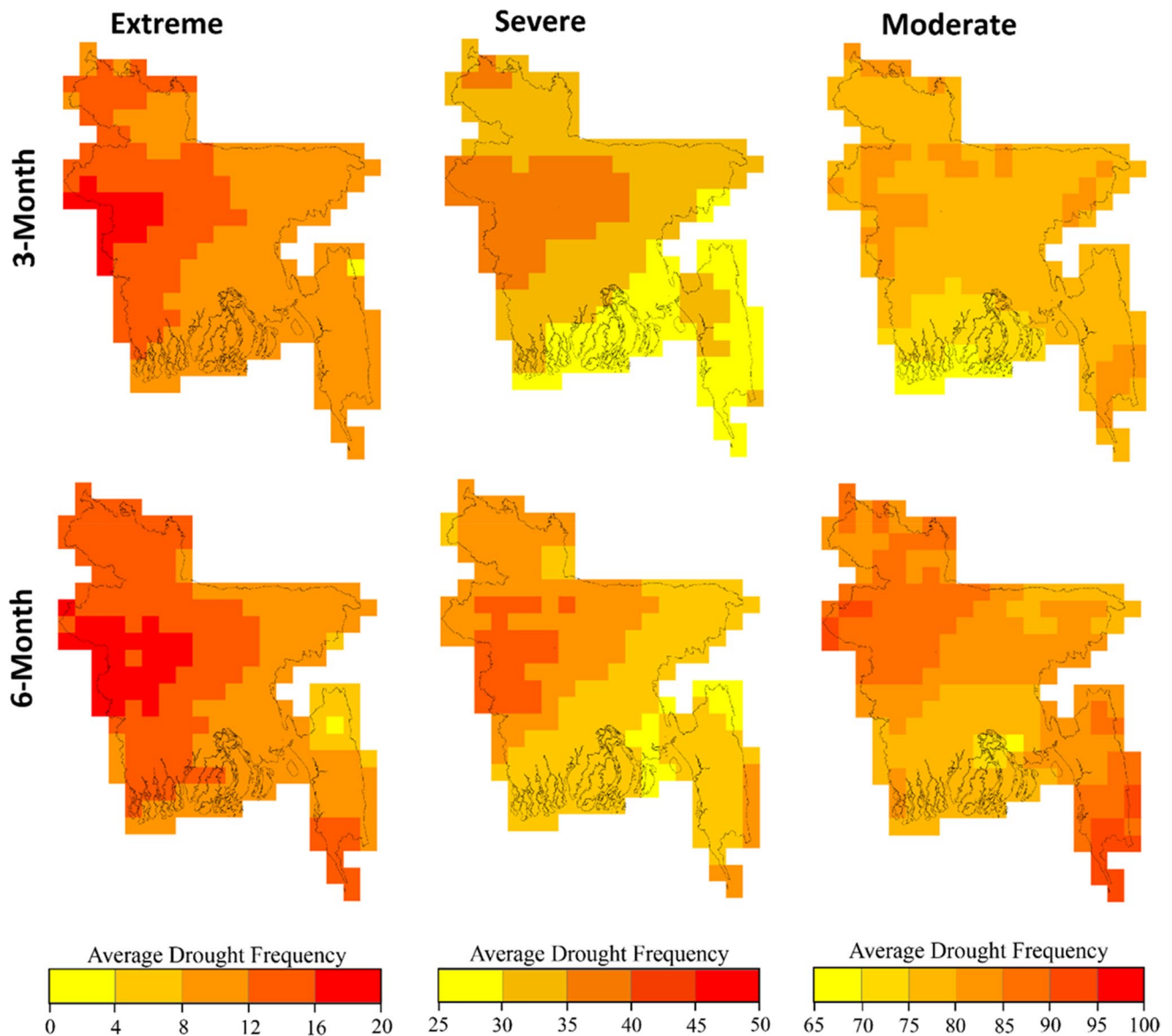
Fig. 8 Occurrence frequency of different severities of 3- and 6-month droughts in Bangladesh during the reference period (1975 − 2014)

to 70%) in extreme droughts was projected in central and northeast Bangladesh in the near future. The increase in drought occurrence was also projected in the far future but in the range of 5 to 20%. The increase in extreme droughts for both of the future periods was found much widespread for 3-month droughts. Severe and moderate droughts were projected to increase over a large region in the central south of the country in the range of 20 to 50% in the near future and 0 to 20% in the far future for severe droughts. The most widespread increase in severe and moderate droughts was noticed for 6-month droughts in the far future. Those were found to increase in the range of 0 to 20% for the whole country except northwest and southeast.

The increased frequency of extreme droughts was noticed much widespread for SSP126 compared to SSP119. It was projected to increase over a big region in the east and some parts in the north of Bangladesh. The increase was up to 40% in the near future and 50% in the far future. The most widespread increase was projected for 3-month droughts in the far future for SSP126, where the increase was projected for most parts of the country. An increase in severe and moderate drought occurrence was noticed in almost the whole country for SSP126. The increases were more widespread for 3-month droughts and in the near future.

Comparison of drought projections of SSP119 and SSP126 revealed that a temperature rise by 0.5 °C more can cause a large change in the drought pattern in

Fig. 9 Projected changes in the occurrence frequency of different severities of 3- and 6-month droughts in Bangladesh for SSP 119 in two future periods, 2020−2059 and 2060−2099, compared to the reference period (1975−2014)
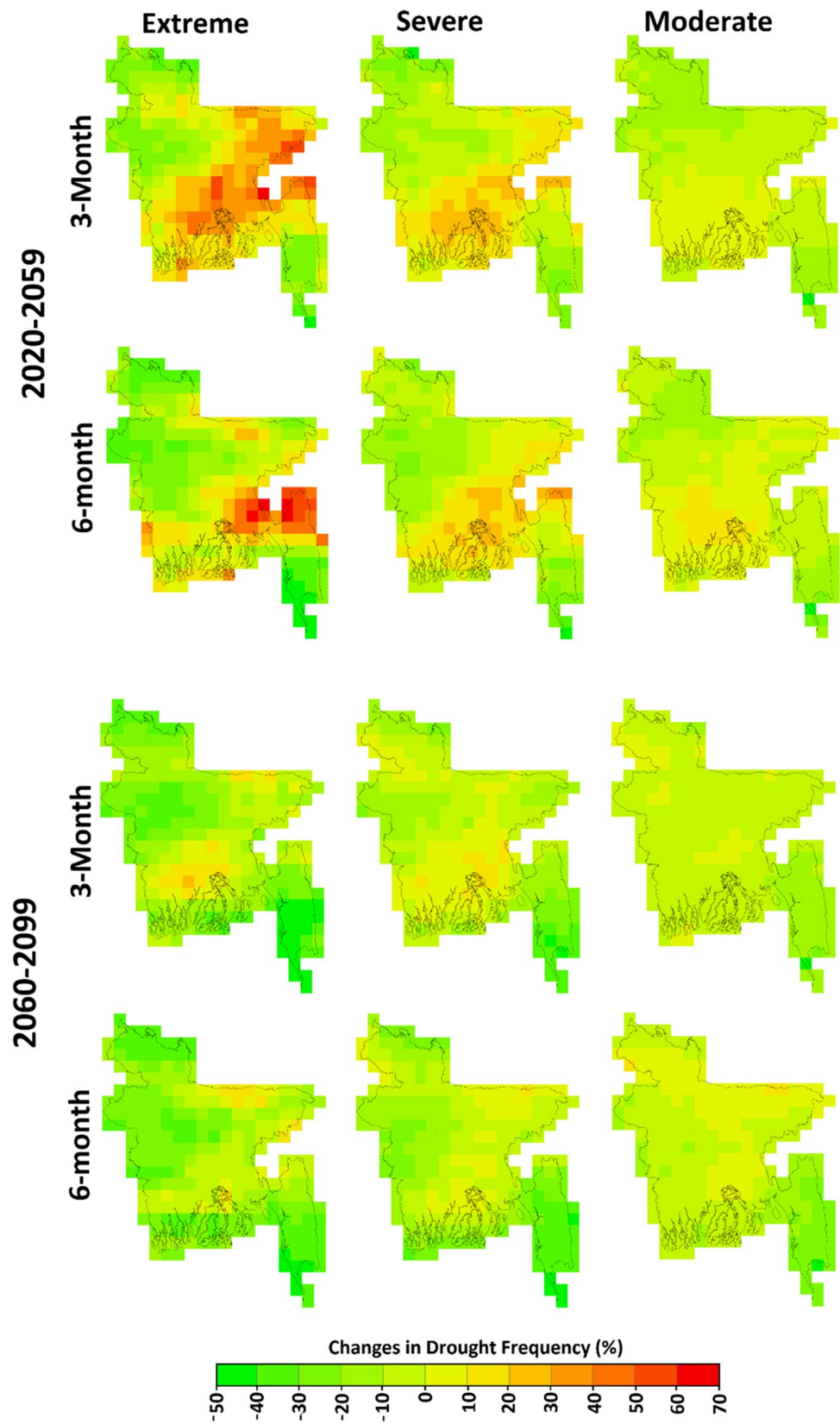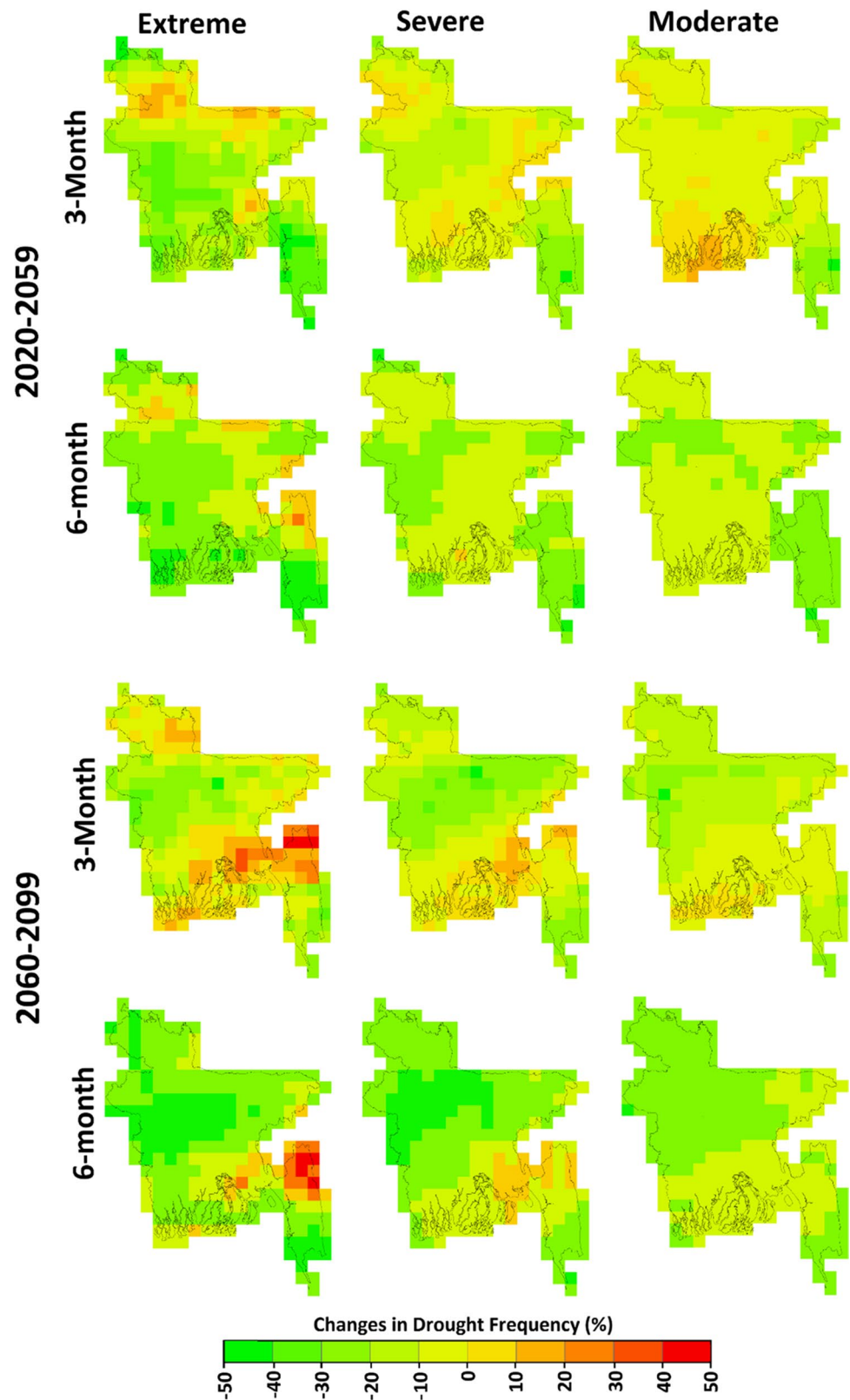
Fig. 10 Projected changes in the occurrence frequency of different severities of 3- and 6-month droughts in Bangladesh for SSP 126 in two future periods, 2020−2059 and 2060−2099, compared to the reference period (1975−2014)

Bangladesh, particularly in the location and areal coverage of increasing droughts. A large increase in extreme droughts was noticed in the central-eastern region for the near future for SSP119 while those increase in the far future for SSP126.

5 Discussion

A gradual increase in temperature is expected in Bangladesh, like in other parts of the world. A 2 °C temperature rise scenario at the end of this century means probably around 1.5 °C temperature rise in the near future and 2 °C temperature rise in the far future. In such a case, the frequent occurrence of extreme droughts in the east of the country would sustain for the whole century. If the temperature rise at the end of the century can be limited to 1.5 °C, the increase in extreme droughts in the far future can be limited to 20% in the areas where it is increasing. In the case of a 2 °C temperature rise at the end of the century, the increase in extreme droughts in the far future would be up to 50% in the areas where it is increasing. This indicates that a 0.5 °C temperature rise can cause an increase in extreme droughts in some regions of Bangladesh by more than 30% compared to the base period. Overall, a decrease in droughts in the drought-prone western region and an increase in the eastern region would make drought frequency more homogeneously distributed. However, an increase would be more in the east than a decrease in the west for SSP119 (Fig. 5), indicating a shift in drought-prone regions in Bangladesh from the west to the east.

The CMIP6 GCM ensemble replicated the historical pattern of droughts in Bangladesh very well (Fig. 4). The historical simulation of droughts using CMIP5 GCMs (Khan et al. 2020b) could not capture the drought pattern obtained using observed data. Mohsenipour et al. (2018) used SPEI to estimate different drought events in Bangladesh using long-term in situ rainfall and temperature data. They revealed the higher occurrence of drought events in northwest Bangladesh and fewer droughts in other parts. Shahid (2008) used SPI and showed that the western part of Bangladesh is more prone to droughts than other parts. Both the SPI and SPEI maps generated using CMIP5 model in the study of Khan et al. (2020b) failed to capture the observed spatial pattern of droughts in Bangladesh. In contrast, CMIP6 MME was found reliable in replicating droughts in Bangladesh. The result is consistent with that obtained by Zhai (2020). They reported a higher capability of CMIP6 models in reconstructing droughts in South Asia compared to CMIP5 models.

The present study revealed more spatial homogeneity in Bangladesh's drought in the future for both SSP119 and SSP126 scenarios. It is mainly due to a decrease in droughts in the west and an increase in the east. A consistent rise in rainfall was observed in Bangladesh for all the future periods and SSPs. Drought does not depend on rainfall amount rather on rainfall variability. The present study found an increase in rainfall in northwest Bangladesh for all the seasons. The increases were more for low rainfall seasons compared to high rainfall seasons. This would make the rainfall in northwest Bangladesh less variable and a decrease in droughts. An opposite condition was projected in the central-eastern region, which would cause an increase in droughts in the region.

Kamruzzaman et al. (2019) evaluated the changes in droughts in Bangladesh using CMIP5 GCMs. They also reported an increase in rainfall in the north and northwest of Bangladesh and a declination of droughts in northwest Bangladesh by nearly 55%. Khan et al. (2020a, b) showed a decrease in droughts all over the country in the near and mid-future and an increase in the far future. They projected a higher increase in drought frequency in the east and southeast compared to other parts. The difference in the results from the previous studies was due to different GCMs to prepare MME. The results obtained in this study were consistent with that obtained by Kamruzzaman et al. (2019) in terms of decreasing droughts in the drought-prone northwest of Bangladesh by more than 50%. The present study showed an increase in extreme droughts in both near and far futures in the central-eastern region of Bangladesh, which could not be obtained using CMIP5 models. The present study revealed a possible shift in the drought-prone area in Bangladesh and a large increase in droughts frequency due to a mild rise in temperature in some parts.

6 Conclusion

The present study evaluated the changes in rainfall and droughts in Bangladesh under 1.5 and 2 °C temperature rise scenarios. The study used a simple climate change factor approach to estimate the percentage of annual and seasonal rainfall changes and their effect on spatial changes in droughts patterns. The results revealed the significant consequence of drought recurrence due to a mild temperature rise. A drastic shift in drought patterns is also noticed, which can be detrimental for the country without effective adaptation planning. Contradictory results have been reported in recent trends in droughts in Bangladesh. The present study justifies both the increase and decrease of droughts in different parts of the country. A decrease in drought frequency in drought-prone areas would ease water resources pressure in the region. However, a large increase in drought frequency, particularly higher recurrence of extreme droughts in some regions, emphasizes the need to pay attention to those regions instead of region-specific adaptation measures limited to only drought-prone regions in Bangladesh. It is expected that the study's findings would help streamline the existing governmental policies based on new scenarios. More GCMs can be considered in the future with the release of more CMIP6 GCMs. Besides, uncertainty in projections

can be considered in the estimated change in drought occurrence frequency.

Declarations

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication All the authors consented to publish the paper.

Conflict of interest The authors declare no competing interests.

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