



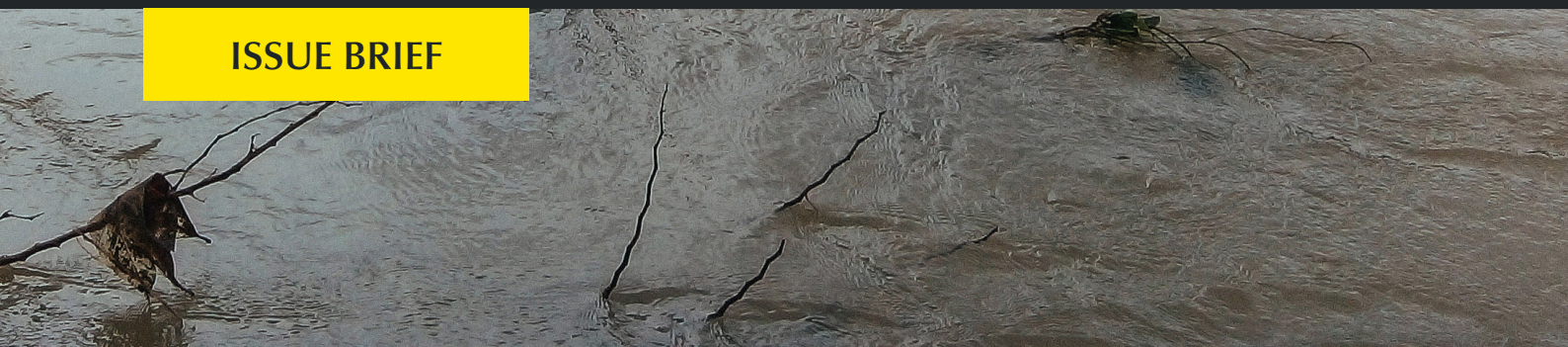
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CLIMATE CHANGE AND RELATED RISKS IN THE INDIAN CONTEXT: A PRIMER

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ISSUE BRIEF



Contents

Executive Summary ... 1

Introduction ... 2

India's High Risk to Climate Change ... 2

**A Recent History of Extreme Weather-Related
Events in India ... 2**

**A Recent History of Extreme Weather-Related
Events in India: Droughts ... 4**

**A Recent History of Extreme Weather-Related
Events in India: Floods ... 5**

**Growing Relevance of Climate Related Changes
and Events ... 6**

Government Response ... 6

Bibliography ... 7

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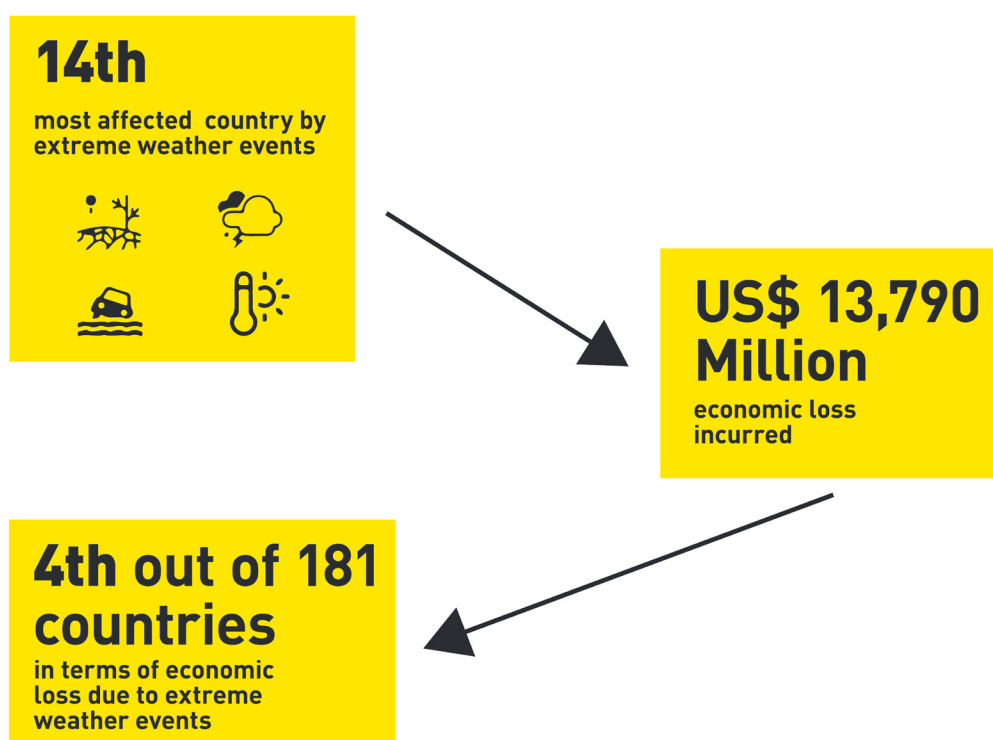
Executive Summary

While climate change and extreme weather events such as droughts, floods, heat waves, and a gradual rise in temperature are a reality for countries across the globe, India is the 14th most affected country by extreme weather conditions according to the Global Climate Risk Index (CRI) 2019 (Ekstein et al. 2018). With 61.5% of India's 133 crore population remaining dependent on agriculture, and more than 60% of this net sown area being dependent on rain (Mahapatra 2019), India's exposure to changes in rainfall patterns that cause floods and droughts remains very high.

A close look at India's 29 states and 7 Union Territories shows that almost all faced at least one extreme weather-related condition in the past five years, with many facing contrasting extreme weather events in the same year.

This paper is a primer on the effects of climate change on India, and aims to show how floods and droughts have impacted the agricultural productivity and economy of the country in the past five years. Additionally, it addresses what the government is doing to tackle this challenge.

India and Climate Risk in 2019



Introduction

Broadly, climate change and its related risks can be categorised as; those which are slow and gradual, such as a steady change in temperature and precipitation levels, leading to droughts, or hindering agricultural productivity; and those which appear to be more sudden and dramatic, such as floods and storms (UNFCCC n.d.).

According to the Global Climate Risk Index (CRI) 2019 (Ekstein et al. 2018), India was the 14th most affected country by extreme weather events, including storms, floods, droughts, and heat waves, in 2017. The report also notes that India incurred US\$13,789.86 million worth of economic loss due to the same, putting it fourth out of 181 countries (ibid 2018).

In the 2018 Economic Survey, the Indian Government acknowledged that climate change is a major risk to its economy. It has taken a toll on India's agricultural productivity, and subsequently reduced farmer incomes by 15%-18% on average (Economic Survey 2017-18). Furthermore, research linking Indian Monsoon patterns and GDP suggested that, in previous years, drought negatively impacted the GDP by 2%-5% (Gadgil and Gadgil 2006).

India's High Risk to Climate Change

61.5% of India's 133 crore population is dependent on agriculture, which contributes 18% to the total GDP. It also constitutes 58% of the total employment in the country. (Skymetweather 2017) Of the net sown area, more than 60% depends on rain (Mahapatra 2019). Any deficiency or excess can, thus, significantly impact the country.

Additionally, a report by the Intergovernmental Panel on Climate Change (IPCC) highlights existing poverty and inequality, as well as a burgeoning population, as exacerbating India's exposure to climate-related risks.

Changing rainfall patterns and extreme heat also considerably amplify the burden on available natural resources, such as water. One article reports that India's changing monsoon patterns has worsened India's water crisis, with many districts facing a drinking-water crisis (Tripathi 2018). This puts further pressure on groundwater, which is depleting at an alarming rate (Mungara 2019) in many states, and jeopardises agricultural productivity and human development.

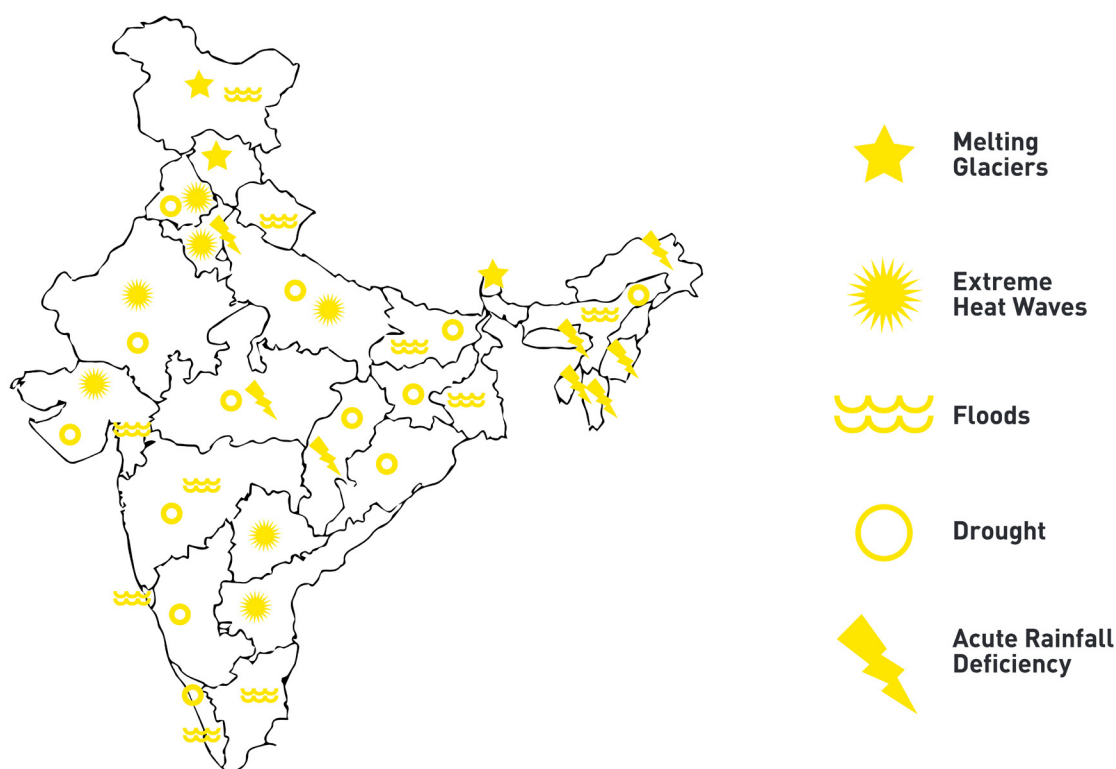
A Recent History of Extreme Weather-Related Events in India

Kerala made headlines in 2018 when it faced excessive rain, causing the worst floods the state has seen in decades (Choudhary 2018). Concurrently, scanty rainfall caused droughts in 18 of the 24 districts in Jharkhand (Sengupta 2019) and affected 50% of the geographical area in Maharashtra (Bose 2019). In the northeast, four of the seven north-eastern states

received deficient rain (Pandey 2018) and heat waves gripped the national capital region (NCR), Rajasthan, Andhra Pradesh, and Telangana for several months (World Economic Forum 2018).

In 2017, research found that the uninhabited island of Parali I, in the Lakshadweep archipelago, had fully submerged due to coastal erosion; this was indicative of the larger threat erosion poses to low-lying coastal areas (Press Trust of India 2017).

The map below shows the occurrence of extreme weather conditions between 2014 and 2019. It displays how every single state in India has been impacted by at least one extreme weather event. Many, including Kerala, grappled with contrasting weather conditions in the same year (2018).



While climate change can be felt in terms of rising temperatures, changing rainfall patterns, and rising sea levels, it is most visible in the form of droughts and floods. While the 2016 drought alone cost the Indian economy Rs. 650,000 crores (Skymetweather 2016), the average annual loss from floods in India is pegged to be more than US \$7.4 Billion (Global Assessment Report on Disaster Risk Reduction 2015).

The following paragraphs highlight the agricultural and economic impacts that droughts and floods have individually had on India:

Droughts:

Droughts are caused by a deficiency in precipitation over an extended period of time. According to a recent study by scientists at IIT Gandhinagar (Press Trust of India 2018), nearly 50% of the country faced drought in 2018, with at least 16% falling in the “exceptional” or “extreme” category. In 2016, in Odisha, Telangana, Maharashtra and Andhra Pradesh alone, over 330 million people were affected by droughts (BBC 2016). By the end of 2018, Gujarat, Maharashtra, Bihar, Karnataka, Jharkhand, Telangana, Chhattisgarh, Andhra Pradesh, and many North-Eastern States became rainfall-deficient, which translated into drought-like conditions in these areas.

In 2018 in some parts of Maharashtra, crop yields of soybean and cotton declined by 70% and 60%, respectively (Jamwal 2018). Further, Kharif crops such as paddy and wheat failed in Bihar and Jharkhand, causing acute food scarcity and pushing farmers into significant debt (Chhandosree 2019). In Karnataka, officials of the agriculture department estimated an estimated 26% decrease in the production of food grains and pulses due to droughts in 2018 (Shankar 2019). The state had initially set a target of 135 lakh tonnes of cereals and pulses, but the total yield is expected to be only around 100 lakh tonnes at the end of March 2019. Production of Ragi, Jowar, and Tur Dal have similarly been affected (ibid 2019).

Concurrently, the economic impact has been immense. In Andhra Pradesh, the central government approved financial assistance of Rs. 900 crore in March 2019. Karnataka similarly sought relief of Rs. 2,064 crore (Express News Bureau 2019). In addition to financial support in the form of minimum support price (MSP), the government of Karnataka waived farm loans of almost Rs. 34,000 crore (Poovanna 2018). Madhya Pradesh, Rajasthan, and Chhattisgarh followed suit with similar farm loan waivers (Press Trust of India 2018). However, it has been highlighted that farm loans cause a surge in non-performing assets (NPAs) to banks, which subsequently pushes them to cut credit and lend skeptically (ET Bureau 2018). Furthermore, bank balance sheets and accounting statements are affected, as compensation from the government takes months to follow through. Knowing that the government has waived-off loans for certain farmer groups causes many more farmer categories who have the capability to repay to default and seek instead loan-waivers. This puts further pressure on the government (ET Bureau 2018).

Farm waivers are usually funded by the central, and sometimes state, government. This government budget, however, is limited, and planned to be spent on infrastructure building or healthcare (Kundu 2017). However, conditions like droughts push the government to overspend, which causes a rise in the fiscal deficit target. For instance, the State’s fiscal deficit target which was estimated at 2.7% of the GDP, will rise to 45% if loan-waivers are factored in (IIFL2018). To keep spending low and maintain the original target, governments often cut

capital expenditure, such as on infrastructure, and scale back welfare schemes (IIFL 2018).

Floods:

India receives an annual average rainfall of 400 million hectare metres, of which 70% is received between June and September (Skymetweather 2019). Kerala, which was inundated by excessive rainfall causing floods, receives an average of 2039.6 mm cumulative rainfall in the South West Monsoon (June to the end of September) season alone (IMD 2018). However, last year, between these four months, it received 2515.73 mm of rainfall, or 23.34 % excess rainfall, which resulted in one the worst floods the state has seen in almost 100 years (IMD 2018). This disaster killed over 480 people and affected more than 5.4 million. (Raghunath 2019). Excessive rain also impacted Mumbai, Gujarat, West Bengal, Bihar, and the North Eastern states between 2017 and 2018. For instance within a span of 45 days (between June 1, 2018 and July 16, 2018), more than 500 houses were damaged and 1.3 Lakh animals affected in Assam. West Bengal reported close to 7000 houses being partially or fully damaged by floods, and claimed more than 47,000 hectares of crop area as affected. (Sangmola 2018) In fact, according to a report from the Central Water Commission (CWC), one fifth of global flood related deaths take place in India (Mallapur, 2018).

In the agricultural sector, Kerala (where agriculture is predominantly focused on cash crops such as rubber and coffee) saw the destruction of 56439.19 hectares of standing crops within the first month (Philip 2018). This includes damage to paddy (26,106 ha), coconut (617 ha), pepper (816 ha), coffee (65.65 ha) and rubber (720 ha), and translated into an economic loss of Rs. 1,345 crores (Kallungal 2018). Additionally, the loss of animals and feed deprivation brought down milk procurement in the state by 2.5 lakh litres a day (Philip 2018). According to Kerala's Animal Husbandry Department, farmers lost 10,000 livestock and fowl worth Rs 110 crore (Bangalore Mirror Bureau 2018). A recent research article suggests that, in the aftermath of the floods, agricultural land that was submerged in sludge has been rendered barren for almost a year.

Kerala alone suffered an economic loss of more than Rs. 21,000 crores, including a loss of Rs. 1,500 crore to its tourism industry in 2018 (Anand 2018). The government of Kerala estimated damage to over 1 lakh buildings, including homes and offices, along with 10,000 kilometers of highways, roads, and bridges (Chauhan 2018). Industries and companies using rubber, coffee, pepper and pulses felt the slowdown as raw materials from Kerala took months to stabilize (Anand 2018).

In addition to rebuilding lost infrastructure, including electric poles and broadband cables, the state government provided Rs. 10,000 each to 6.7 Lakh affected families as immediate financial assistance (Haneef 2018). A calamity cess up to 10%, in addition to the Goods and Service Tax (GST), was approved for goods moving out of Kerala, thus making them costlier (Business Line 2019) and therefore difficult for farmers to be competitive. Furthermore, ac-

cording to the Finance Minister of the state, T.M. Thomas Isaac, floods could slow the economic growth rate of Kerala by over 2 percentage points (Prasad 2018).

Growing Relevance of Climate Related Changes and Events

A 2018 study done by the World Economic Forum showed that 63% of extreme weather events, including heat waves, cold and snowy weather, droughts and storms, were made more likely or more severe by human-caused climate change (Smith 2018).

While climate change can be felt in terms of rising temperatures, changing rainfall patterns, and rising sea levels, it is most visible in the form of droughts and floods. While the 2016 drought alone cost the Indian economy Rs. 650,000 crores (Skymetweather 2016), the average annual loss from floods in India is pegged to be more than US \$7.4 Billion (Global Assessment Report on Disaster Risk Reduction 2015).

Government Response

The Government of India accepts climate change and rising temperatures as a threat (Press Trust of India 2018). Resultantly, it pushed hard to include measures such as sustainable lifestyle practices for combatting climate change in the Paris Climate Agreement in 2015 (Aggarwal2018). As a response to the United Nations' Intergovernmental Panel for Climate Change (IPCC) report of October 2018, which ranked India as one of the most vulnerable countries, the Environment Minister, Harsh Vardhan, promised that the country will make all efforts to combat climate change-related impact (Press Trust of India 2018). India also signed the Paris Agreement in 2016, where it pledged to reduce greenhouse emissions by 33%-35% below 2005 levels by 2030. It planned to do this, firstly, by increasing its power capacity based on non-fossil fuel sources by 40%, and secondly, by creating an additional 'carbon sink' of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030. (Sethi 2018) It is important to note that the report suggests that India has made significant progress on these goals, and 35% of India's power capacity is already based on non-fossil fuels such as renewables and hydroelectricity. On February 11, 2019, a report from NASA similarly concluded that India is doing well in terms of increasing its forest and tree cover. The report named India as a major contributor to the world's green cover in the past 20 years (NASA 2019).

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