Assessing India’s mounting climate losses to Financial Institutions
Author: Mr. Charanjit Singh

Supporting Authors: Dr. Cristina Rumbaitis Del Rio, Ms. Vidya Soundarajan, Ms. Vandana Nath and Ms. V. Shivaranjani

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The document reports data from various sources and agencies. The authors have retained the original figures from source of reference assuming that different exchange rate for conversion may result in a higher margin of error while reporting. In order to standardise the data, the authors have used The Indian Rupee (INR) wherever possible; but where original reports are in United States Dollar (USD) or other currencies and exchange rates are not provided, they have used the currency as stated in the original report or used a conversion rate of 1 USD = 67 INR. The currencies reported in the document are INR, USD and Great Britain Pound (GBP).
This report analyzes the increasing risks of extreme weather events to the ‘Financial Institutions’ (FIs) in India, as the frequency and severity of these events intensifies. The report cover three aspects:

- Growing crop losses, given the high vulnerability of agriculture to weather events and the poor resilience of farmers’ in India
- Increase in asset losses with damages to more vehicles, buildings, other infrastructure and the potential loss in business income
- Distribution of these losses amongst different stakeholders, including the financial institutions
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Impacts of climate change in real time: Climate scientists globally have been warning about the extreme weather events due to global warming. These warnings appear to be conservative as the impacts of Climate Change (CC) appear to manifest at a quicker pace than expected, and with more ferociously than expected in many parts of the world. The last three years were the hottest on record all over the world and 2017 was the costliest year on record in terms of weather losses, which reached USD330 billion versus USD184 billion in 2016 and inflation adjusted average of USD170 billion during last 10 years.

Losses caused due to extreme weather events are amongst top-three global risks: Increasing losses from extreme weather events are early warning signs, with even higher losses expected in the coming years, if no concrete actions are taken to curtail climate change. The 2018 Global Risks Report published by the World Economic Forum (WEF), identified “extreme weather events” and “natural disasters” amongst the top three risks in terms of likelihood and impact. This report shares the perspectives of some 1000 global experts and decision-makers on the most significant risks facing the world.

India is seeing new peaks in weather losses, with losses having doubled in last decade: During last few years, India also observed new peaks in temperature and economic losses from weather-related disasters, as the frequency and severity of these events has intensified. The estimated economic losses caused by some of the weather disasters of last few years clearly reflect this point: 2018 Kerala Floods (USD4.25 billion), 2017 Bihar Floods (USD1.6 billion), 2016 Cyclone Vardah (USD1 billion), 2015 Chennai Floods (USD2.2 billion), 2014 J&amp;K floods (USD16 billion), 2014 Hudhud Cyclone (USD7 billion), and Uttarakhand floods (USD1.1 billion), and Cyclone Phailin (USD0.64 billion).
As a result of these events economic losses of last 10 years (2008-17) are almost twice the losses of preceding decade (source: EMDAT).

The agriculture sector has a major share of economic losses in India: The economic losses can broadly be categorized into two types - (i) agricultural, and (ii) non-agriculture. The latter type includes losses from damages to vehicles, building, other infrastructure and revenue loss to businesses. The agriculture sector continues to be the single largest contributor of the estimated economic losses in India, with at least one-third of total annual losses on average. The agriculture sector is a key sector for the country, with 49% share in employment generation and providing food security to its 1.3 billion people. As a result, the increasing crop losses is a serious concern. With 85% of the country’s farmers having poor financial resilience, the situation is even more precarious.

Despite investment in crop insurance programmes, banks absorbing a share of losses: To mitigate the crop loss risk for the farmers, the Government of India (GoI) is heavily subsidizing the key crop insurance schemes. However, with less than 30% of the total crop area covered by insurance, this risk coverage remains poor. With banks in the country obligated to execute restructuring of existing loans and providing fresh loans to farmers in the disaster affected areas, low insurance cover is likely to be adversely impact banks. During FY2012-17 agriculture non-performing assets (NPAs) grew almost 2.5 times to reach INR602 billion, with one of the likely reasons being crop failure from extreme weather events.

Non-agricultural losses have become material with increase in floods and cyclones: Historically, droughts have been the major driver for weather related losses in India. However, the extreme weather events of around last two decades reflect that floods
and cyclones are now the largest contributor of the economic losses. Some of the key weather disasters of last few years (also listed earlier), have brought the focus on non-agricultural losses with increasing damages to assets such as vehicles, buildings, other infrastructures and potential revenue loss to businesses. With less than 1% penetration of non-life insurance cover in the country, this increasing damages to assets, implies significant financial stress for households and businesses, especially the small and micro enterprises, in the event of a natural calamity.

**Banks exposed to rising provisions and NPAs due to weather calamities**: In many of the major disasters listed on previous page, the business revenues were adversely impacted. In cases such as the Uttarakhand floods, where the primary revenue source for most businesses is “tourism,” the potential revenue loss of USD1 billion for the state had a significant impact on the survival of various enterprises. In line with the Reserve Bank of India (RBI) guidelines, the banks had to restructure the loans given to business units, especially for the micro and small enterprises, with poor financial resilience and no insurance cover. According to a research report by the Kotak Institutional Securities, post natural calamities, loans in affected states show an increase, helping banks show a healthier balance sheet. But two years down the line, when concessions provided on repayment run out, the bad loans or the NPAs start rising. This conclusion was based on review of Uttarakhand and J&K data. We also see significant risk for regional banks given their concentrated portfolio.

It is time that the financial institutions in India start giving due consideration to this growing risk and have a strategy in place to manage it. The government will need to work closely with the financial sector regulators to develop a well-rounded comprehensive strategy to mitigate the impact of this increasing risks on individuals and businesses.
Weather losses touching new peaks

Heating up

Globally, the average temperatures have been rising rapidly during last few decades. The world has seen new records for the hottest years, with years 2015 to 17 leading the chart, with temperature increases of around 1°C above pre-industrial period. This trend is well replicated in the temperature increases observed in India (see Figure 1).

According to climate scientists, a warmer world would face wilder weather events, with increased floods, cyclones, heat waves, droughts, etc. These events are likely to result in wild fires, habitat loss, food insecurity and human migration. To manage these adverse impacts, the countries agreed to limit the global temperature increase to well below 2°C and as close to 1.5°C, through the Paris Climate Accord signed in 2015, which entered into force in 2016. However, recent forecasts by the UK Met office are reflecting that the global temperatures could break through this agreed limit within next five years. This is highly concerning, considering the economic losses caused by extreme weather events of this century and especially the last few years.

Figure 1:
Temperature rise in India

Source: UK Met Office
Weather getting wilder

The changes to climate have already amplified the severity and frequency of extreme weather events globally. The US has seen some 219 weather extremes since 1980 which have caused damages exceeding USD1.5 trillion. In Europe, the European Environment Agency (EEA) estimates total economic losses caused by weather and climate-related extremes during 1980-2016 at around EUR 436 billion (in 2016 Euro values). The average annual economic losses were EUR7.4 billion (1980-1989), EUR13.3 billion (1990-1999) and EUR13.9 billion (2000-09).

2017 the costliest year on record for weather losses: According to Munich Re, the losses from natural catastrophes in 2017 totaled USD330 billion globally versus USD184 billion in 2016 and inflation adjusted average of USD170 billion during last 10 years. These resulted from 710 events (2017) versus 780 events (2016) and there were 10,000 fatalities (2017) compared with 9,650 deaths (2016). Around 93% of all events worldwide in 2017 were weather-related disasters. This makes 2017 the costliest year ever in terms of global weather disasters.

According to EM-DAT, during 2017, Asia seemed to be the most vulnerable continent for floods and storms, with 44% of all disaster events, 58% of the total deaths, and 70% of the total people affected. However, the Americas reported the highest economic losses (USD306 billion) on the back of three quick hurricanes in the North Atlantic - Harvey, Irma, and Maria. China, US and India were the hardest hit countries in terms of occurrence with 25, 20, and 15 events respectively. Flooding in India, Nepal, and Bangladesh reportedly affected almost 27 million people, with 450 million people living in the area identified as potentially exposed. These estimates provide visibility on areas with greatest vulnerability.

2017 also the costliest year on insured disasters Insured losses in 2017 came to USD135 billion, the highest recorded during 1980 to 2017. This was almost three times the average of last 10 years, at USD49 billion (adjusted for inflation). The hurricanes in the North Atlantic accounted for USD215 billion in overall losses, of which USD92 billion is expected to be insured. Losses from the October fires in the US alone exceeded USD10 billion, with more than USD8 billion insured. However by the year end, losses from wildfires were substantially higher. For comparison, widespread flooding in China caused losses of more than USD6 billion.

While 2018 may appear relatively better-off after a turbulent 2017, but still during the year, the world has seen various weather events including hurricanes and drought in the US, heat waves in Europe, wild fires in the Nordic and Scandinavian countries; one of the most extreme droughts of last 100 years in Australia, floods in India, China and many more such incidents across various countries.

India amongst the most vulnerable to weather events

India is highly vulnerable to disasters. Around 12% of its land is prone to floods and river erosion; out of 7,516 kilometers long coastline around 5,700 kilometers is prone to cyclones and tsunamis; 68% of its cultivable area is vulnerable to droughts; and, its hilly areas are at risk from landslides and avalanches. The disaster risks are further
compounded by socio-economic conditions, unplanned urbanization, development within high-risk zones, environmental degradation, climate change, etc.

The United Nations International Strategy for Disaster Reduction (UNISDR) and the Centre for Research on the Epidemiology of Disasters (CRED) report states that China and India dominate the league-table of countries most-affected by weather-related disasters (see dark brown regions in the Figure 2). Together these two nations account for more than 3 billion disaster affected people between 1995 and 2015. The German Watch in their Global Climate Risk Index 2018 puts India as the sixth more vulnerable country facing extreme weather events. The five countries preceding India are much smaller economics - Haiti, Zimbabwe, Fiji, Sri Lanka and Vietnam- and not amongst the G20 member list. The analysis takes into consideration the fatalities and economic losses for 2016 and 1997-2016. The countries are ranked on four parameters for normalization, so as to get a score for individual countries.

**Figure 2:**
Number of weather-related disasters reported per country (1995-2015)

India’s economic losses doubled in the last decade

The time series data from EM-DAT reflects an increasing trend of economic losses due to extreme weather events. The cumulative losses for 2008-2017 are estimated at USD45 billion versus USD20 billion for 1988-1997 (see Figure 3). This yearly average loss is significantly lower in comparison to estimate of USD9-10 billion reported by the Government of India (GoI) in 2017 Economic Survey and some press reports. In the absence of any time series data from the GoI, we use EM-DAT database for a trend analysis. This data clearly reflects a jump in the frequency and severity of extreme weather events.
**Frequency increases**: Based on decadal data from EM-DAT, we see that the count of extreme weather events has been on continuous increase. During past 20 years (1998-2017), the average annual count stands at around 16 events versus 10 events during the previous two decades (1978-97) (Figure 4).

**Severity magnifies**: It’s not only the count of such events but also their severity that has been rising with passing years. For example, during 1998-2007, five events reported caused economic losses in excess of USD1 billion. These were – Odisha Super Cyclone (1999), Floods in Assam, Tripura and Bihar (2004), Mumbai Floods (2005), Gujarat Floods (2005) and Andhra Floods (2006). However, during 2008-17, there are nine such events, which include - Karnataka and Andhra Floods (2009), Leh Floods (2010), Uttarakhand Floods (2013), J&K Floods (2014), Hudhud Cyclone (2014), Chennai Floods (2015), Drought in TN, Rajasthan, Jharkhand and few other states (2016), Cyclone Vardah (2016) and Bihar Floods (2017). It can be observed that loss caused by most of the events reported in 2008-17 are higher in comparison to the events of the previous decade (Figure 5).

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**Figure 3**:
Economic losses of USD45bn in last 10 years

Source: EM-DAT; Note: Economic Loss estimates are in nominal value

**Figure 4**: Continuous rise in the count of extreme weather events

Source: EM-DAT;
India highly sensitive to droughts, though floods have the largest share of economic losses

Amongst the 328 extreme weather events listed in the EM-DAT database for 1998-2017, almost half are floods. The cumulative economic loss caused by these floods is higher than the losses from any other type of weather event (storm, landslides, drought, etc.). However, in terms of the number of people affected, droughts have the maximum impact, despite a smaller count of such recorded incidents (see Figure 6). India appears more fragile to droughts versus floods given the high share of agriculture sector in the employment (49%), poor irrigation infrastructure and cultivation practices, and a significant count of people below the poverty line. A drought not only directly hits the jobs of economically weaker section of the Indian society, but it also adversely impacts the food prices, thereby making their survival even more difficult. During 2015 alone, at least nine states were declared drought hit and that affected around one-third of the country’s population.\(^1\)
There has been a three-fold increase in widespread extreme events over central India during 1950-2015. In the 1950s, there were two extreme rainfall events per year, while in recent years the number of events has increased to six per year.

Dr. Roxy Mathew Koll from the Centre for Climate Change Research at the Indian Institute of Tropical Meteorology

**Figure 6: Summary of extreme weather events in India based on their type**

<table>
<thead>
<tr>
<th>Event type</th>
<th>Total Occurrences</th>
<th>Total deaths</th>
<th>Total people affected (millions)</th>
<th>Total damages (USD billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floods</td>
<td>162</td>
<td>27567</td>
<td>376</td>
<td>45.7</td>
</tr>
<tr>
<td>Storms</td>
<td>71</td>
<td>16795</td>
<td>40</td>
<td>14.2</td>
</tr>
<tr>
<td>Droughts</td>
<td>4</td>
<td>2616</td>
<td>680</td>
<td>4.5</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>32</td>
<td>12082</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>Landslides</td>
<td>25</td>
<td>1321</td>
<td>0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*Source: EM-DAT*

**Conclusion**

Our analysis highlights that severity and frequency of extreme weather events is on the rise. While the EM-DAT database provides for an average economic losses of around USD4.5 billion per annum during last ten years, estimates published by the World Bank and Government of India (Economic Survey) reflect a USD9-10 billion range for last few years. However, in the absence of a long-time series data from the World Bank, we have primarily relied on the EM-DAT database for most of our analysis. During last few decades, floods have caused the maximum economic loss, which includes damage to crops, infrastructure (buildings, roads, ports, electricity infrastructure, railway lines and industrial facilities) and business revenue. In terms of people impacted, droughts are more sensitive from India’s perspective, as agriculture is key from job and food security perspective. In the following chapters, we analyze the two categories of economic losses – agricultural and the non-agriculture type - to understand their magnitude and also to determine, as to how these losses are being shared amongst various stakeholders.
Crop yield at risk due to rising temperature

Agriculture sector in India accounts for 16% of the GDP and 49% employment. The main crops are wheat, maize, rice, millets, pulses, sugarcane and oil-seeds. Poor crop production leads to inflation, farmer distress, and much greater impacts on economy. As a result, the changing climate is a major concern for agriculture sector in India. We can expect increase in atmospheric Greenhouse Gases (GHG) concentrations impacting agriculture in various ways, including:

- Fall in crop yields as duration of many crops is reduced due to changes in temperature, rainfall pattern and humidity
- Increase in crop losses due to jump in the severity and frequency of natural catastrophes such as floods, cyclones, droughts and others
- Loss of farmland by inundation and increase in groundwater salinity in the coastal areas with the rise in sea level

India’s crop productivity faces significant downside risk in the coming years

Rising temperature is impacting the crop productivity, as some studies are reflecting. For example, in the state of Haryana, night temperatures during February and March 2003-04 were recorded 3°C above normal, and the wheat production during this period recorded a decline from 4106 kg/ hectare (ha) to 3937 kg/ ha (Cooshalle, 2007).

Various research studies conducted in South Asia to estimate the impact of increasing temperatures on the productivity of key crops anticipate material decline in crop yields, through the quantum varies across studies. Most of them conclude that the rain fed crops, which take nearly 60% of the net sown area in India, will see greater declines.

Key takeaways from selected studies conducted in South Asian countries

- Negative impact likely on rice and wheat yields in tropical parts of South Asia, with exposure beyond their tolerance capacity (Kelkar and Bhadwal, 2007)
- For emerging markets taken together, the decline in yields of wheat is expected to range between 29.2-33.5%. For maize, South Asia may experience a decline between 8.9-18.5% (Nelson et al., 2009)
- Both rice and wheat yields would decrease in the region, with impact on the latter being considerably higher (ADB, 2013)
- Rice production is likely to decrease most in the northern parts of the region, while wheat production is expected to decline in the Indo-Gangetic plains (IPCC, 2014)
- By 2050, more than half of the Indo-Gangetic plains, which grows 15% of the world’s wheat area, may become heat-stressed for wheat, with a significantly shorter season for the crop (International Maize and Wheat Improvement Center (CIMMYT))

Annual average crop loss due to weather events in India could easily be approximately USD4.5bn, which is equivalent to 0.25% of the country’s GDP.
Climate change adversely impacts India’s agriculture production by 4-9% annually. With agriculture contributing around 16% to the country’s GDP, this translates to around 1.5% loss in the country’s GDP.

B. Venkateshwarlu, former director at the International Central Research Institute for Dryland Agriculture (CRIDA)

Key takeaway from some India specific studies

- At most places in North India, grain yields are likely to decline by 15-17% for every 2°C increase in temperature (K. Vasanta, 2013)\(^7\)
- Productivity of most crops to decrease only marginally by 2020 but by 10-40% by 2100 (Mohapatra et al, 2017)\(^8\)
- A 1°C increase in temperature may reduce yields of wheat, soybeans, mustards, groundnuts, and potatoes by 3 to 7% (Choudhary, 2012)\(^9\)

Figure 7: Estimated impact on yields of wheat and rice due to temperature increase

<table>
<thead>
<tr>
<th>Crop</th>
<th>Temp increase (°C)</th>
<th>Reduction in crop yield (%)</th>
<th>Region / State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>0.5°C in winter temperature</td>
<td>0.45 tonnes / hectare (translates to around 10% reduction in high yield regions)</td>
<td>High yield regions such as Punjab, Haryana and UP</td>
</tr>
<tr>
<td>Rice</td>
<td>2°C</td>
<td>0.75 tonnes / hectare</td>
<td>High yield regions</td>
</tr>
</tbody>
</table>

Source: Sinha and Swaminathan (1991)

Farming income could decline 15-25% as crop yield fall

The Economic Survey FY2017-18 published by the Government of India (GoI) estimates that the annual agricultural income is likely to decline by 15-18% on an average, and up to 20-25% for unirrigated areas (see Charts), assuming IPCC predicted temperature increases (3-4°C by 2100) to this situation. The analysis also concludes that impacts are more adverse in unirrigated areas (rainfed crops) versus irrigated areas, i.e. primarily cereals. These studies use district-level data on temperature, rainfall and crop production for this analysis.
Extreme weather events causing crop losses in India

According to a study from the Food and Agriculture Organization (FAO), during 2005-15, natural disasters have resulted in losses worth USD96 billion towards damaged or lost crop and livestock production for emerging economies. This includes USD32 billion loss in South Asia and around USD 14.5 billion in Southeast Asia. In Asia, the losses have been high for commodities, especially rice and wheat. The cumulative loss of around USD12 billion in cereal production, is followed by fruit and nut production (USD7.3 billion), livestock (just over USD6 billion) and vegetable production (around USD5 billion). It can be assumed that around 80% of total crop losses in South Asia correspond to India, implying a loss of cUSD2.5 billion.

Some regions in India have a history of frequent disasters. For example, the states of Jharkhand, Odisha and Chhattisgarh, face severe droughts almost one-in-five years, which results in losses of around 40% of their rice production. Other examples include the states of Bihar and Assam, which are faced with floods almost every year; the state of Andhra Pradesh experiences regular cyclones. Using the GoI data for crop area affected by extreme weather events (see Figure 10), the average of 10 years (FY 2007-16) is around 2% of the total crop area in the country.

With average farm incomes at INR 77,976 only (equivalent to approximately USD 1200), a decline in the range of 15-25%, is a serious concern and necessitates a need for strong action to manage this risk.
### Figure 10: Crop area affected due to weather events and the cattle lost

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle Lost (Nos.)</th>
<th>Cropped areas affected (in lakh ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>455619</td>
<td>70.9</td>
</tr>
<tr>
<td>2007-08</td>
<td>119218</td>
<td>85.1</td>
</tr>
<tr>
<td>2008-09</td>
<td>53833</td>
<td>35.6</td>
</tr>
<tr>
<td>2009-10</td>
<td>128452</td>
<td>47.1</td>
</tr>
<tr>
<td>2010-11</td>
<td>48778</td>
<td>46.3</td>
</tr>
<tr>
<td>2011-12</td>
<td>9126</td>
<td>18.9</td>
</tr>
<tr>
<td>2012-13</td>
<td>24360</td>
<td>15.3</td>
</tr>
<tr>
<td>2013-14</td>
<td>102998</td>
<td>63.7</td>
</tr>
<tr>
<td>2014-15</td>
<td>92180</td>
<td>26.9</td>
</tr>
<tr>
<td>2015-16</td>
<td>99057</td>
<td>31.1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>113362</strong></td>
<td><strong>44.1</strong></td>
</tr>
</tbody>
</table>

Source: Ministry of Home Affairs, GoI; VK Sharma and AD Kaushik

### Estimated USD4.5 bn of weather related crops losses

The cumulative contributions from the GoI on relief measures through state disaster response fund (SDRF) and national disaster response fund (NDRF) during FY2015-17 is around INR500 billion (USD7.7 billion), whereas the payouts made by insurance companies for crop loss and damage is around INR455 billion (USD7 billion) for the corresponding period (see Figure 11). However, the funds paid out under NDRF and SDRF are relief measures, whereas, the insurance payout is the compensation for losses incurred.

**Figure 11:**
Annual disbursals by the GoI to the NDRF and SDRF and the insurance payouts

Source: MHA, MoA, GoI
On average during FY2014-17, the insurance payout for crop losses is around USD2.3 billion. Besides, there are also some cases where the insurance payouts have either been delayed or denied due to some administrative gaps, despite damage to crops. With less than 30% of the crop area covered under insurance, there is a good possibility for large proportion of affected farmers not receiving any insurance payouts. Simple extrapolation of crop loss estimates based on area coverage under insurance could imply an annual average coverage crop loss of around USD7 billion.

Based on the annual average crop loss area share discussed earlier and the gross value of India’s crop production during FY2015-17, an annual average loss of around USD4.5 billion is estimated. This approach of estimating losses appears to be more reasonable in comparison to extrapolating losses from insurance payouts (USD7 billion).

**Conclusion**

Agriculture sector in India is highly vulnerable to the impacts of climate change. Firstly, the decline in crop yields which can lead to reduction in agricultural revenues; and secondly, increasing crop losses due to extreme weather events is leading to current average losses estimated at least USD4.5bn or around 0.25% of India’s GDP. These intensifying adverse impacts are a serious concern for India, as 85% of the country farmers have poor financial resilience. The following chapter analyses the non-agricultural losses due to extreme weather events and its impact on some of the key stakeholders.
Businesses and households waking up to this new risk

The large gap between the economic and insured loss from many of the extreme weather events emphasizes the need for greater insurance penetration in large cities in India. This will become even more important as Indian megacities continue to grow and the risk of major urban flood events increases.

Uttarakand Floods (2013)

Against total estimated economic losses of USD1.1 billion for the Uttarakand floods of 2013, around USD500m were insured losses. The biggest losses for general insurers came from hydroelectric power projects and the vehicles. Around 245 projects were estimated to have been damaged (including very small projects).24

According to the press reports, between 13,000 and 14,000 micro industries and business units were badly affected.25 A report titled ‘ASSOCHAM Prescription: Coping With The Impact of Disaster in Uttarakhand State’ estimated that the hospitality and tourism sector are likely to suffer direct loss of around 180,000 jobs in six months post disaster and lose over INR41 billion (USD631m) in revenue annually. It was also estimated that the floods will reduce the prior growth of tourism sector by at least five years, which is the likely time needed to rebuild the damaged infrastructure.

A Joint Rapid Damage Needs Assessment conducted by GFDRR, the World Bank, and the Asian Development Bank uncovered the extent of sector-specific damages, which included an estimated USD1 billion loss in tourism revenue for the year and, by the end of the recovery period, more than USD3.8 billion in total economic losses. The loss in tourism revenues implied a hit also for the State Government’s finances, due to drop in tax revenues.


According to EM-DAT database, the 2014 floods are estimated to have resulted in economic losses of USD16bn, whereas on the Munich Re estimates the economic loss was around USD6bn.

The J&K GSDP was around INR454 billion in 2013-14, with agri & allied activities accounting for 20% share, industry and mining c23.5% and the services sector contributing the remaining 56.5% share. Trade, hotels and restaurant services turnover
was around INR38bn, with a rough share of tourists for Jammu, Kashmir and Ladakh region estimated in the ratio of 40:40:20\textsuperscript{27}.

The flood impacted around 1.5 million families, some 0.35 million structures (including 75,000 business establishments) suffered damages, 90,000 cattle/sheep lost lives, crop loss reported in 0.65 million hectares of land besides huge losses to public and private infrastructure and assets such as workshops, stores, tools, raw material, and finished product stocks, which severely impacted non-farm livelihoods in urban centers\textsuperscript{28}.

Tourism sector was severely impacted with bookings for airlines and hotels almost completely cancelled for the months of September and October and even thereafter.

**Cyclone Hudhud (2014)**

Munich Re had estimated economic losses from Hudhud at USD7 billion, of which only USD530 million was insured. A report from P.L.C.’s Aon Benfield Group found that insured losses of USD650 million against estimated economic loss of USD11 billion\textsuperscript{29}.

The banks extended their support through rescheduling of loans to the infrastructure sector, agriculture and industry, particularly the micro, small and medium enterprises. Banks even requested permission from the RBI for re-phasing of loans given to small business units, rather than giving them one-year moratorium on repayment, which is the RBI guidance under such circumstances. The idea behind this suggestion was to allow small borrowers to repay their loans in tranches given the grim situation\textsuperscript{30}.

The cyclone impacted various large industrial units including RINL, Hinduja Power, NTPC, HPCL and various other entities. Both RINL and Hinduja Power had claimed losses of roughly over INR5 billion each\textsuperscript{31}. The HPCL had to temporarily shut down its refinery and the power generation was affected at the Simhadri thermal power station of NTPC\textsuperscript{32}. The Jawaharlal Nehru Pharma City reported opportunity losses of around INR1 billion per day due to disconnection of power supply for nearly 18 days\textsuperscript{33}.

**Chennai Floods (2015)**

According to Swiss Re economic losses were estimated at USD2.2 billion and insured losses at USD755 million, making these floods the second costliest insurance event in India.

From the industry perspective, Chennai is the base for various IT and automobile companies. Rather, it is India’s largest automobile manufacturing centre with various large Original Equipment Manufacturer (OEMs) having their manufacturing / assembly line operations in the region. Most of these facilities had to shut down operations due to floods. While many could fully restore their operations within a month but for some, it took longer to sort out their supply chains due to road conditions. According to some news reports, the production losses for the automobile industry could be between INR12-15 billions, as an after effect of this natural disaster (Lakshmana, 2015).

Various IT companies also had a hit on their operations. For example, IT firm Mphasis estimated a hit to its margins of up to 120 basis points in the December quarter owing to floods. The company had given out about two weeks’ pay to its employees in the affected areas. Companies like Tata Consultancy Services, Wipro, Hexaware and Take Solutions also guided for an adverse impact on revenues and margins but without much details\textsuperscript{34}.
According to the Union Minister for Micro, Small & Medium Enterprises (MSMEs), nearly 50,000 employees in roughly 10,000 micro enterprises located in and around Chennai were estimated to be left unemployed due to the floods. The minister stated that around 10,000 micro units suffered losses and most of these units didn’t have any insurance cover for their assets. Around 3,000 small units suffered a huge loss and operations of around 1,000 medium size units were affected.

**Kerala Floods (2018)**

Kerala witnessed one of the worst floods in 100 years after south-west monsoon rains lashed the state for more than two weeks, claiming more than 400 lives and displacing over eight lakh people across 3,314 relief camps in the state. According to EM-DAT database, these flash floods are estimated to have resulted in economic losses of USD4.25 billion.

A report from CARE Rating states that service sector is the driver of the state’s economy (63% of Gross Value Added (GVA)) and has grown at an average 6.8% during 2012-17). However, in FY 2018-19, the service sector growth is unlikely to see a notable increase as the increase in reconstruction related services is unlikely to offset the losses witnessed in the tourism and hospitality segments (largest share in services GVA at over 40%). Also, agriculture (11% of GVA) has been adversely affected and is likely to see a significant contraction in output and even the industry (26% of state’s GVA) is unlikely to see any jump in the manufacturing activity in the state.

Overall, the state economy is likely to seen a decline in growth rates in 2018-19 but could see a gradual recovery in the next fiscal year. The report estimates that the state’s economy could be affected by up to 1% depending on the time taken for rehabilitation / reconstruction especially for tourism/recreation sectors.

**Conclusion**

In the last 4-5 years, India has observed several extreme weather events which have caused significant losses for the businesses and households. These losses are because of the damage to assets such as vehicles, buildings, machinery, etc. Many businesses have suffered a material loss in potential revenues due to disruption of operations caused by these events. While many large corporates in the country are likely to have an insurance cover for disasters, this is not the case with most micro and small business establishments who must bear the brunt of these losses. The following chapter reviews the existing framework in India to manage these growing risks.
Managing the losses from natural disasters

This section reviews the relief and compensation measures currently used in India to manage / limit the adverse impact of natural disasters on the agriculture sector, especially highly vulnerable small and marginal farmers.

Relief provided by the state under SDRF and NDRF

In order to manage the impact of natural disasters, the Government of India (GoI) has developed a National Disaster Management Framework. The execution of relief activities on the ground is responsibility of the state concerned. Financial assistance is provided to the affected state from the SDRF and NDRF in line with the GoI approved assistance criteria.

In the event of a natural disaster, the state governments undertake relief operations from the SDRF already placed at their disposal. These measures include provision for input subsidies and other financial assistance to farmers and agribusiness. Contributions to SDRF is made by Central and State Governments in the ratio of 3:1 for 18 general category states and in the ratio of 9:1 for 11 special category states (eight states in the North East and three hilly states Himachal Pradesh, Jammu & Kashmir and Uttarakhand).

Figure 13: Disbursements by the GoI to NDRF and SDRF for farmer relief measures

Relief and rehabilitation support from the banks

In the Indian banking system, agriculture is classified as a ‘priority sector’, implying that the banks have to allocate certain portions of their lending to this sector in line with requirements laid out by the RBI. The RBI has also issued directions termed as Relief Measures by Banks in Areas Affected by Natural Calamities (Directions 2017), which are applicable to every Scheduled Commercial Bank (including Small Finance Banks, but excluding Regional Rural Banks) licensed to operate in India. These banks are expected to play a developmental role by rescheduling existing loans and sanctioning fresh loans as per the requirement of borrowers in the event of a natural catastrophe. To enable banks to take uniform and concerted action expeditiously, directions issued by RBI cover four broad aspects summarised below (for details refer the Annex):

1. **Institutional Framework:** defines the conditionalities of a natural calamity and responsibilities of the State Level Bankers’ Committee (SLBC) and the District Consultative Committee (DCC) in the scenario of any natural calamity

2. **Loan restructuring guidelines:** for the Short-term Production Credit (Crop Loans), Long-term (Investment) Credit, and Other loans. For example, an extension of repayment by 1-5 years and any moratorium on interest or not.

3. **Decision on fresh loan sanctions:** for crop loans, the credit requirement for any allied service or another occupation even without any guarantees and securities.

4. **Other ancillary measures:** these include relaxation of Know Your Customer (KYC) norms and other measures to ease the use of banking services.

How do these restructured and fresh loans impact banks?

According to the RBI guidelines, the restructured loans are treated as current dues and need not be classified as a bad loans, technically called as Non-Performing Assets (NPAs). However, the banks are required to make higher provisions in their books for such restructured advances as prescribed by the Department of Banking Regulation. These incremental provisions are a reflection of greater uncertainty in recovery of these loans, implying increased chances of these loans going bad and banks failing to recover them from its customers.

Natural calamities add to agriculture sector NPAs

The news articles on some of the major weather disasters of last few years specify that the banks have restructured loans in the affected areas. While this analysis was not able to obtain data on the cumulative value of agriculture loans restructured due to weather events, the data on non-performing assets (NPAs) in the sectors can be used as an
indicator of the poor performance of agriculture sector, with natural disasters being one of the major drivers for this performance.

During five-year period (FY2012-17), agriculture NPAs grew almost 2.5 times to reach INR602 billion, which was around 8.3% of the total NPAs in the banking sector as of March 2017 (see Figure 14). One of the reasons for this NPAs increase is the damage to the crops from extreme weather events. The other reasons include the lingering impact of demonetisation and the vicious circle of farm loan waivers announced by some of the state governments, which is assumed to trigger some deliberate defaults in expectation of loan waiver.

Natural calamities add to non-agriculture sector NPAs

Uttarakand Floods: NPAs doubled in the following year

Following the Uttrakand floods, banks had to do the loan restructuring and provide fresh loan approvals in the affected areas. As a result, loans in FY2014 jumped by 35% versus around 25% jump in FY2013. However, in FY2015, the loan growth rate plunged to below 5% and the ratio of gross non-performing assets (NPAs) to total loans more than doubled to 2.2% from 1% in FY2014, reflecting that the floods have adversely impacted the ability of some borrowers to meet their interest and loan repayment obligations of the restructured/fresh loans.

Kashmir Floods: Restructured loans of INR50 bn implies hit to banks earnings; significant jump in NPAs

While the GoI announced support (of USD12bn) for post-flood rebuilding and development in Kashmir, banks also had to share the burden with loans restructuring of around INR50bn, whereas the insurance companies paid claims of INR15bn. The head of Indian Banks’ Association (IBA), in an interview shared some details of this restructuring, which included:

- Banks will recast loans over INR50 billion, with around 60% of this restructuring to be done by the Jammu and Kashmir Bank Ltd, and remaining by other banks.
• All individual borrowers were to be permitted a two-year moratorium and seven years’ repayment period (excluding the two-year moratorium).
• For corporates, working capital and medium term loans were to be converted into long-term loans, payable through equated monthly instalments (EMIs), so to ease their repayment burden.
• The interest rate was reduced closer to the bank’s base rate (the minimum lending rate of a bank). The bank’s average yield of advances was around 12.5% and its base rate of around 10%. This implied a straight hit of 2.5% on the bank’s income. The impact was reflected in the J&K bank’s stock, which declined around 15% post the restructuring announcement.
• The National Housing Bank, provided loans of up to INR5 billion to other banks at 6.5% interest, which these banks can lend to customers at an interest rate of 8.5%, subject to a maximum of Rs.10 lakh per borrower.

The floods occurred in September 2014 and the loan growth in the state had halved to around 15% in FY15 before picking-up in the first half FY2016. The ratio of gross NPAs to total loans increased from 8% in FY2015 to 14% in the first half of FY 2016. This doubling of NPAs reflects the adverse impact of floods on the borrowers’ ability to service their loan obligations.

**Significant risk for banks with concentrated portfolio**

According to a report by the Kotak Institutional Investors, at the time of Chennai floods, total bank loans of INR 6500 billion were disbursed in Tamil Nadu, with Chennai contributing around half of these loans and deposits. The report estimates that around 35% of this loan portfolio (INR 1000 billion), which is primarily the priority sector, was at risk due to floods. Two banks with high concentration of business in the state were significantly exposed. This includes the City Union, which has 70% of its branches and close to three-fourths of its business in Tamil Nadu and the Karur Vysya Bank with around half its business coming from the state.

In October 2014, CRISIL (one of the country’s Credit Rating agency) downgraded J&K Bank’s fixed deposits from ‘AA+/stable’ to ‘AA/negative’. The move reflected the stress on the bank’s asset quality and the expected impact on its profitability. The agency has stated that the weakness in the bank’s corporate loan book is expected to be compounded by the impact of the recent floods in the state. The significant losses to commercial property and assets of SMEs is likely to affect asset quality, as around 45% per cent of the bank’s advances are in J&K.

Emkay Global (an investment research firm) listed out few stocks which are likely to be more affected as a result of the Kerala floods. These include the - Federal Bank, South Indian Bank, Muthoot Finance and Manappuram Finance. Federal Bank has 34% of lending and 64% of deposits directly linked to the state. Out of total Kerala-based lending book, 51% is to corporate, 28% towards SME/MSME and 21% to the retail segment. Emkay expects that rising risk of default in all these segments could result in a potential delay in recoveries along with a spike in credit costs. South Indian Bank is yet another Kerala-based bank with total lending exposure of 41% to the state. Of this Kerala-based lending, 42% of exposure is towards SME/MSME which remains at
higher risk. NBFCs such as the Muthoot Finance have 15% of branch network in Kerala, whereas Manappuram Finance has 15% of the Gold Loan branches and 7% of MFI branches in the state.

To conclude, in the event of a disaster in a particular region/state, the financial institutions with the highest concentration of its loan portfolio in that region/state are at a significantly greater risk in comparison to the peers with diversified regional presence.

**Compensation from insurance companies**

While loan restructuring is intended to provide some relief to the farmers on their immediate loan obligations, the compensation for losses suffered is to be met by insurance proceeds. This compensation is only payable to farmers who have insured their crops by paying premium, as per the approved schemes. However, the low penetration of agriculture insurance in India (less than 30% of the cropping area) implies that only a section of farmers are entitled to this compensation.

The most recent changes to the crop insurance policies were implemented in April 2016, with an intention to provide insurance cover to over half of the country farmers within a span of next 2-3 years. The modified policies launched by the GoI are:

- The ‘**Pradhan Mantri Fasal Bima Yojana**’ (PMFBY), which replaced the schemes named National Agricultural Insurance Scheme (NAIS) & Modified National Agricultural Insurance Scheme (MNAIS). The two schemes replaced have been operational from 1999-2000 and 2010-11 respectively
- The ‘**Restructured Weather Based Crop Insurance Scheme**’(RWBCIS), which replaced the Weather Based Crop Insurance Scheme (WBCIS) implemented in 2007

**Two key changes introduced in these schemes are:**

- Removal of cap on the premium rate charged by insurance companies; this enables insurance companies to charge higher premium, and
- Reduced premium for the farmers, with a cap for 2% for Kharif season and 1.5% for Rabi season versus premium rates of 8-10% in the old schemes (NAIS and MNAIS), thereby implying higher premium subsidy by the government (distributed equally between the Centre and State Governments).

All agriculture loans from the banks are now tied-up with an insurance cover for all stages of the crop cycle including post-harvest risks in specified instances. Banks also facilitate assessment of crops insurance coverage, premiums deducted, etc.

Despite the above mentioned changes to schemes and the mandatory crop insurance cover against the agriculture loan from the banks, insurance penetration has remained low (see Figure 15). This is primarily due to ground level implementation challenges with the revised schemes which has acted as deterrent for farmers, lack of awareness about the insurance products, announcement of debt waiver schemes by some of the State Governments, farmer’s perception of mitigated risk in 2017-18 given the good monsoon and some other related factors.
The governments will need to make more efforts towards streamlining the implementation of crop insurance schemes, including timely payment of premiums to the insurance companies, more localized collection of crop yield data with higher accuracy, quick submission of yield data for claim processing, faster settlement of claims and some other parameters. There is also a good need to educate farmers about the objectives and advantages of the insurance.

Conclusion

In India 85% of farmers have poor financial resilience given their small land holdings and low average family income. In the scenario of any crop loss, these farmers are faced with significant financial stress, given the poor penetration of agriculture insurance in the country. Even non-life insurance cover in India is very low, and significantly below the global average, especially in the case of small-and-medium scale enterprises. This translates into higher burden for the banks in terms of loan restructuring and fresh loans disbursals without adequate security and guarantees. To manage these risks, the GoI will have to take necessary measures to improve the penetration of non-life insurance, including crop insurance, in the country. In the Business-As-Usual (BAU) scenario, banks will continue to run the risk of rising provisions and NPAs, unless they take adequate measures at their end.

There is no doubt that insurance is a key tool to manage the crop risks faced by the farmers. The GoI seems to have a major task at hand for improving the penetration of agriculture insurance in the country given the increasing intensity of crop losses driven by changing climate.
Conclusion

Globally, the warnings about the extreme weather events due to global warming are proving to be very accurate. The year “2017” was the costliest on record in terms of weather losses, with estimated losses of USD330 billion. The 2018 Global Risks Report published by the World Economic Forum (WEF), identified “extreme weather events” and “natural disasters” amongst the top three risks in terms of likelihood and impact.

In India, the economic losses from weather related disasters have doubled in last decade (2008-17), as the frequency and severity of these weather events multiplied. During the decade, on an average, the country has seen at least one extreme weather event per year which has resulted in economic losses of at least USD1 billion. Of the total economic losses incurred, at least one-third are in the agriculture sector due to damages to the food crops. This is a serious concern as the sector generates 49% of the country’s employment, provides food security to its 1.3 billion people and around 85% of the country farmers have poor financial resilience, making them highly vulnerable to these natural disasters.

To mitigate the crop loss risk for the farmers, the Government of India (GoI) has been promoting the crop insurance schemes, with large share of premium being directly paid by the government. However, still less than 30% of the total crop area is covered under insurance schemes. In the event of any natural disaster, the banks in the country are obligated to execute restructuring of existing loans and provide fresh loans to farmers in the affected areas. However, these measures are adding to the loan provisions and NPAs held by banks.

The extreme weather events of last two decades have resulted in significant amount of non-agricultural losses. These result from the damages to vehicles, buildings, other infrastructure and revenue loss to businesses. With less than 1% penetration of non-life insurance cover in the country, this increasing damages to assets causes significant financial stress for households and businesses, especially for small and micro enterprises, in the event of a natural calamity. As a result, post any extreme weather disaster, banks are faced with a common demand for loan restructuring. However, despite the loan restructurings, one-to-two years down the line, bank NPAs have jumped in the impacted areas. The risk of such events is significantly higher for the financial institution with geographically concentrated portfolios.

Based on these findings, there is a strong case for financial institutions in India to develop a strategy for managing this growing risk. Further, there is a strong need for the GoI, various state government bodies and financial sector regulators to work together to develop a comprehensive strategy for mitigating the impact of this growing risks on the individuals, farmers and the businesses.
Relief and rehabilitation support from the banks

In the Indian banking system, agriculture is classified as a ‘priority sector’, implying that the banks have to allocate certain portion of their lending to this sector in line with requirements laid out by the Reserve Bank of India (RBI). The RBI has also issued directions termed as Relief Measures by Banks in Areas Affected by Natural Calamities (Directions 2017), which are applicable to every Scheduled Commercial Bank (including Small Finance Banks but excluding Regional Rural Banks) licensed to operate in India. These banks are expected to play a developmental role by rescheduling existing loans and sanctioning fresh loans as per the requirement of borrowers, in the event of a natural catastrophe. To enable banks to take uniform and concerted action expeditiously, directions issued by RBI cover four aspects: (i) Institutional Framework; (ii) Restructuring of Existing Loans; (iii) Providing Fresh Loans; and (iv) Other Ancillary Relief Measures.

1. **For extending relief, the institutional framework defines the ‘crop loss’ criteria**

For extending relief measures, the crop loss assessed should be 33% or more. For assessing this loss, while some states are using techniques such as Crop Cutting Experiments (CCE) whereas, some others are relying on the eye estimates/visual impressions. The CCE includes selection of a 25 square meter area in the field, harvesting of crop in that area and weigh of the produce to determine the yield per acre, which is then compared with the yield under normal weather conditions to estimate the crop loss.

In the event of an occurrence of a natural calamity which covers a larger part of a state, the State Level Bankers’ Committee (SLBC) should evolve a coordinated action plan for implementing the relief programme. If the calamity has affected only a small part of the state/few districts, the convener of the District Consultative Committee (DCC) of the affected district(s) will need to take the responsibility of a coordinated action plan.

2. **Loan restructuring: extension of repayment by 1-5 years**

**Agriculture loans - Short-term Production Credit (Crop Loans):** the principal amount as well as interest due for repayment in the year of occurrence of the natural calamity may be converted into a ‘term loan’. The repayment period varies depending on the severity of the calamity, the impact on loss of economic assets and distress caused. Also, the banks are not to insist on additional collateral security for such restructured loans.

- If the loss is between 33% and 50%, a maximum repayment period of up to 2 years should be allowed (including moratorium of one year); and
- If the crop loss is 50% or more, repayment period may be extended up to a maximum of 5 years (including moratorium of at least one year).
Agriculture loans – Long-term (Investment) Credit: should be rescheduled keeping in view the repaying capacity of the borrower and the nature of natural calamity:

- **Only the crop is damaged and productive assets are not damaged**: the banks may reschedule the payment of instalment and interest during the year of natural calamity and extend the loan period by a year; and
- **Productive assets are partially or totally damaged and borrowers are in need of a new loan**: rescheduling on the basis of overall repaying capacity of the borrower vis-a-vis his total liability less any subsidies received, compensation from insurance schemes, etc. Generally, the repayment period is unlikely to exceed five years.

Other loans: The SLBC/DCC needs to take a view on rescheduling of other loans such as the ones granted for allied activities or that given to rural artisans, traders, etc.

Utilization of insurance proceeds: While restructuring loans banks should take into account the insurance proceeds, if any. They should adjust these proceeds to the ‘restructured accounts’ in cases where they have granted fresh loan to the borrower.

3. **Fresh loan sanction even without guarantees and securities**

Once the decision to reschedule loans is taken by SLBC/DCC, banks shall grant fresh crop loan to the affected people based on the scale of finance for the crop and the cultivation area or the credit requirement for any allied service or another occupation, taking into consideration, their credit requirement. Banks shall also grant consumption loan up to INR10,000/- or even higher to existing borrowers without any collateral.

Guarantee, security and margin: Fresh loan shall be granted, even if the value of security is less than the loan amount. If the borrower has already taken a term loan against mortgage/charge on land, the bank should be content with a second charge for the converted term loan. Banks should not insist on third party guarantee for providing conversion facility. Margin requirements may be waived or the grant/ subsidy given by the concerned state government may be considered as margin.

Rate of Interest: Depending on the nature and severity of natural calamity, the SLBC/DCC shall take a view on the interest rate concession that could be extended to borrowers. The banks should defer the compounding of interest charges and shall not charge any penal interest for any current dues in default and restructured loans.

4. **Other ancillary measures to ease the use of banking services**

Relaxation on Know Your Customer (KYC) norms: In cases where affected people don’t have access to their normal identification and personal records, fresh accounts can be opened with an account limit of up to INR50,000/- or the amount of relief granted (if higher) and the total credit in the account does not exceed INR1,00,000/- or the amount of relief granted, (if higher) in a year.

Supporting access to banking services: Bank can operate its natural calamity affected branches from temporary premises under advice to the concerned Regional Office of RBI. Due importance to be given towards restoring ATMs or making alternate arrangements for cash disbursement.
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