Summary Report

Financing Resilience against Natural Disasters

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Overview

One of the most discussed issues of modern times is that of problems related to the scarcity of funds in dealing with the increasing catastrophic events due to volatile climatic conditions. Disaster Risk Resilience (DRR) can be interpreted as global policies working for improving disaster risk reduction and building efforts for resilience worldwide. The report analyses the applicability of popular instruments for emerging economies, the role of the private sector, and challenges to implementation of resilience framework. The Sendai Framework for Disaster Risk reduction (SFDRR) is the guiding principle for disaster risk reduction policies and efforts to improve resilience worldwide. The SFDRR synergises risk reduction efforts with sustainable development goals. Our report links global efforts for disaster risk reduction with resilient infrastructure. With the increased frequency of disasters, the economic burden of the states is rising not just with respect to 'build back better', but also regarding creation of resilience. Infrastructure network and asset creation have to be seen in the context of efforts to combat climate change, reduce disaster risk, and promote sustainable development. Infrastructure creation should account for climate and disaster resilience (OECD, 2018). Hence this report tries to compile a set of problems and preventive measures surrounding disasters in India.

Vulnerability profile of India

The numbers of disasters are increasing globally. According to a report by Intergovernmental Panel on Climate Change (IPCC), the number was recorded to be 991 in 2001, while it had reached 1100 in 2010 (IPCC, 2012). A country prone to multiple disasters to a varying degree, India has a very diverse vulnerability profile. According to NDMA (2016*), "more than 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12%) of its land is prone to floods and river erosion; close to 5,700 km, out of the 7,516 km long coastline, 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".* Table 1 shows the disaster profile of India from 2004 to 2019, covering earthquakes, cyclones, floods, storms, etc. and the risk profile. Table 2 presents the targeted schemes.

Field trip to Odisha

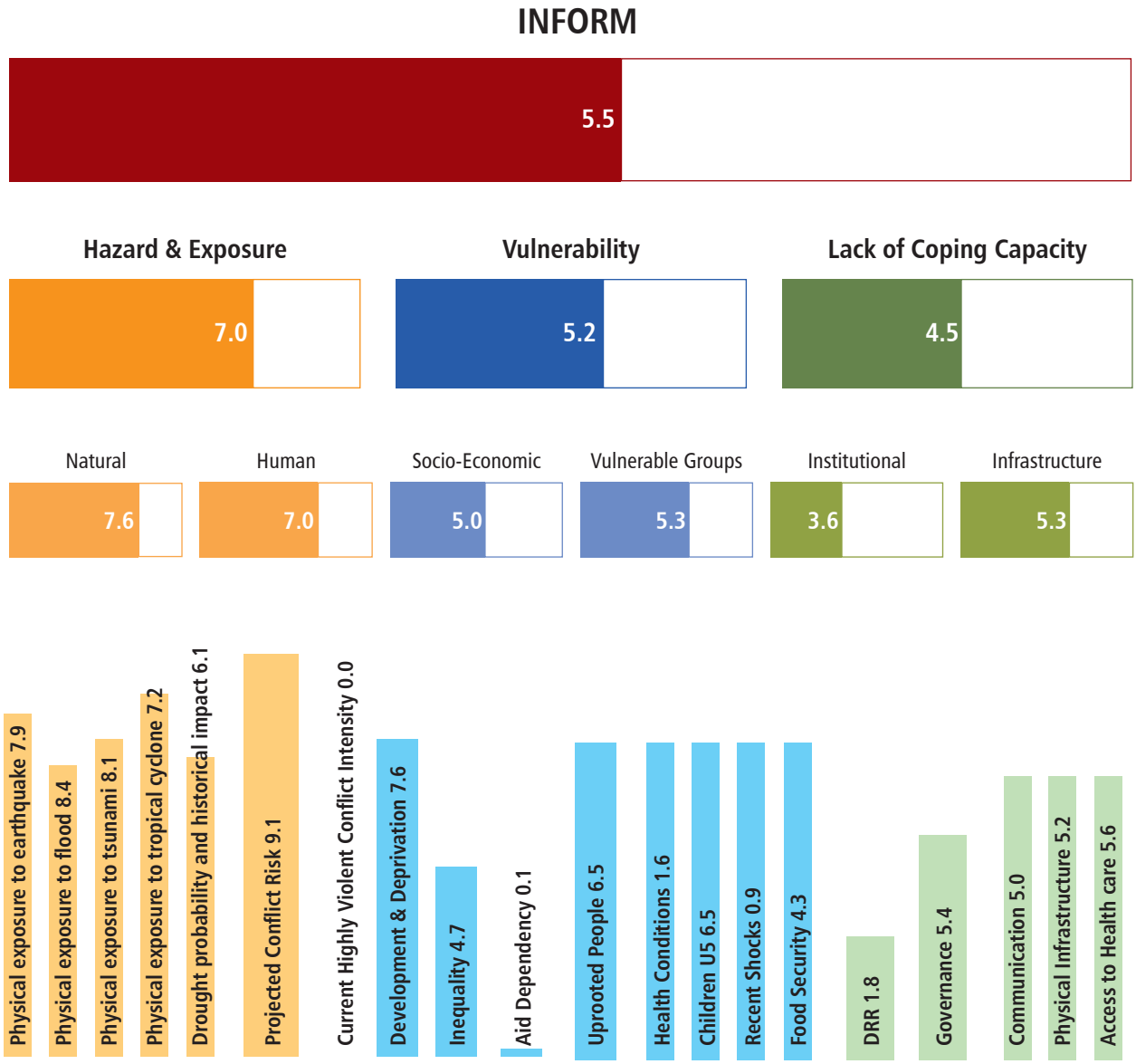
Table 1: Disaster profile of India (2004-19)

Year	Occurrences	Injured	Affected	Homeless	Total affected
2004	7	6913	33748599	105000	33860512
2005	31	6803	28196813	464000	28667616
2006	20	478	3234000	4150000	7384478
2007	20	33	38143000	0	38143033
2008	11	50	11589018	2400000	13989068
2009	17	118	11092521	4000	11096639
2010	18	305	3372183	907000	4279488
2011	13	250	12504069	325000	12829319
2012	10	0	4280860	0	4280860
2013	12	4547	16704280	0	16708827
2014	16	84	5503980	650200	6154264
2015	22	1695	346502337	54097	346558129
2016	15	313	1816500	2000000	3816813
2017	18	44	22335051	60100	22395195
2018	22	719	32137579	223050	32361348
2019	7	510	12400000	0	12400510

Source: EM-DAT: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, Brussels, Belgium.

Figure 1: Risk Profile of India

Risk Profile



Source: INFORM country risk profiles, http://www.inform-index.org

Table 2: Targeted schemes in India

Name of the Scheme	Year of initiation	Objectives	Organisational Head
National Cyclone Risk Mitigation Project (NCRMP)	2011	• Mitigating the effect of cyclones in India. • Two phases Phase 1 - Odisha and Andhra Pradesh Phase 2 - Goa, Gujarat, Karnataka, Kerala, Maharashtra, and West Bengal • Four major components 1. Early warning dissemination system 2. Cyclone risk mitigation infrastructures 3. Providing technical assistance for cyclone hazard mitigation 4. Project management and implementation support	National Disaster Management Authority, National Institute for Disaster Management (NIDM).
Flood management and flood forecasting programmes	Eleventh Five Year Plan	• Financing the resilience activities to reduce the losses from floods • Work related to river management, flood control, anti-erosion, drainage development, flood proofing works	Ministry of Water Resources
Integrated Coastal Zone Management Programme	2004	• Four components I. National Coastal Management Programme II. ICZM-West Bengal III. ICZM-Orissa IV. ICZM-Gujarat • Building national capacity for implementation of a comprehensive coastal management approach • Aim of rehabilitation of 223 existing dams and strengthening the system	Ministry of Environment and Forests (MoEF)/ Society of Integrated Coastal Management (SICOM)
Disaster Management Support programme		• Natural Disasters - Monitoring/Damage Assessment • National Database for Emergency Management (NDEM) • VSAT based VPN for emergency communication • Strengthening Early Warning Systems for tsunami, floods, cyclone, drought, landslides • Development of Hydro-met. networks, DSS • Capacity Building on DMS Exclusive Training Programme • Key Developmental Efforts - Airborne SAR, communication equipment, support to IOTWS, constellation of EO satellites	ISRO - DMS Decision Support Centre (DSC) at NRSC in association with Nodal Agencies MHA, MOA, Cabinet Secretariat, NDMA, State Agencies, NGOs[1]
Tsunami and Storm Surge Warning System	2007	• Will issue alerts for the killer waves within 30 minutes of an earthquake • Enables early warning centre to disseminate warnings to the MHA, as well as to the state emergency operations centres • Gives information about magnitude, location, and depth at which an earthquake occurs	Ministry of Earth Sciences Department of Science and Technology Department of Space and the Council of Scientific and Industrial Research

Source: Authors' compilation

[1] https://www.sac.gov.in/nisar/NISAR%20Science%20Workshop_Presentations/BR-GT2.pdf

Insurance and reinsurance in India

Insurance and reinsurance markets in India are underdeveloped, placing India among the underinsured economies. According to a report published by Kotak India, the penetration of insurance in India in only 0.7% of the GDP, compared to 2.8% for the rest of the world. Life insurance dominates the insurance markets, whereas the reach of general insurance is limited. Catastrophic insurance has not been able to acquire a separate market, because its value is not yet realised by the consumers and the insurance providers. It is a product that is offered as an embedded benefit under the home insurance policy in our country. Ironically, even the penetration of home insurance in India is low, which pushes the percentage of catastrophic insurance to almost nil. Home insurance is mostly purchased by people if they are taking home loans. The lackadaisical attitude of the insurance industry and lack of proactive measures by the distribution channels delays the claims and reduces the incentives for consumers to buy home insurance. Table 3 shows a list of disasters up to 2015 that were uninsured.

Table 3: Extent of uninsured losses in recent catastrophe events in India

Date	Event	Place of event	Economic Loss USD (billion)	Insured Losses (USD billion)	Uninsured loss of total loss
Dec 2015	Floods	Tamil Nadu and Andhra Pradesh	2.2	0.8	66%
Oct 2014	Cyclone 'Hudhud'	Odisha and Andhra Pradesh	7.1	0.6	91%
Sept 2014	Severe monsoon floods	Jammu and Kashmir	6.0	0.2	96%
Sept 2014	Severe monsoon floods	Assam, Bihar, Meghalaya, Uttar Pradesh, West Bengal	6.1	0.2	96%
Oct 2013	Cyclone 'Phailin'	Odisha	4.5	0.1	98%
Jun 2013	Floods	Uttarakhand	1.1	0.5	54%
Sept 2013	Floods	Andhra Pradesh and Karnataka	5.3	0.1	99%

Source: ICICIdirect.com, Research 2017

Crop Insurance

Table 4: Crop Insurance in India

S. No.	Parameters	National Agriculture Insurance Scheme (NAIS)	Modified National Agricultural Insurance Scheme (MNAIS)	Pradhan Mantri Fasal Bima Yojana (PMFBY)[2]
1	Year	1999-2017	2010-16	2016-Present
2	Primary Feature	Sharecroppers were included for insurance cover	Private sector participation encouraged. Immediate partial payment to affected farmers introduced	Premium rates lowered. Use of technology emphasised. No capping on premium rates and farmers will get claim against full sum insured without any reduction.
3	Farmers Covered	All farmers, including sharecroppers and tenant farmers growing the notified crops in the notified areas, were eligible for coverage. Scheme was compulsory for farmers availing crop loans and voluntary for others.	Same as NAIS	Same as NAIS
4	Claim Liability	In case of food crops and oilseeds, claim liability of up to 100 per cent of premium collected was to be borne by the AIC. Thereafter, the Centre and state governments shared the liability equally. In the case of annual commercial/horticultural crops, claim liability beyond 150 per cent of premium in the first three or five years and beyond 200 per cent thereafter, equally shared by Centre and state governments.	All claims were to be borne by the IAs. To protect IAs against overall loss exceeding 500 per cent of gross premium, a Catastrophe Fund at national level was to be set up with contributions from Centre and state governments.	All claim liabilities on insurer and claim liability beyond 350 per cent of premium collected or 35 per cent of sum insured at national level to be shared equally by the Centre and state governments
5	Premium Rate	a. Kharif season 3.5 per cent b. Oilseeds and bajra 2.5 per cent c. Cereals, millets, and pulses d. Rabi season 1.5 per cent e. Wheat 2 per cent Other food and oilseeds crops Actuarial premium for annual commercial/horticultural crops	Actuarial premium as well as net premium rates (premium rates actually payable by farmers after premium subsidy) for each notified crop through standard actuarial methodology in conformity with provisions of IRDA	a. Maximum premium of 2 per cent of sum insured for Kharif (food and oilseed) crops. b. 1.5 per cent of sum insured for Rabi (food and oilseed) crops; and c. 5 per cent of sum insured for Annual commercial/horticultural crops.
6	Premium Subsidy	Ten per cent to small and marginal farmers only, to be shared equally between Centre and states	Actual premium with subsidy up to 75 per cent to all farmers, to be shared equally between Centre and states	The difference between the Actuarial Premium Rate (APR) and insurance charges payable by farmers shall be provided by Governments as subsidy, and shall be shared equally by the Centre and states.
7	Use of better technologies for yield estimation	Yield estimation through traditional CCEs.	Pilot studies for yield estimation through use of Remote Sensing Technology (RST)	Provision for adoption of RST, drone, and other technologies in yield estimation and categorisation of number of CCEs after validation by pilot studies. Use of smartphone apps for accurate and fast transmission of CCE data to facilitate early settlement of claims

Source: CAG, Report No. 7, 2017

[2] https://www.researchgate.net/publication/319643499_Impediments_to_the_Spread_of_Crop_Insurance_in_India

Features of WBCIS/RWBCIS

WBCIS was launched in 2007 and restructured in 2016 as RWBCIS

- Covers parametric weather risks, on account of anticipated crop loss from adverse conditions.
- Provides payout against rainfall incidence (both excess and deficit). It is not a yield guarantee insurance
- Claim settlement is faster; an area approach is used, as opposed to individual approach
- Needs up to 25 years' historical weather data. Hence, technical challenge in correlating weather challenges with yield losses
- Claims arrive when there is deviation from actual temperature within a specified time period, leading to a crop loss
- Premium Rates
  Kharif - 2%
  Rabi - 1.5%
  Rabi and Kharif Annual - 5%

USA - Heavily subsidised, 70% of premium subsidy paid by the government.

CHINA - Heavily subsidised, revamped in 2007, covering 75% of cultivated land. Decentralised power, shared by all levels.

TURKEY - Restructured in 2005, agriulture insurance pool (Public Private partnership).

Noteworthy illustrations from selected countries

Natural disasters leave in their wake a trail of tremendous economic losses, which are more often than not funded via budget allocations or government resources. The rising frequency of disasters and their increasing severity thus calls for ex-ante financial protection solutions that can reduce the fiscal impact of disasters. Prudently designed and efficiently implemented financial instruments can increase the disaster resilience of an economy, along with complementing risk reduction and mitigation efforts. Table 5, Table 6 and Box 1 present a snapshot of notable examples of financial instruments for disaster risk reduction that have been implemented in different countries and regions.

Table 5: Insurance, reinsurance, and catastrophe pools

Country	Programme	Key details
State sponsored insurance programmes		
Spain	Insurance programme by Consorcio de Compensacion de Seguros (CSS)	CSS, a state-owned enterprise, cooperates with the private insurance industry to provide coverage against natural catastrophes and manmade events (OECD, 2015).
Turkey	Compulsory Earthquake Insurance (CEI)	The programme is managed by the Turkish Catastrophe Insurance Pool, a non-profit legal entity built through public private collaboration. The programme has been acclaimed for its low-cost structure and well-designed public private partnership program. It seeks to privatise part of the potential risk by exporting it to the international reinsurance and capital markets. In addition, the government bolsters the pool through reinsurance, premium subsidies, and technical and organisational support.
USA	National Flood Insurance Program (NFIP)	The programme is managed by the Federal Emergency Management Agency (FEMA), through its subcomponent the Federal Insurance and Mitigation Administration (FIMA) (CRS, 2019). It seeks to provide affordable insurance for decreasing the impact of flooding on private and public structures (FEMA, 2019a) and risk reduction via flood management practices. It runs on a community basis[3] and not on an individual basis. It serves as a classic example of a state backed insurance programme where affordability is primarily achieved through subsidisation.

[3] "A community, as defined for the NFIP's purposes, is any state, area, or political subdivision; any Indian tribe, authorized tribal organization, or Alaska native village; or authorized native organization that has the authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction. In most cases, a community is an incorporated city, town, township, borough, or village, or an unincorporated area of a county or parish" (FEMA, 2011).

Country	Programme	Key details
Reinsurance programmes and catastrophe pools		
France	Caisse Centrale de Réassurance (CCR)	CCR is a public sector reinsurer that provides insurers cover against natural catastrophes and uninsurable risks. While bringing in stability, it also comes with state guarantee so as to avoid any failure of the system. Additionally, CCR does not have a monopoly by law, thus offering flexibility to the primary insurers in choosing their risk management strategy.
The UK	Flood Re	Through a joint collaboration of the government and private industry, this provides affordable insurance for properties facing flooding risk through reinsurance support to industry. It was conceived as a transient solution and is due to run till 2039.
Florida, USA	Florida Hurricane Catastrophe Fund (FHCF)	Structured as a tax exempt state trust fund, FHCF provides reinsurance coverage to insurers. It reimburses part of the losses to residential property insurers through the reinsurance programme at a cost less than market rates in case of a hurricane loss.
California, USA	California Earthquake Authority (CEA)	This is a not-for-profit, publicly managed, and privately funded entity that provides earthquake insurance policies (CEA, 2019). The policyholder premiums, along with insurers' contribution and own investment returns, form the base of CEA finances. It also invests in mitigation by providing financial incentives.

Source: Authors' compilation

Table 6: Regional risk pools

Risk pool	Key Details
Caribbean Catastrophe Risk Insurance Facility (CCRIF)	This is a parametric insurance programme for the Caribbean governments to limit the financial impact of catastrophic events. Nineteen Caribbean countries and two Central American countries have become a part of it. The major advantage of CCRIF is that it mitigates the short-term cash flow problems of a small economy in the event of a catastrophe (OECD, 2015) and transfers the risks to international markets at a lower cost.
Pacific Disaster Risk Financing and Insurance (PDRFI)	PDRFI was launched under the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI). A joint initiative of the Pacific community, the World Bank, and the Asian Development Bank, it received financial support from the Government of Japan, GFDRR, and other international agencies. Under the programme, five of the Pacific island nations risk financed their exposure to earthquake, tsunami, and cyclone catastrophes in the international reinsurance market (ESCAP, 2017) and thus ensured more budget flexibility and reduced contingent liability in the event of a disaster. The pilot programme came to an end in 2015 and is now continued under the Pacific Resilience Program (PREP).

Source: Authors' compilation

Box 1: Catastrophe Bonds and Insurance Linked Securities (ILS)

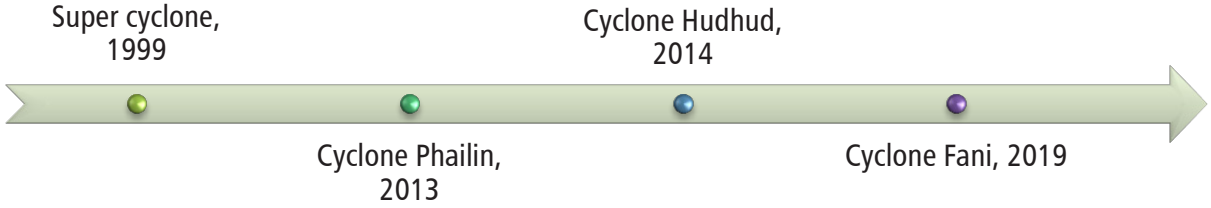
The most successful examples of Cat bonds and ILS come from the USA, where they are widely used by the government and the insurance and reinsurance industry. These include the California Earthquake Authority, Texas Insurance Windstorm Association, and Citizens Florida (CPIC), among others. It has been reported that the total outstanding volume of the global market reached its highest level at USD 30 billion in the first half of 2018 (Aon Securities, 2018). Another notable policy development regarding ILS can be traced to the UK. In order to provide for an ILS friendly legal framework, a parliamentary committee in the UK passed Risk Transformation Regulations, 2017 and the Risk Transformation (Tax) Regulations, 2017 (Aon Securities, 2018).

The Case of Odisha

Odisha is spread over an area of 1,55,707 sq. km on the eastern seaboard of India and is constituted of four geographical regions, namely the Northern Plateau, the Central River Basins, the Eastern Hills, and the Coastal Plains. The idiosyncratic topography of the state of Odisha has rendered it extremely vulnerable to various natural calamities, such as cyclones, storm surges, floods, tsunamis, drought, heat wave, lightning, and landslides. Keeping this in view, the vulnerability of the districts of Odisha to cyclones has been assessed based on the occurrences of four major cyclones that hit Odisha from 1999 to 2019. The four major cyclones considered for the present purpose are the Super Cyclone of 1999, Cyclone 'Phailin' of 2013, Cyclone 'Hudhud' of 2014, and Cyclone 'Fani' of 2019.

The vulnerability mapping of the state has been done by utilising the information pertaining to the occurrences of these cyclones in various districts. The frequency of cyclones in a particular district has been used as a basis to establish the vulnerability of a district. The criteria employed for classifying the districts under different categories are enumerated in Table 7.

Figure 2: Timeline of the four major cyclones in Odisha from 1999 to 2019



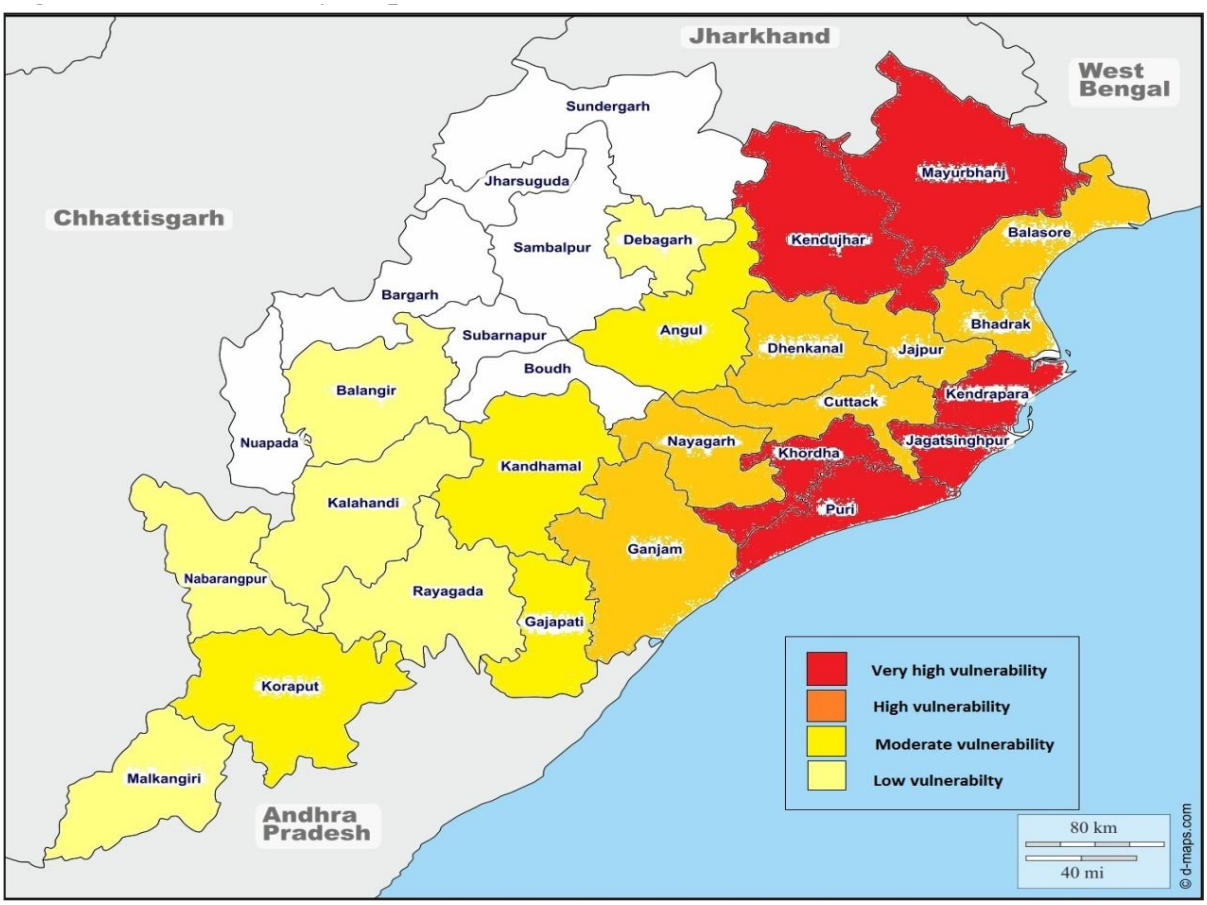
Source: Authors' compilation

Table 7: Criteria for classification of districts on the basis of vulnerability to cyclones

Category	Classification	Colour code
Very high vulnerability	Districts that have been hit by all the four cyclones	Red
High vulnerability	Districts that have been hit by any three cyclones	Orange
Moderate vulnerability	Districts that have been hit by any two cyclones	Yellow
Low vulnerability	Districts that have been hit by one cyclone	Lime Yellow

Source: Authors' analysis

Figure 3: Vulnerability map of districts in Odisha



Source: Authors' analysis

Note: The districts in the map have been shaded on the basis of the districts reported to be affected by the four cyclones under consideration.

The vulnerability map (Figure 3: Vulnerability map of districts in Odisha) for the districts in Odisha classifies the districts into different categories of vulnerability. As expected, the coastal districts are the most vulnerable to cyclones and fall into the category of very high and high vulnerability. Puri, Khordha, Jagatsinghpur, Kendujhar, Kendrapara, and Mayurbhanj districts have been hit by all the four cyclones under consideration and are classified under districts with very high vulnerability. Further, the vulnerability decreases as we move away from the coast and towards the non-coastal districts. The districts of Balangir, Kalahandi, Nabarangpur, Rayagada, Debagarh, and Malkangiri have been classed under districts with low vulnerability, as these districts have been hit by only one cyclone.

Property loss and damage of infrastructure facilities is an impediment in the development of a completely disaster resilient Odisha. Cyclone 'Fani', which recently hit the state, crippled its economy by inflicting damage on electricity lines, houses, summer crops and plantations, road networks, and telecom infrastructure.

The post-disaster situation is made worse by the depressed levels of insurance penetration, particularly of general insurance. The challenge of underinsurance, if resolved, can alter the present dynamics of disaster risk mitigation to some extent. Therefore, the transition from excessive reliance on ex-post recovery towards ex-ante risk mitigation involves building of disaster resilient infrastructure, increase in insurance and reinsurance cover, and taking into account the vulnerability profile of different districts while formulating disaster management and financing strategies.

Model of Multipurpose Cyclone Shelter - Field visit to Odisha

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