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A Study of Global Practices on Financial Resilience Against Natural Disasters and its Relevance to Andhra Pradesh

Sanjay Kumar ***MSc, MBA,***

Department of Commerce & Management Studies, Andhra University, Visakhapatnam, Andhra Pradesh, India.

Dr. G Sudarsana Rao ***Ph.D,***

Professor and Chairman PG Board of Studies, Department of Commerce & Management Studies, Andhra University, Visakhapatnam, Andhra Pradesh, India.

ABSTRACT

Financial resilience is an important component of disaster management process as it allows the governments, individuals and businesses to recover from the effects of a disaster in a timely and efficient manner. It comprises internal and external funds to buffer against disaster shocks. In India, the State government is primarily responsible for disaster management in the State and relief expenditure is met from State Disaster Relief Fund. The State government faces huge financing gap post disaster as available financial resources are not enough to overcome this gap. Various reports indicate that the frequency and magnitude of natural hazards have increased in recent decades and the associated financial and economic losses are increasing at a rapid pace.

In order to mitigate the impacts of natural disasters and achieve financial resilience, the countries around the world have employed various innovative financial risk reduction measures and tools. These tools include reserve funds, insurance, catastrophe bonds, credit liabilities, microfinance/ microcredit arrangements etc which can be classified into immediate/ emergency response, recovery and reconstruction/ rehabilitation measures. The Indian state of Andhra Pradesh is exposed to various natural disasters like cyclones, storm surges, floods, droughts of which cyclones are more common because of its geographical location and has repercussions on the state's economy, its development policies and life of millions of people. The global practices in various parts of the world provide good examples for financial resilience and the relevant practices can be emulated to augment financial resilience in the state of Andhra Pradesh.

The paper explores how various relevant global practices on financial resilience including the recent innovations can be emulated to augment the financial resilience of the State of Andhra Pradesh against hydro-meteorological disasters.

Keywords: Disaster Management, Financial Resilience, Insurance, Reserve Funds Catastrophe Bonds.

INTRODUCTION:

The Global Assessment Report (GAR 2015) estimated that the economic losses from disasters such as earthquakes, tsunamis, cyclones and flooding are going to reach an average of US$ 300 billion each year and future losses (expected annual losses) are estimated to increase up to US$ 415 billion by 2030. In its report, Munich Re (2017) indicated an overall loss of US$ 330 billion for all types of natural disasters in 2017, which is almost twice the ten year inflation adjusted average of US$170 billion. For its report, Munich Re tracked a total of 710 natural catastrophes, which is significantly higher than the average number of 605. These reports indicate that the frequency and magnitude of natural hazards have increased in recent decades and the associated financial and economic losses are increasing at a rapid pace. These can be attributed to the rise in population densities, rapid urbanisation, climate change and environmental degradation.

India is highly vulnerable to natural hazards especially earthquakes, floods, drought, cyclones and landslides. Studies indicate that natural disaster losses equate to up to 2% of India's Gross Domestic Product (GDP) and up to 12% of Central government revenue (Ramprasad M, 2013). Many countries especially the developing countries like India are facing a financing gap as they do not have the financial resources to buffer against these kinds of severe disaster losses. The Indian state of Andhra Pradesh is exposed to various natural disasters like cyclones, storm surges, floods, droughts of which cyclones are more common because of its geographical location. In the recent cyclonic disaster of October 2014, cyclone Hudhud caused extensive damage to the city of Visakhapatnam and the neighboring districts of East Godavari, Vizianagaram and Srikakulam in Andhra Pradesh. As per the estimates of the National Disaster Management Authority (NDMA), damages were estimated to be Rs 13,263 Crores (US $ 2155 million) including 61 reported deaths and temporary displacement of several thousand people (Jain RK, 2015). The regular occurrence of such natural disasters in coastal Andhra Pradesh has repercussions on the state's economy, its development policies and life of millions of people especially those living in the coastal region. During cyclone Hudhud, once the immediate humanitarian needs were met, the restoration of the livelihoods of the affected population, business and infrastructure became critical and availability of buffer funds both at the state level and the household became a critical requirement.
The financial resilience is an important component of disaster management process because the immediate availability of funds to finance the necessary disaster response and recovery is critical for government, individuals and businesses. The Sendai Framework for Disaster Risk Reduction (DRR 2015 - 30), adopted at the 3rd United Nations World Conference on Disaster Risk Reduction, held in 2015 in Sendai, Japan highlights the need for focused action within and across sectors by States at local, national, regional and global levels for investing in DRR for resilience. The Sendai framework for DRR has recognised financial resilience as crucial factor for effective disaster management. There are various approaches for financial resilience against the disaster being practiced all around the globe, as each area has its unique solution based on the socio - economic, geographical and demographic factors including the type of disaster that a particular region encounters. The coastal State of Andhra Pradesh is subjected to mostly hydro-meteorological disasters like tsunami, cyclones, storm surges and associated risk of flooding.

LITERATURE REVIEW:

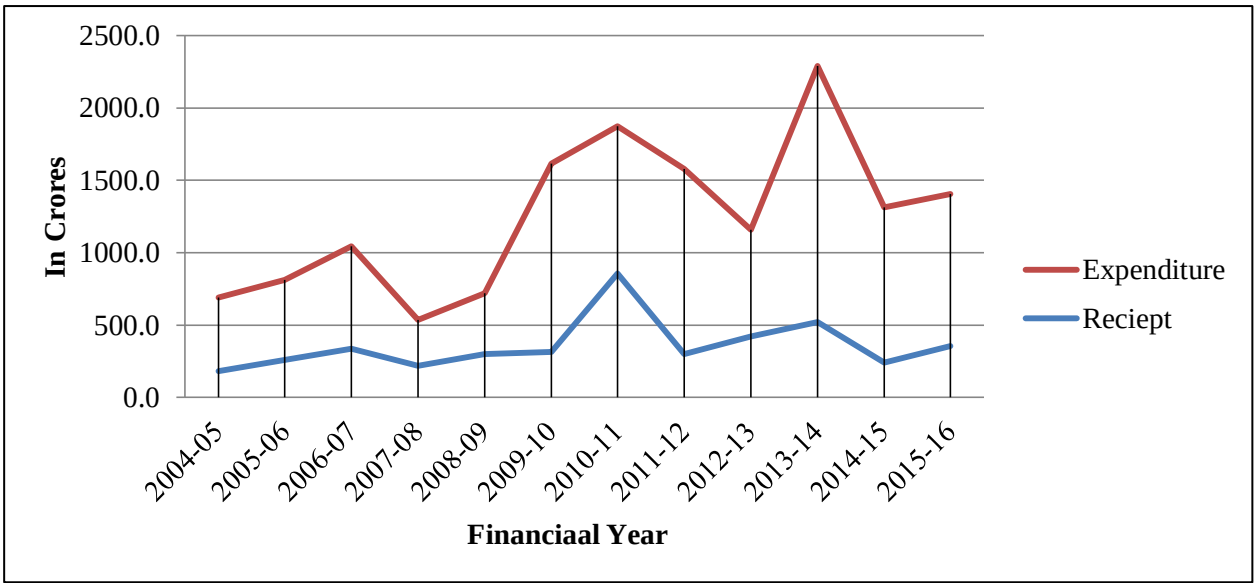
In India, the literature on disasters generally focuses on definition, types, effect and recovery mechanism of disasters and there is lack of literature on disaster risk financing. The alternate means of disaster funding, apart from the allocation of funds by the central government, have not been given adequate attention. Disaster risk financing requires focused pre and post disaster strategies including domestic insurance market (Clemence, Raghuram et al, 2009). The Insurance Regulatory & Development Authority (IRDA) and National Disaster Management Authority (NDMA) of India have mentioned insurance as a means of funding disaster expenditure, however indicated the lack of its penetration and on-ground implementation as problem areas (Ramprasad M, 2013). Disasters present a broad range of human, social, financial, economic and environmental impacts, with potentially long-lasting, multi-generational effects which is a key challenge for individuals and governments in developed and developing countries (OECD, 2015). Disaster financing is a complex mechanism and one of the major impediments the governments face is in determining whether the programs and financial strategies employed by them are appropriate and efficient (Benson and Clay, 2004). Bevan and Cook (2015) provide guidelines as to how to value the cost of post-disaster public budget increases and reallocations. Porter and White (2015) suggested an innovative approach of combining vulnerability analyses with forward-looking catastrophe risk modeling to understand the potential welfare effects in the event of disaster. Organisation for Economic Co-operation and Development (OECD, 2015) evaluated the wide range of approaches to the financial management of disaster across economies, reflecting differing levels of disaster risk and economic development. It highlights common challenges across economies and suggests the need for further investment in developing comprehensive approaches to disaster risk financing. Analysis of post-disaster budget allocation over time can give a good sense of the recurrent needs governments face (Francis Ghesquiere and Olivier Mahul, 2012). Disaster Risk Financing and Insurance frameworks need to be tailored to the specific needs of the countries and needs to be done comprehensively as planning for disasters in advance will lead to lesser costs of post-disaster needs (Clarke, Skoufias et al, 2015).

NEED FOR THE STUDY:

In India, the State Government is primarily responsible for the disaster management in the State and relief expenditure is met from State Disaster Relief Fund (SDRF) in the event of a disaster. In case of severe

calamities, the National Disaster Relief Fund (NDRF) supplements the funding available from SDRF. Currently, government of India contributes 90% of the total yearly allocation to states and the balance 10% is contributed by the respective State government. The current SDRF norms have limitations in funding beyond the immediate relief, repair and restoration of damaged infrastructure. A study of Andhra Pradesh State Budget expenditures for the past 12 years (State Finances: A study of Budgets, 2004 to 2016), indicates a phenomenal growth of relief expenditure in the State (Fig 1). For the country as a whole, the annual relief expenses during 2015 -16 registered a growth of 268% over the years 2004 - 05. The Analysis depicts that Andhra Pradesh incurred more expenditure than the combined allocations under SDRF and NDRF for the State. The study of revenue receipt and expenditure budgets brings out an average financing gap of 200% in the last 12 years for the period from 2004 to 2016 (Fig 1) .The expenditure on disaster management has risen considerably over the years and is likely to follow the trend in the years to come.

Fig1: Receipt & Expenditure statement in respect of natural calamities for Andhra Pradesh (Financial Years: 2004 – 2016)



According to Disaster Management Act of India 2005 and National Disaster Management Policy (NDMP), the long term rehabilitation and reconstruction is to be undertaken as part of the planned schemes of the government (Jain RK, 2016). The historical data on the financial and economic losses during various natural disasters in the state of Andhra Pradesh indicates that it is beyond the coping capability of the State government. The funds needed for reconstruction and rehabilitation after a disaster are channelised/ reallocated from funds earmarked for other developmental activities or through external aid and loans. The government of Andhra Pradesh, therefore, needs to cater for the financing gap through pre-disaster risk financing measures and innovative means. The relevant global practices on disaster financing can be emulated and remodeled to the specific requirement of the State.

OBJECTIVE OF THE STUDY:

The objective of the paper is to explore how various relevant global practices on financial resilience including the recent innovations can be emulated to augment the financial resilience of the State of Andhra Pradesh against hydro-meteorological disasters especially in the north coastal region.

Definition of Financial Resilience:

Resilience is defined as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. A financially resilient state or household endures the shock, and regains previous levels of net worth within a reasonable period of time (Jacobsen, Karen 2009).

Hazard Risk Vulnerability (HRV) Analysis of Coastal Andhra Pradesh:

Historical Data:

The coastal Andhra Pradesh is exposed to tsunamis, cyclones, storm surges, floods and droughts of which the cyclones are most recurrent. A moderate to severe intensity cyclone can be expected to make landfall every two to three years. About 44 percent of the state is vulnerable to tropical storms and related hazards. The cyclone and tidal wave of 1977, 1979, 1990, 1996 and 2014 resulted in great loss of life and affected the economy of the coastal Andhra Pradesh and attracted attention of international communities. The incidence of cyclones seems to have increased in the past decades, to the extent that severe cyclones have become a common event occurring every two to three years, repeatedly and severely affecting the state's economy and challenging its financial and institutional resources. Almost 2.9 million people are vulnerable to cyclones and their effects in coastal Andhra Pradesh, 3.3 million of whom belong to communities located within five kilo meters of the coastline. The major hydro-meteorological disasters in the last 50 years and the associated damages are:

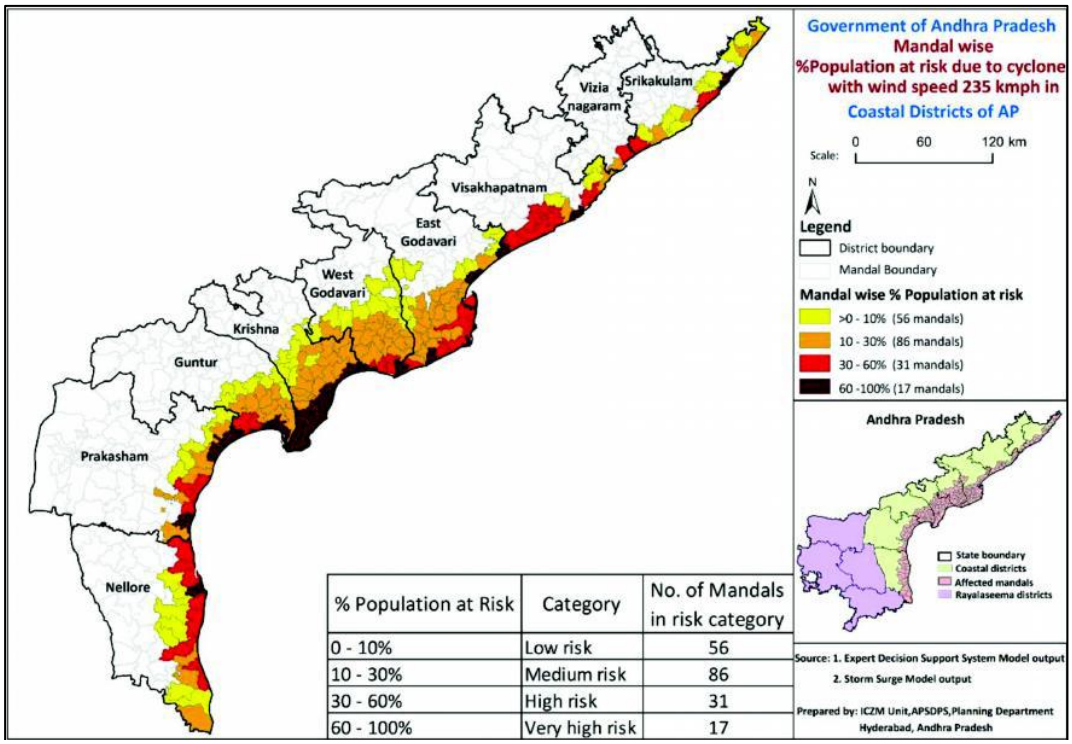
Table 1: Major Hydro-Meteorological Disasters in Andhra Pradesh (1977 – 2017)

S No	Year	Type of Disaster	Fatalities
1	1977	Cyclone	• 10,000 deaths • Millions rendered homeless • 40,000 cattle deaths
2	1990	Severe Cyclonic Storm	• 967 people killed • Rs 2,248 crores of crops and properties damages • 435,000 acres of land affected
3	1996	Very Severe Cyclonic Storm	• 2,000 people killed and 900 people missing, • Crops affected in 320,000 hectares. Estimated loss of crops to a tune of Rs 150 crores • 10,000 houses destroyed
4	2004	Tsunami	• 10,749 deaths and 5,640 persons missing • 2.79 million people affected • 11,827 hectares of crops damaged • 300,000 fishermen lost their livelihood (*data includes coastal area of Tamilnadu, Kerala, Andhra Pradesh, Puducherry and A & N Islands)
5	2014	Severe Cyclonic Storm	• 61 deaths within Andhra Pradesh • Estimated damage of Rs 13,263 Crores (US $ 2155 million) • 182,128 hectare of agricultural land and 7871 houses affected

HRV Analysis based on a Probabilistic Model:

Andhra Pradesh State Development Planning Society (APSDPS) carried out the HRV analysis of the state on a probabilistic model and estimated the Mandal wise percentage population at risk due to vulnerability of cyclones in nine coastal districts of Andhra Pradesh. The data was computed based on the latest data sets using the Expert Decision Support System (EDSS) model which computes expected casualties due to cyclones by considering percentage area inundated and combined casualty rate for a wind speed of 235 kmph (Sammaiah Matta, Tejaswi et al, 2015). This is derived from the storm surge and wind damage model based on the population and number of existing cyclone shelters. The results indicated that out of 430 mandals in nine coastal districts of Andhra Pradesh, 190 mandals are affected due to cyclone with a wind speed of 235 Kmph. The percentage population at risk is categorized into four classes as low (55 mandals), medium (86 mandals), high (31mandals) and very high (17 mandals) respectively. The EDSS model depicts that **o**ut of the total population in nine coastal districts, 11% of population is at risk (7% rural and 4% urban) (Fig 2).

Fig 2: District wise percentage population at risk (Source: Vayu Mandal (41) 2015, Andhra Pradesh State Development Planning Society (APSDPS), Hyderabad available at http://www.apsdps.ap.gov.in/HUDHUD/Hudhud_Report.pdf)



Global Practices on Financial Resilience and its Relevance for Andhra Pradesh:

Financial preparedness can be categerised into pre disaster and post disaster arrangements. Pre disaster arrangements provide certainty that funds will be quickly available to enable governments to prevent the affected areas from suffering extreme financial and economic loss. In order to mitigate the impact of natural disasters and achieve financial resilience, the state governments need to complement the investment in financial risk reduction with pre disaster risk financing tools. Organisation for Economic Co-operation and Development (OECD, 2015) has classified these tools into short-term (emergency response), mid-term (recovery) or long-term (reconstruction) and these can be utilized in combination to cover financial risk, based on the relative frequency and severity of the expected events:

- **Government Reserves** - dedicated contingency reserves for disasters which is allocated for emergency response i.e. funds allocated to State Disaster Relief Fund (SDRF) and National Disaster Relief Fund (NDRF) in India
- **Insurance** - Enables the transfer of risks and indemnifies against damage (e.g. to cover damage to government assets such as buildings and infrastructure).
- **Contingent credit arrangements** - Long term arrangement with a financial institution or international organization i.e. US AID, World Bank, IMF etc.
- **Catastrophe bonds or other types of catastrophe-linked securities or derivatives** - Provides an alternative means for risk transfer

Global Practices:

Government reserves (Emergency Response):

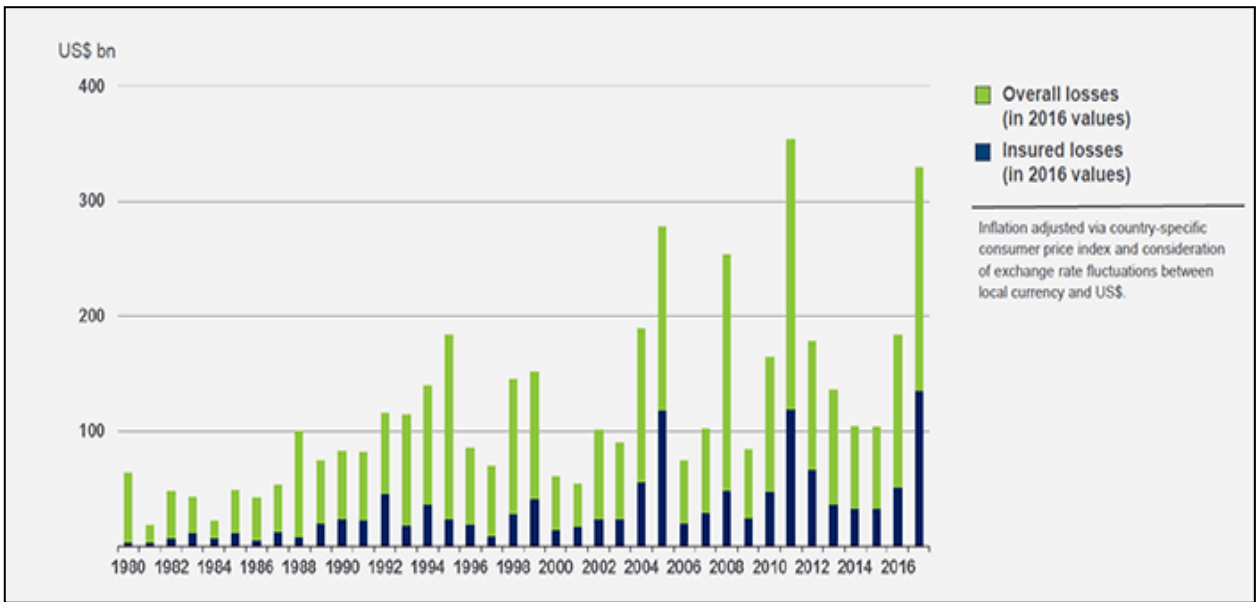
The existence government reserves for financial assistance and compensation schemes is important in economies where insurance markets are less developed, or where income levels are low, as it may be unreasonable to expect individuals and businesses to make use of private markets such as insurance due to the lack of availability or affordability (OECD, 2015. In the global context**,** dedicated disaster reserve funds have been established in a number of countries and have established detailed procedures for distribution, use, monitoring and accounting of the relief/ compensation funds. To quote a few, in Philippines, the National Disaster Risk Reduction and Management (NDRRM) Fund is funded through annual allocations from the national budget. In Indonesia, at the central level, the Rehabilitation and Reconstruction Fund (RRF) is the main budget instrument to finance public

post disaster expenditures. The central government also provides funding for disaster reserve funds in State budgets. The amount of the reserve fund reflects the potential disasters that might occur and the financial capacity of the state government concerned. In Mexico, FONDEN provides the 32 Mexican states and the federal agencies in charge of federal infrastructure with the necessary resources to cover the losses and damages caused by natural disasters, whose magnitude may exceed their financial capacity, including resources for the reconstruction of public infrastructure at all levels of government (federal, state, and municipal)

Insurance/ Contingent Credit arrangements/ Catastrophe Bonds:

A study of best practices for pre-disaster financial mechanism around the world indicates that insurance is the most cost-effective way of dealing with the financial risks in medium and long term and provides considerable liquid funds to the government for quick and timely relief, repair, and reconstruction and rehabilitation process. Study (Ramprasad M, 2013) indicates that 85% of total loss following a major disaster is attributed to uninsured loss and average uninsured annual loss is approximately US$ 1.96 billion. In developed countries the insured proportion of losses account for 40 - 66% of total loss; however in developing country including India it accounts for less than 2%. According to Munich Re (2017), overall losses from world-wide natural catastrophes in 2017 totaled US $330 billion dollars, which is US $184 billion more than the previous year. Insured losses from these events rose to US$ 135 billion in 2017, up from US$ 50.7 billion in 2016 (Fig 3). Insured losses in 2017 were almost three times higher than the average of the past 10 years, at $49 billion (adjusted for inflation). The various Finance Commissions of India, responsible for recommending financial allocations to the states, have envisaged the disaster funding through insurance, however, it did not make any concrete recommendation in this regard due to existing poor penetration of insurance and various other operational on-ground issues related to its implementation especially for low frequency high impact disasters (Ramprasad M, 2013).

Fig 3: World Natural Catastrophes by overall and insured losses, 1980–2017(Source: © 2018 Munich Re, Geo Risks Research, NatCat Service.



There are different approaches adopted by the governments to close the financial protection gap through insurance. Some countries emphasise on facilitating and promoting insurance solutions for household and businesses to reduce government's liabilities for disaster relief funding while some directly insure the government's exposure. A variety of innovative Public Private Partnerships models for risk transfer have been implemented over the past few years around the world and these can act as models for many other countries including the state of Andhra Pradesh on pre disaster risk financing strategies.

Public - Private Partnerships Models:

El Fondo de Desastres Naturales (FONDEN, Mexico):

Mexico is considered a pioneer in transferring risk through public-private partnerships. Mexican Government created a fund for natural disasters in 1996 (FONDEN) to improve its financial preparedness for natural

disasters, to which it transferred budgetary funds for disaster relief and reconstruction efforts. It invests funds as premium to insurance companies in return of payment of all costs and relief and reconstruction of all Mexican states and federal buildings and infrastructure, which by laws are compulsorily insured. In 2009, it concluded the Multi- Cat transaction, which uses catastrophe bonds to transfer earthquake and hurricane risks to capital markets. Mexico's multilayered financial strategy for managing the costs of disasters at the Federal level has three main components:

- A parametric triggered layer of cover immediate emergency funds if a major and severe disaster occurs.
- A risk retention vehicle (FONDEN) that allows to budget for the costs to cater for the most frequent types of disasters
- A reinsurance program that utilises budget funds to purchase a cover that provides funds unrelated to the public finances when severe deviations of disaster frequency arise

Turkey:

Turkish Catastrophe Insurance Pool (TCIP) & Turkish Agriculture Insurance Pool (TAIP). A very good example of a disaster insurance scheme for households is the Turkish Catastrophe Insurance Pool (TCIP) which today serves as a model for many countries. It is one of the most successful specialized earthquake insurance pools in the world, providing risk-based disaster insurance for households. It also serves as a model for many countries in terms of a successful Public-Private Partnership. Established in 2000, TCIP is the legal entity which is responsible for the provision, implementation and management of compulsory earthquake insurance in Turkey. The TCIP insurance provides indemnification for monetary losses caused by earthquake to dwelling houses for up to a maximum compensation limit that is reviewed annually. The main highlights of this scheme are

- Compulsory earthquake insurance is only available for residential buildings within municipals borders. Buildings which belong to public institutions and organisations or used for commercial and industrial purposes cannot obtain insurance.
- Turkish Agriculture Insurance Pool (TAIP) provides only product guarantees in the agriculture branches such as crop insurance, livestock insurance, aquaculture insurance and greenhouse insurance.
- Turkish government and insurance sector work together. Insurance companies are an important part of the pools and participate on Management boards of these pools.
- Insurance companies are the main distributors of TCIP and TAIP policies and also have the option of participating in the reinsurance phase.
- Turkish government provides support to the pools, which includes financial support in the provision of reinsurance, premium subsidies, technical support and organisational support.
- To ensure affordability of insurance for compulsory earthquake insurance, there is a cap for maximum indemnities. Beyond this cap, individuals have the option of buying additional property insurance coverage from non-life insurance companies.
- The premium support provided to individuals is at least 50%, up to a maximum amount of 66.6% of the policy cost. Premium support payments are made directly to TAIP on behalf of farmers who buy agriculture insurance policies.
- TCIP and TAIP try to generate reserve funds for future contingencies and endeavour to calculate the risks in order to promote fiscal stability

Horn of Africa Risk Transfer for Adaptation (HARITA) and R4 Rural Resilience Initiative:

HARITA project is a joint initiative led by Swiss Re, Oxfam America and several other partners whose objective is to extend insurance coverage to the vast majority of people. It consists of a comprehensive risk management package for the poor, including a risk transfer component. With donor support, it gives people the initial option to pay for their premiums with their labour, engaging them in community-led and locally designed climate adaptation initiatives in return for insurance cover. Building on the success of the HARITA project in Ethiopia, Oxfam America and the World Food Programme launched the R4 Rural Resilience Initiative. The initiative offers households access to drought insurance and credit, facilitates their work on environmental projects that strengthen their communities, and encourages families to save. This innovative Public-Private Partnership is expanding and will enable poor farmers to strengthen their food and income security by managing risks through a four-pronged approach i.e. improving natural resource management, accessing microcredit, obtaining insurance and increasing savings. HARITA and R4 are new models for sustainable development founded on the principles of collaboration and mutual support by public and private sector

organisations, communities and governmental ministries. The long-term goal of HARITA and R4 is to achieve rural resiliency through an effective public-private partnership and a market based collaborative mechanism.

Europa Reinsurance Facility (Europa Re):
To address very low levels of catastrophe and weather risk insurance penetration in Southeast Europe, Europa Re was established with financial and technical support from the World Bank. Europa Re is owned by economies in Southeast Europe including Albania, Serbia, Macedonia, Bosnia and Herzegovina & Montenegro. The program is aimed at the development of local catastrophe insurance markets in Southeast Europe by equipping the insurance companies with adequate reinsurance, know-how and insurance technology to enter or expand their presence in catastrophe and weather risk insurance product lines, which include earthquake and flood insurance and multi-peril agricultural insurance products. This objective is pursued through the creation of economy specific risk models, regulations, pricing and new products. Europa Re provides reinsurance support to insurance companies which include:

- Catastrophe insurance coverage for damages caused to property and earthquake (includes fire following an earthquake) and flood
- Agriculture yield index insurance coverage designed to protect farmers from the loss of crop yields due to adverse weather events and biological risks.
- Tailored for specific crops, this insurance product provides protection to farmers against extreme weather events that affect crop yields.
- Access to a sophisticated web-based production platform with integrated insurance technology applications that include automated pricing and underwriting, innovative claims management services, financial and regulatory reporting, interactive consumer information portal and risk management.

Regional risk pooling initiatives:
A number of smaller countries have collaborated on the establishment of regional risk pooling arrangements also called 'Sovereign Risk Pools' as a means to mutualise risk and create economies of scale for accessing international capital and reinsurance markets.

Caribbean Catastrophe Risk Insurance Pool (CCRIF):
It is a sovereign risk pool owned and operated by 16 Caribbean governments. It is structured to pay out quickly in case of serious disaster, using parametric insurance instruments e.g. strength of earthquakes, wind speeds or rainfall to estimate losses and to determine payout levels. CCRIF represents a paradigm shift in the way governments treat risk by putting contingent funding in place before catastrophes occur and streamlining the loss assessment process. It shows how the proactive treatment of risks can reduce their economic impact. Since the inception of CCRIF in 2007, the Facility has made eight payouts totaling more than USD 32 million to seven member governments.

Pacific catastrophe risk insurance Pool:
Through this programme, six of the Pacific Islands countries including Cook Islands, Marshall Islands, Samoa, Solomon Islands, Tonga and Vanuatu, have arranged protection against earthquake, tsunami and tropical cyclone risks from the global reinsurance market. Launched in 2013, the programme assists the governments of the Pacific Islands to transfer catastrophic risk and provide emergency funds for disaster relief efforts. Tonga was the first country to benefit from a payout.

African Risk Capacity:
It is the latest regional risk pool. Its first sovereign insurance programme was launched in May 2014, offering initially five African governments to cover some of their disaster relief expenses related to drought through innovative weather-index insurance. Senegal, Mauretania, Niger, Kenya and Mozambique are among the first five countries which have joined this African Risk Capacity insurance program.

Probabilistic Models Assessing Exposure to Natural Disasters:
Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI):
Pacific Island Economies are among the world's most vulnerable to natural hazards such as tropical cyclones, earthquakes, tsunamis and volcanic eruptions and their financing for disaster recovery have been undertaken by the international donor community. Under the auspices of PCRAFI, technical tools have been developed to

support pre disaster risk reduction measures, such as planning, emergency preparedness, climate change adaptation, disaster risk financing, and post disaster support such as rapid assessments. PCRAFI produced detailed probabilistic hazard models for all 15 PIEs, such as Tropical Cyclones with Winds, Storm Surge, Rain, Earthquake with Ground-shaking, and Tsunami and has taken a holistic view of the impact of extreme natural hazards in the region, including direct effects on population, all structures, including housing for the poor and squatted properties, as well as on public and infrastructure assets and major crops. The database includes building location, number of stories, replacement cost, and structural characteristics that affect vulnerability to natural disasters. The various tools developed so far include:

- **A regional historical hazard and loss database** for major disasters which contains historical including tropical cyclone catalogue that includes 2422 events from 1948 to 2008
- **Hazard models** which cover earthquakes (both ground shaking and tsunamigenic) and tropical cyclones (wind, storm surge, and excess rainfall);
- **A regional GIS exposure database** containing components for buildings and infrastructure, agriculture, and population which included building footprints and structural classifications digitised from high resolution satellite images
- **Probabilistic catastrophe risk models** specific to each country developed by integrating data collected and produced through the risk modelling process and including maps that show the geographic distribution of hazards, assets at risk, and potential losses
- **Geo-referenced data** for hazard modelling in the region, including satellite imagery, topographic maps, bathymetry maps, surface geology maps, surface soil maps, land use/ land cover maps and geodetic and fault data,

Micro Insurance/ Micro finance/ Micro Credit:

One of the important approaches to relieve governments budgets of the contingent liabilities related to natural disasters is to promote insurance solutions for households (Reinhard Mechler and Joanne Linnerooth-Bayer, 2006). This is especially relevant in countries like India, where private insurance markets are not as well developed, government resources are severely constrained and the paying capacity of the most vulnerable layers of the population is extremely low. The aim of Micro Insurance/ Micro finance/ Micro Credit**s** schemes is to provide low income households and businesses with easily accessible and affordable insurance to cover the loss of small-scale assets, livestock, and crops as well as own life and health in the event of natural disaster. Although India has been a pioneer in the micro insurance and microfinance arrangements, few relevant global practices are:

Saint Lucia: Weather Index-Based Livelihood Protection Policy:

In October 2012, a weather index-based micro-insurance product known as the Livelihood Protection Policy (LPP) was launched in Saint Lucia. The aim of the LPP is to provide livelihood protection for low-income populations against adverse weather risks, offering a safety net for those whose incomes are affected by severe climatic events, such as strong winds and heavy rainfall during hurricanes and tropical storms. The territory of the island of Saint Lucia was divided into 39 grid cells and each insured person is assigned to the cell in which he or she is domiciled. Pricing of coverage is based on a fixed rate of 8% on the sum insured across the entire island, without any differentiation from cell to cell. The maximum sum that can be insured is approximately USD 3,700 and customers may decide the amount of coverage required in 10 segments of equal value. Rainfall levels and wind-speed at the centre point of each grid cell are monitored on a daily basis by satellite technology and insured persons receive early warnings and emergency advice via mobile phone SMS, allowing them to anticipate a storm and take precautionary measures.

Meso-level flood insurance pilot, in Bangladesh, is a good example of how disaster insurance solutions can also be tailored to low-income families. In recent years, an innovative meso-level flood index insurance pilot project has been launched in Bangladesh by donor organizations in close collaboration with the private sector. The pilot scheme covers 1660 families from 14 villages and uses model-generated flood data for payout calculation. If a catastrophic flood occurs (according to pre-defined criteria), the programme provides cash relief to households through local organizations.

Hurricane-Resistant Home Improvement Program in St. Lucia (HRHIP):

In 1996 the St. Lucia charity, National Research and Development Foundation (NRDF), with assistance from donors like USAID established a home improvement program offering loans for affordable new or improved

existing housing to low income homeowners, while providing for physical and financial protection against natural disasters. Within this Hurricane - Resistant Home Improvement Program (HRHIP), minimum building standards were developed for reference by homeowners, and builders and local builders were trained in safer construction. The services of a trained building inspector are also offered to approve materials for use in retrofitting and to check whether minimum standards were being observed. Furthermore, a group insurance plan, underwritten by a Caribbean subsidiary of a United Kingdom based insurance company, was established through a St. Lucia broker. Membership of the insurance scheme was mandatory for recipients of the home improvement loans.

Relevance of Global Disaster financing Tools to Andhra Pradesh:

The above practices in various parts of the world provide the necessary evidence that the mechanisms of sovereign risk transfer work and that they can help pave the way from short term relief and recovery to long term growth. These practices can be modeled at the national level as well as in the state of Andhra Pradesh and cater for pre and post disaster risk transfer mechanisms. These programs enable governments to make regular payments in good years in return for financial protection in bad years, making financial resources more readily available when natural catastrophes occur and at a lower long-term cost.

The government reserves for emergency response in India are on similar lines as practiced in most countries. Currently the Government of Andhra Pradesh relies mainly on the Government reserve funds i.e. SDRF & NDRF which provide an immediate source of funding. On the recommendation of the various Finance Commissions, the Ministry of Finance, Government of India has allocated funds for strengthening disaster relief, capacity building and response mechanisms. It has also laid out guidelines/ norms for assistance towards Gratuitous Relief, search and rescue operations, Relief / repair measures. The 14th FC recommended allocation of 2429 Crores to the newly formed State of Andhra Pradesh for the period 2015 - 2020 out of a total allocation of Rs. 61,219 Crores to all states. The government of Andhra Pradesh has spelt out the various financial aids for immediate relief and recovery. It caters for gratuitous relief, expenditure towards search & rescue operations and other relief measures including clearance of affected areas. It also caters for assistance to farmers, animal husbandry, input subsidy, fishery, damage to house, road and infrastructure related to irrigation, health, power etc (Manual on management of SDRF and NDRF, 2013).

Mexico's multi-layered financial strategy, based on Public Private Partnership model (FONDEN)**,** for managing the costs of disasters at the federal level is an excellent example for short, medium and long term disaster financing mechanism. It demonstrates the importance of a well developed technical infrastructure for conducting probabilistic risk assessment within the public sector and the need for strong co-ordination among government departments and research institutions. Adoption of this model will lead to development of an integrated disaster risk management framework involving risk assessment, prevention and reduction including transfer tools.

Risk transfer schemes based on parametric or index insurance is relevant to the State of Andhra Pradesh as it closely mirrors the actual damage on the ground and enables a much more rapid payment, since no assessment of the actual damage is required after the event. It does not require surveyors to assess damage after a disaster occurs, a process that can take months or even years and which can delay the payout. The speed of payout is one of the significant advantages of this type of transaction. A parametric trigger is transparent, both for the insured and for investors, and it means that loss events can be handled faster and more efficiently than with other kinds of insurance-based solutions.

Although more relevant at the national level, Regional risk pooling initiatives can be emulated amongst the countries of the Indian Ocean Region (IOR) or amongst South Asian Association for Regional Cooperation (SAARC) nations. Such an initiative can be found viable amongst the coastal states on the eastern coast of India .i.e. West Bengal. Odisha, Andhra Pradesh, Tamilnadu and Puducherry. This initiative can render diversification benefits gained from intra state co-operation on the management of fiscal exposures. it would create economies of scale for accessing capital and insurance/reinsurance markets (OECD, 2015).

On the lines of Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), the state of Andhra Pradesh can develop risk profiles using the hazard and exposure databases. The HRV analysis of the states have been carried out by various districts in the state in conjunction with external agencies like UNDP, however it needs to include an analysis of the distribution of the potential cost of natural disasters by magnitude over time for each district, as measured by the expected return period for losses of a specified amount. The impact of simulated events on population is to be measured by the number of people affected, in terms of fatalities, injuries and displacements, and the impact on the built environment and crops in monetary terms. The losses should reflect both the cost needed to repair or replace the damaged assets, and the emergency response costs that the state may face as a result of providing necessary relief, including debris removal, cost of temporary

shelters, and food and medicine.

In India, the regulatory framework requires insurers to reserve a certain portion of their portfolios for the rural and social sectors. This has ensured the number and diversity of micro-insurance products for disaster risk targeting especially low income segments of society. In the state of Andhra Pradesh, this sector is well developed. However in 2010, the Allegation of suicides due to unethical means of recovery of loans, charging higher rate of interest by MFIs, over-indebtedness in Andhra Pradesh resulted in the enactment of Andhra Pradesh Microfinance Institutions (regulation of money lending) Act, 2010. The state of Andhra Pradesh has various schemes such as Swayamkrushi, VimoSEWA, Apathabandhu, BASIX, DHAN projects and various programmes under Andhra Pradesh Disaster Preparedness Program. It will be important to understand the extent to which such tools impact the lives of vulnerable populations. The state of Andhra Pradesh can take a cue from the global practices and its micro insurance/ microfinance sector. These would include activities such as:

- Preparing a detailed vulnerability analysis of the cities and model various risks for effective mitigation planning and disaster response preparedness in consultation with community representatives and by applying local knowledge;
- Carrying out an in depth assessment of Insurance scheme like agriculture risk insurance, social safety nets and other such risk transfer mechanisms and develop an integrated program for the vulnerable populations .
- Increasing the awareness and understanding of the merits and challenges of micro insurance and providing support and subsidies to the micro insurance and microfinance companies need

CONCLUSION AND RECOMMENDATIONS:

The global practices reinforce the utility and need of disaster financing tools for meeting the existing financing gaps as an effective risk transfer mechanism. The state could explore the option of purchase of insurance scheme for compensation in respect of death, injury, loss of property due to disasters which are not included in the list of expenditure as per SDRF norms as well as for repair and reconstruction of damaged infrastructure. The state government could utilize part of the allocated SDRF (up to 10%) towards meeting the expenditure. This would avoid channelization of funds from other developmental funds. Taking a cue from the global practices, the state government can emulate the following to augment the financial resilience in case of disaster.

- Improve the consistency of disaster impact assessments and understanding of risk-bearing capacities across society in order to optimise financial assistance and improve cost-effectiveness in the delivery of recovery assistance. This would enhance utilisation of the SDRF and NDRF funds judiciously and optimally to achieve financial resilience. It would result in a fair, timely and efficient disbursement of funds for disaster relief whilst ensuring transparency and accountability in the process.
- Implement mandatory insurance for:
  - Private homes in highly vulnerable zones
  - Government buildings, roads, bridges, schools and hospitals
  - Public utilities like electricity, eater , drainage
  - Public places
  - Places of importance where public congregations take place i.e. religious places/ pilgrimage etc
- Provide incentives by way of premium subsidies or tax deduction benefits for purchase of insurance cover to promote the affordability of disaster insurance and expand the coverage of disaster risks particularly case of agriculture insurance including fisheries and animal husbandry
- Enhance the availability and penetration of disaster insurance through media and innovative means. In Mexico, insurance policies are sold in packages with earthquake, volcanic eruption, and hydro meteorological perils as an add-on if fire insurance is purchased.
- Provide primary insurance to cover certain disaster losses by a special purpose entity set up by the government to act as direct insurer in case the private insurer is unwilling to provide insurance due to various limitations. In such cases, the state government can provide insurance and respond to claims (completely or up to a certain limit). The private insurance sector can contribute its operational capabilities, such as marketing of the policies, collection of the premiums, and/or adjustment of the claims.
- Quantifying the contingent liabilities associated with disasters based on historical data and complements it with information from probabilistic risk models. Analysis of post disaster budget allocation can give a good sense of the recurrent needs. This would help the state government in preparing demand for the future financial allocation, in the absence of which it remains ad hoc and is generally projected based on the previous years' allocation added with the inflation figures.

- Improving the availability, consistency, and quality of data on hazards, exposures, vulnerabilities and losses in order to enhance the understanding of risk and improve capacity to undertake cost benefit analysis of various approaches to reducing and managing risks.

Enhance the financial capacity to deal with disasters by promoting the development of DRF tools and markets, including legislative and regulatory frameworks with the aim of augmenting financial resilience across all segments of society.

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