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Editor-in-Chief

Responding to the dramatic increase in extreme weather events and mega-disasters is one of the great challenges of our present age. Climate change, rapid urbanization and population growth in hazard-prone cities and coastal areas make action all the more urgent. Disaster risk reduction is a top priority as we seek to hold back the tide of rising economic and human losses. Its impact can be catastrophic for poverty reduction and sustainable development efforts.

India is among the world's most disaster-prone countries exposed to recurrent natural hazards such as cyclones, earthquakes, landslides, floods and droughts. Climate change and environmental degradation have further compounded the frequency and intensity of disasters along with increasing the vulnerability of key assets including people. Disasters may have severe negative impacts on short and long-term economic development in various sectors. Hazards continue to strain not only the country's economy but the wellbeing and happiness of its people. Anthropogenic hazards from chemical, biological, and nuclear threats are also a concern given the high population densities and rate of industrial development.

As per the mandate of Disaster Management Act 2005, National Institute of Disaster Management has always stridden forward to create disaster resilient India through its training, research, documentation and publications. The Institute publishes a bi-annual Journal titled "Disaster & Development" with an aim to provide a common platform to the researchers, academicians and others for publication of their unique and innovative research work on all aspects of the disaster management. The current issue of the journal covers research works on all facets of the disaster risk reduction. The papers were reviewed by renowned persons having years of experience and expertise in the field of disaster management. I am hopeful that this issue will be valuable for the readers in understanding the natural hazards, associated risks and also the prevention and mitigation enhancing disaster risk reduction and resilience.

Major General Manoj Kumar Bindal, VSM

Editorial Note

We would like to present, with great pleasure, the 9th volume, Issue 2 of journal "Disaster and Development". This issue is devoted to the gamut of Disaster Risk Reduction and Resilience, from theoretical aspects to application-dependent studies.

Disaster Risk Reduction (DRR) and Resilience interventions aim to reduce and mitigate the risk of displacement and increase the resilience of communities to cope with disasters. DRR, more broadly, is defined as the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

India is exposed to a wide range of sudden and slow-onset natural hazards, from hydrometeorological threats such as flooding (riverine and coastal), cyclones, droughts, landslides and extreme temperature to wildfires, earthquakes and epidemics. Furthermore, hazards may also originate from anthropogenic sources when human systems have the potential to fail.

India plays an active role in global initiatives on disaster management. India is a signatory to the Sendai Framework for Disaster Risk Reduction and is committed to achieving the priorities and the objectives through systematic and institutional efforts. With multi-dimensional initiatives and expertise, India is taking a leading role in strengthening regional cooperation among South Asian countries for reducing disasters. India is one of the participating countries and works closely with the United Nations International Strategy for Disaster Reduction (UNISDR). India has been working closely with many countries for the exchange of ideas and expertise in disaster management. It is imperative to mainstream disaster risk reduction in developmental planning and to adopt an inclusive approach towards risk reduction to ensure sustainability of developmental initiatives and to widen its reach to cover every citizen.

Each article provides an example of a concrete application or a case study of the presented methodology to amplify the impact of the disasters. Many scientists/researchers/academicians/disaster managers and institutions have contributed to the creation and the success of the NIDM journal "Disaster & Development". We are very thankful to everybody who supported the idea of creating a journal issue – Disaster Risk Reduction & Resilience. This issue would not have been possible without the great support of the Editorial Board members, and we would like to express our sincere thanks to all of them. We would also like to express our gratitude to the reviewers and publication team of NIDM, who supported us at every stage of the journal. It is our hope that this fine collection of articles will be a valuable resource for DRR&R readers and will stimulate further research into the vibrant area of disaster management.

Surya Parkash, Ph.D.

Orissa Super Cyclone 1999: Preparedness Strategies for Community through CSR Initiatives at Paradeep Phosphate Ltd., Paradeep

Kalyan Kumar Sahoo[1]*, Vikash Barnwal[2], Sangram Singh[3]

Abstract

Orissa, being situated on India's east coast abutting the Bay of Bengal is extremely vulnerable to multiple disasters. The continual developments of natural disasters affect every sector of socioeconomic life together with the industrial sector. Therefore centered attention is needed for risk mitigation endeavors to consistently scale back the vulnerabilities by Corporate Social Responsibility (CSR). Perceiving the gigantic extents of the test presented by repeating rate of normal fiascoes, affiliation, and contribution of corporate division and their agent nodal associations for starting calamity hazard the executive's measures have been considered as fundamental to the achievement of the debacle of the board activities. This paper examines the impact of Orissa Super Cyclone 1999 in terms of infrastructure and involvement of the corporate sector in Jagatsinghpur, Orissa. With the aim of highlighting the social and psychological change after implementation of various developmental programs by the Government of Orissa through the CSR of Paradeep Phosphate Ltd., which was effective to combat Phailin and minimize its post-disaster impact. Community participation is a critical element of sustainable disaster management to develop a model integrating the Community Based Disaster Preparedness and Mitigation Process with the now-familiar Corporate Social Responsibility initiative.

Keywords: *Corporate Social Responsibility, Community Participation, Disaster Management, Disaster Preparedness Strategies*

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1. Introduction

Orissa, situated on the eastern coast abutting the Bay of Bengal is extremely vulnerable to multiple disasters. Due to its sub-tropical location, the state is vulnerable to tropical cyclones, storm surges, and Tsunamis. Its densely inhabited coastal plains are the alluvial deposits of its river watercourse systems. The rivers in these areas with a vital load of silt have little carrying capability, resulting in frequent floods, alone to be joined by broken embankments. Though an outsized part of the state comes under the purview of Earthquake Risk Zone-II (Low Damage Zone), the Brahmani Mahanadi Graven and their low triangular areas come beneath Earthquake Risk Zone (Moderate Damage Risk Zone) covering forty-three out of the 103 urban native bodies of the state. Other than these normal dangers, human-induced fiascos such as mishaps, fire, etc, vector-borne fiascos such as scourges, creature infections, and bother assaults and mechanical/ chemical fiascos include human enduring. Some commonly suspected outbreaks were of viral hepatitis (55 outbreaks; 1223 cases) followed by dengue (45 outbreaks; 1185 cases), chickenpox (30 outbreaks; 421 cases), viral encephalitis (27 outbreaks; 930 cases), measles (23 outbreaks; 464 cases), chikungunya (10 outbreaks; 593 cases) and rubella (1 outbreak; 60). The outbreaks peaked in frequency and intensity during the months of July and September in Orissa. The epidemiology of viral disease outbreaks in the region. Preparedness of health system based on evidence is essential for early detection and adequate response to these outbreaks.

2. Selection of Field of Study

The multi-Hazard map of Orissa demonstrates the vulnerability of the state. This overlapping nature of the hazardous zone played an important role in selecting the district for our study. This decision was coupled with the Orissa Super Cyclone, in which the Jagatsinghpur district was the worst hit has influenced the selection of our study locale. And, the Blocks where the field-work was conducted are Kujang, Ersama, and Balikuda of the district.

2.1 Orissa Super Cyclone and other Disasters in 1999

The state of Orissa severely faced a series of major catastrophes in 1999. There were extreme floods in August, which influenced seven beachfront regions. At that point,

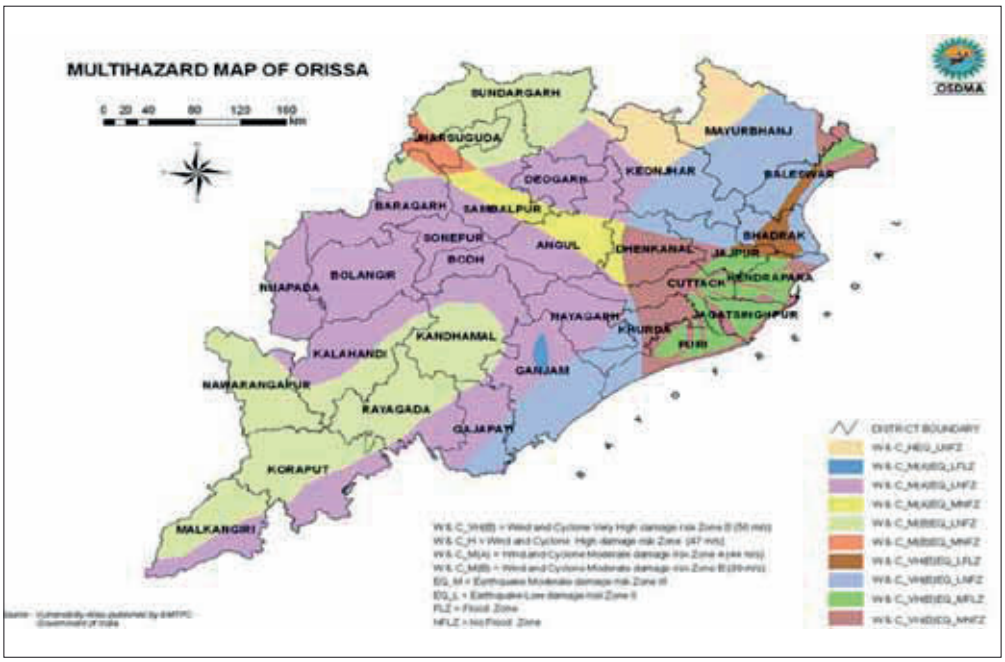

Figure 1: Multi-hazard Map of Orissa

in October, inside a range of only 11 days, 14 areas in the state were crushed by two typhoons. The main typhoon, kept going for the time being from seventeenth to eighteenth October 1999, was delegated an extreme cyclonic tempest with wind speeds arriving at 200 km for each hour. The subsequent typhoon, from 29 to 30 October, was an uncommon tornado of calamitous power, with wind paces of 300 km for an hour. It cleared the whole Orissa coast, influencing 12 areas and parts of neighboring West Bengal, destroying a 250 km stretch of eastern Orissa's coast. Ten thousand individuals were accounted for killed and a huge number more crushed.

The savage violent wind cleared the state with supported winds of 160 mph. It was the most exceedingly bad tornado in meteorological history; with one of the most elevated wind speeds ever recorded 223 mph. It endured 24 hours when most tornados final now not than three. The storm heaved 30-feet waves onto shore, washing absent whole towns, straightening mud cabins, and drowning thousands who overseen to outlive the effective winds. The super tornado uncovered the individuals and the scene to the effect of three natural disasters: Storm surges, High-speed wind, Heavy torrential

rain. These brought about three distinct impacts: (1) physical devastation; (2) saline inundation; and (3) flooding.

Within the recorded history of violent winds for the State of Orissa, the Super Violent wind of 29-30 October 1999 was without a doubt the foremost serious one. It had a few special highlights such as quick escalation, a little span of eye-wall restricting the huge surge near to the point of landfall and moderately long life after landfall. Climatologically there's a tall recurrence of dissemination of tornados in October since of solid easterly winds on high. Cyclone genesis more often than not ends at the organization of minimal violent winds. Sometimes improvement of tornados to hurricane drive winds and higher happens in September and October months because it happened in 1831 and 1885.

The official death toll was 9,893, but there were challenges in making precise gauges and nearby individuals demand the ultimate passing number was much higher. Entirety towns along the ocean and Ersama piece of Jagatsinghpur area were washed. No one knows how numerous individuals were misplaced. The violent wind too crushed the job of the coastal state's cultivating community and soaked more than 1 million hectares of cropland beneath salty water and killed 406,000 animals. Millions of individuals who squeezed out their living were cleared out destitute. The violent wind destroyed the agrarian community. All paddy areas, sugar cane, and vegetable crops were crushed. Around 11 million individuals, about one-third of the state's populace of 35 million, were assessed by the UN organizations to be straightforwardly influenced, having misplaced their shelter, crops, cattle, and livelihoods.

Table 1: Districts with Maximum Human Casualties (OSC 1999)

District	Human Casualties	Population affected		
		Total	Rural	Urban
Jagatsinghpur	8,119	13,62,760	15,99,295	64,117
Cuttack	471	24,17,048	18,47,923	5,69,125
Kendrapara	469	13,70,000	13,03,200	75,800
Puri	303	15,63,000	13,70,000	1,93,000

Source: "Orissa Super Cyclone 1999", National Center for Disaster Management

Table 2: Districts with Maximum Washed away Houses (OSC 1999)

Name of District	Fully Washed Houses
Jagatsinghpur	12,124
Balasore	11,483
Kendrapara	276
Mayurbhanj	262

Source: "Orissa Super Cyclone 1999" National Center for Disaster Management

Table 3: Districts with Damaged Boats and Nets (OSC 1999)

District	Boats	Nets
Chilika Lake	7,560	11,599
Jagatsinghpur	6,988	16,271
Kendrapara	6,354	8,905
Puri	3,181	7,945

Source: "Orissa Super Cyclone 1999", National Center for Disaster Management

Table 4: Districts with Maximum Number of School Damaged (OSC 1999)

Name of Districts	No. of School Damaged	
	Primary School	High School
Jajpur	2,115	208
Ganjam	1,972	315
Cuttack	1,617	424
Balasore	1,288	152
Jagatsinghpur	1,111	275

Source: "Orissa Super Cyclone 1999", National Center for Disaster Management

Other sectors which were badly affected by OSC were:

i. ***Agriculture Sector:*** OSC has completely devastated the agricultural base and logistics in the affected areas of *Orissa*. In coastal belts, due to high tidal waves, the standing crops were damaged affected 15 lakh families and the worst affected areas were Jagatsinghpur, Cuttack, Kendrapada, and Puri districts.

ii. Loss of Livestock: More than 0.4 million cattle were killed by the super cyclone. Cattle death was reported highest in Jagatsinghpur(Highest), Kendrapara, Cuttack, Khudra, and Puri.

iii Infrastructure: Complete collapse of communication networks and the surface communication was hampered due to damage to the Road and Rail network. The water supply system and irrigation infrastructure were adversely affected. Drinking water sources were either destroyed or contaminated by strewn carcasses compounded the already vulnerable state of the populace.

iv. Research Institutions: Research Institutes and all facilities in the coastal area were severely damaged by the super cyclone.

3. Community-Based Disaster Preparedness (CBDP) Model in Orissa

Sensitive communities have been at the frontline of disaster management operations in Orissa on various occasions due to the training and skills they receive from governmental and non-governmental agencies. Community preparedness is not limited to their participation in disaster management activities alone, it takes care of the effective and active cooperation of the community members with the local and national disaster management authorities. Lessons from past disasters are also kept in mind while designing prevention and response strategies. Orissa had witnessed a Super Cyclone which led to the loss of 10,000 lives in 1999. The unfortunate experience propelled the state to build multipurpose cyclone shelters along its 480 km long coastline, equipped with community kitchens and life-saving equipment. The shelter offers all type of services that are required during emergencies and have allotted announcement vehicles. Some buildings have also been designated as cyclone shelters so that evacuees do not get scattered at different locations but can stay within their communities. Achieving the goal of "zero casualty", Orissa completed one of the biggest evacuation activities in human history, moving around 1.2 million people just before Super Cyclone Fani in 2019.

As a result of the Pilot Orissa Disaster Management Project, a local disaster management (preparedness and mitigation) system was installed within the 10 Blocks from the Block level to the Gram Panchayat (GP) to the village levels. Increased level of appreciation, especially with case stories of successful disaster preparedness activities

in the June 2001 floods and November 2002 cyclone threat, has increased the demand for the replication of the preparedness and mitigation activities in other Blocks within the coverage districts of the Project and for the other districts in Orissa.

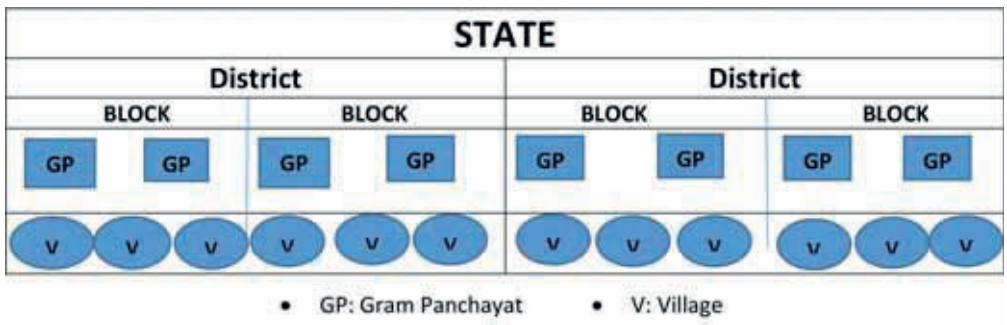

Figure 2: Diagrammatic Representation of CBDM

Community-based disaster management (CBDM) encounters have indicated that when villagers comprehend "what to do to and how to ensure them," especially after the experience of a major disaster such as Super Cyclone of 1999, Floods in 2001, and 2009 and Phailin in 2013, they can proceed and continue the procedure.

4. Corporate Social Responsibility: With Special Reference to Paradeep Phosphates Ltd.

The Paradeep Phosphate Ltd. (PPL), has focused on improving the quality of life in the communities around. PPL perceives acknowledged obligation of being an impetus in the financial change process, through specialty intercessions that supplement the administration's endeavors in various sectors. PPL accepted that prosperity should be shared. Being proactive and aware of our commitments denotes our endeavors intending to comprehensive development – connecting through inventive network-based intercessions. With a focal point of comprehensiveness, a system that empowers investment of key partners, a proactive methodology, and a drawn-out vision of change – we work inside socio-legitimate structures, in a period serious, process-driven way. Activities of PPL could be categorized under various heading along with a glimpse of initiatives:

Peripheral Activities: The PPL is focused on the turn of events and government assistance of the bigger network in its zone of activities. The organization proceeds with its endeavors for country uplifting with a large group of projects and intercessions. As a commitment for the government assistance of detainees of the Nivedita Ashram Orphanage, a lobby with appended latrines, a recreation center for open use, fixing old clinics, and giving facilities are simply few instances of initiatives.

Health: With a target to provide awareness and assistance health camps are organized by PPL. There are especially focused camps like Diabetes Camp conducted in collaboration with Kanungo Institute of Diabetes Specialties.

Education: Apart from community outreach activities, there were initiatives where PPL distributed study kits in the schools located near the plant site.

Community: The PPL's progressing community activity in two Gram Panchayats – Bagadia and Mangarajpur, covering 11 towns at Paradeep has established an essential premise by a child-centric approach. The strategic vision is to give a stage to aggregate activity all together that at least two towns can be created as model towns in a range of three years. While a few sources of info particularly regarding exercises, activity research and participatory occasions are being led in the effort towns, the attention is on basic contributions to training, wellbeing, water, and sanitation, and occupation (in light of improvement plans made by a network of individuals who organize their felt needs) in 2 towns as an exhibit model. The PPL has been working as an organization, with the Forum for Integrated Development and Research (FIDR); and, helped by nearby Panchayati Raj Institutions and a regional organization.

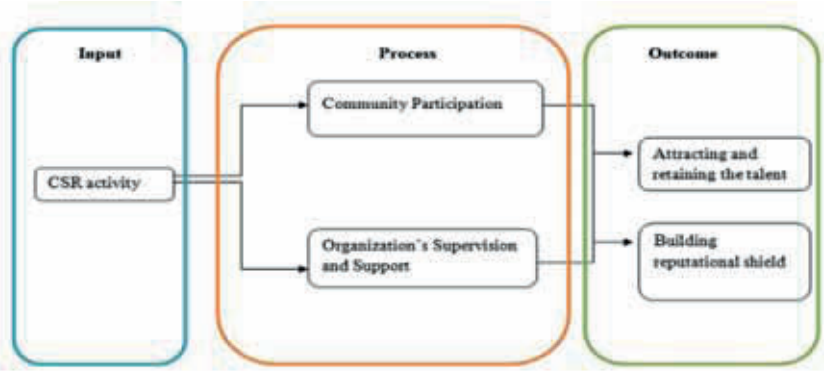

Figure 3: CSR Activity and Final Outcome Focused in Long Run

The data gave us a relative report between both the twisters. The way that the Government of Orissa and the CSR wing of PPL are taking care of the circumstances is worth appreciation. The investigation caused us to comprehend that mindfulness assumes such a major job in dealing with a debacle circumstance. Being a Disaster Management master, it turns out to be significant for us to comprehend these measurements. With all this, we ended our discussion by thanking them for their precious time and information that they have shared with us.

i. ***Psychological:*** The fear of cyclone was evident and the memory seemed to be new. The impact depends upon the damage caused to the community. During the discussions, Phailin was never given any priority. Since everyone was prepared, therefore the damage to life was zero. This was reflected in the form of confidence to face any other disaster. Hence the villages required a psychological habilitation program to prevent the impact from being carried by the next generation.

ii. ***Lack of Financial Institutions:*** The presence of financial institutions was found to be very negligible. Insurance companies, banks, and other financial institutions could not perform well during that period.

iii. ***Insurance:*** There was increased demand for insurance, but when compared to the size of the community,it was negligible. Hence a wide scope for insurance and a better way of disaster preparedness is required.

iv. ***Community Participation:*** Community participation in our opinion was more noticeable at Nuagaon. During the visit to a Multi-Purpose Cyclone Shelter hub,

the condition of the toilets and rooms seemed to be degraded. The responsibility for the maintenance was not taken care of by the officials or the local people. Whereas the condition at Nuagaon was far better along with the training sessions; and, the awareness level among the women groups was quite high. Besides, it had Self-Help Groups to take care of the civic amenities, sanitation, and livelihood interventions in the villages by companies like PPL added to their competence. The SHG at Nuagaon was well versed with the strategies for mother and child care. This was missing in the nearby regions. Though the need of SHG and plays a vital role in bringing awareness among the most vulnerable group of the society, i.e., women and children.

v. ***Awareness:*** Awareness about disaster management was found to be quite high among the masses. The importance of communication channels like roads, telecommunication devices was more. Awareness for the forest was observed and its need is being felt. But due to industrial intervention, people also understand the hazards which are present in the region.

vi. ***School-Based Disaster Reduction Plan:*** Schools in the villages were found to have a good infrastructure. This followed the guidelines of School-Based Disaster Risk Reduction.

vii. ***Sanitation:*** Sanitation and other interventions by PPL were appreciable. This ensured control over the diseases caused due to unhygienic sanitation conditions. Reducing the impact could be caused after the disaster occurrence.

viii. ***Lack of Strategic Interventions:*** The interventions of PPL and its reputation was found to be far better than the other organizations in the villages. Still the interventions were more philanthropic in nature and increased the dependency of the people on the organization's intervention.

ix. ***SHG Model Adopted was Multifunctional:*** The SHG functioning performed activities including disaster preparedness and livelihood generation, e.g., Nuagaon.

x. ***The Need for Infrastructure:*** There is a need to build more cyclone shelters, which would help and result in both direct and indirect benefits. Thus, the need to build more Multipurpose Cyclone Shelters to provide refuge to the vulnerable people in the study locale is justified.

xi. ***The Negative Impact of Support and other Government Programs:*** During a disaster, the support and other relief activities are the only support to bring back life to the

mainstream. But the negative impact could be observed in the long run where people take initiative to build basic requirements. Like building the concrete houses and other types will bring other basic requirements. There is a lack of coordination when it comes to bringing any change for preparing a self-dependant sustainable model. In terms of financial backup or integrating people into the financial system, the maintenance function should be taken up by the community. But this was perceived ignored, as they passed the responsibility of maintaining Multi-Purpose Cyclone Shelters (MPCS) to the government officials. Even today people seemed to be relaxed by being very sure there is no need to have a developed model that should need the least dependence on the external relief. It's apparent that the villagers have been ignoring the fact that disaster preparedness needs proper advanced health and education systems to tackle the debilitating effects of emergency through awareness building of the local community. Besides, overlooking recovery function from the impact in the minimum possible time amounts to passing the buck to the grassroots bureaucracy.

5. Suggestions

i. ***Core Competency:*** The main strengths or strategic advantages of a business enterprise include the core competencies in conjunction with pooled knowledge and technical capabilities which would allow a business to be competitive in the marketplace. Theoretically, a core competency should allow a company to expand into new end markets as well as provide a significant benefit to the customers. It should also be hard for competitors to replicate. Therefore,PPL has its strength in fertilizers, giving a cutting edge towards hazards and proper application of research inputs.

ii. ***The Benefits to Organization:*** Redefine new practices in the disaster-prone coastal region. In point off act, people in the nearby areas would be the main beneficiaries. And most important, it will help in building a reputational shield for the organization's employees. This process can be viewed and well understood by the diagram above.

iii. ***Need for Partner Organizations/Village Groups:*** Like all other interventions will not be included in the competency of PPL/organization, the partner and village group organizations in a few vital sectors will be benefited.

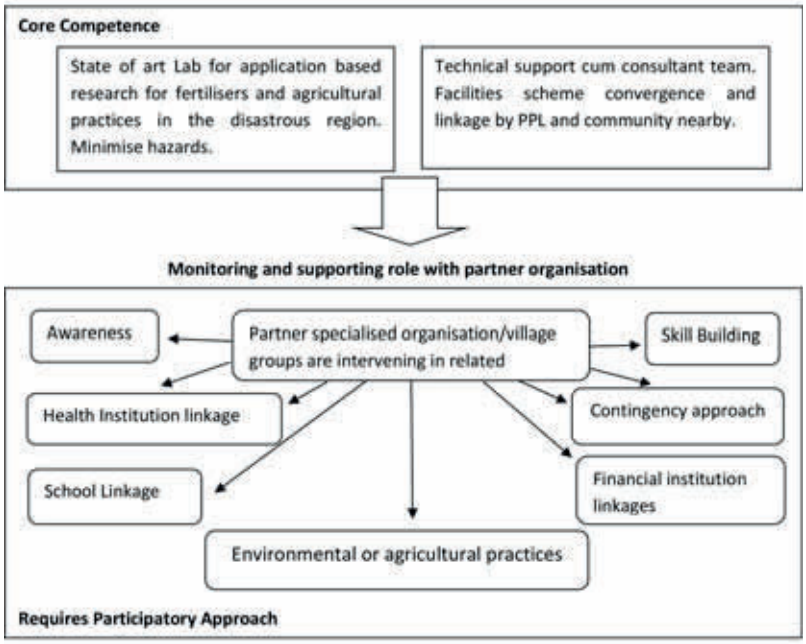

Figure 4 : Proposed Model

iv. ***Awareness, Skill-building Contingency Practices:*** These applications directly deal with disaster management practices. In the main, the skill development could have a diversified intervention in developing skilled laborers for the organization and empowering the vulnerable class of people.

v. ***Financial Institution Linkages:*** The know-how of fiscal practices and linkages to the financial institutions are necessary for any community to shore up group activities.

vi. ***Health and Educational Linkages:*** There should be a proper link between the institutions functioning in the form of the status of equipment and the specializations. The school curriculum should have a blend of disaster management as well as the development of skills like masons, carpentry, electricians, etc.

vii. ***Environment/Agriculture Practices:*** Here it talks about the awareness of the community's Common Property Resources (CPRs) like the forest produce, ponds, rivers, etc. These features demonstrate a new technique for agriculture and other livelihood practices such as fish processing via aquaculture, etc.

This aspect also includes helping the community to upgrade and adopt suitable practices since the industrial interventions have been affecting the priorities of the rural population.

6. Conclusion

The Orissa Super Cyclone-1999 investigation has given significant exercises to presenting measures on moderation at the network level. Generally significant of which has been the need to address the limitations and the inspiration of individual family units, enhanced by fortified network structures through the Corporate Social Responsibility. Additionally, the activity in relief saw the collaboration of multilateral offices at another level. Expanding on one another's qualities and assets with the goal of reinforcing the powerless network have ended up being a one of a kind and elating experience. These exercises gained from the involvement with PPL are currently being applied in various parts of India, the prepared bricklayers from Super Cyclone-1999 are presently venturing out more than thousand kilometers to prepare individual artisans.

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Perceived Disaster Risk and School Resilience

Balu I

Abstract

This study was commissioned to analyse the "perceived risk and disaster/emergency and resilience" of schools in South Goa district of Goa and Thane district of Maharashtra. Adopting convenient sampling method 360 schools are covered under this study. Study found more than one third of the respondents perceived fire as immediate risk for their school. Nearly one fourth of the schools experienced disasters in past five years. One third of the respondents perceived that earthquake as greater risk to their school but only one fourth of the schools are having earthquake preparedness plan for resilience. Half the schools only conduct safety drills that too rarely. Most of the teachers and students are aware on do's and don'ts on various disasters. It is found there is a significant association between location of school, number of students,percent of students with disability, greater risk of schools and school resilience.

Keywords: *School Safety, Home to Safety, Perceived Risk, School Resilience*

1. Introduction

Experience of past disasters/emergencies and risk perception has a great impact on preparedness. Awareness of and preparedness for disasters and emergencies are essential for improved risk management. In recent past, schools in India and worldwide have witnessed many disasters/emergencies exposing vulnerability of children from the predictable and/or perceived risk. Schools are the daily refuge for millions of children around the world. By in large, school-age children spend between 6 to 8 hours on educational campuses roughly 5 days per week. During such time, a child's safety and security are transferred from the parents or guardians into the responsibility of the respective Heads of Schools and subsequent teachers and staff.

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In light of such responsibility transfer, the importance of a child's safety in the schoolhouse has long been recognized from both a structural and health-related focus (Veselak, 2001; Haynes, 2002; Salisbury et al., 2002; Deschesnes et al., 2003; Sheetz, 2003) as various natural and human-induced hazards pose risks to the lives, health and safety of students and staff at school (Berkowitz et al, 2002). Over the last century, the possibility of a mass-casualty event occurring on school premises has garnered widespread recognition (Graham, 2006). Whereby more recent high profile events such as the Beslan Terrorist Siege in Republic of North Ossetia, Russia, in September 2004 (Hickok, 2004) and the Columbine shootings in April 1999 (Larkin, 2009) as well as the numerous school shootings taking place around the globe (Infoplease.com, 2018), global attention has focused onto the need for emergency preparedness in schools. It is evident that in the face of such risks, schools need to be prepared to manage emergency events in order to prevent or minimize physical and psychological trauma to both students and staff as well as the surrounding community.

A brief glimpse into the recent past shows that schools in India have witnessed a plethora of disasters at all scales. During the 2001 Bhuj Earthquake in Gujarat, a total of 31 teachers and 971 students perished, and the injured counted 95 and 1,051 respectively (Roy et al., 2002; Kenny, 2009). Had it not been for a holiday, school-related deaths would have likely been in the tens of thousands for the near 15.7 million affected (Edinger, 2001). The widespread damage to physical infrastructure, totaling over $7.5 billion, disrupted formal education. Just four years later in October 2005, a far more devastating earthquake took place in Jammu & Kashmir leaving 19,000 children dead, according to Government figures, as a result of widespread collapsing of school buildings (Shiwaku et al.; 2007; Peek, 2008; Wachtendorf et al, 2008). One of the largest school-related disasters in Indian history occurred on July 16, 2004, in the town of Kumbakonam in the state of Tamil Nadu. In a building located between two residential buildings, three different schools were operating: the Sri Krishna Aided Private School, Saraswathy Nursery and Primary School, and Sri Krishna Girls High School. These three schools contained more than 800 students within one three-story building. When the fire initiated, teachers asked children to stay in a classroom, locked the door, and left to extinguish the fire. The fire escalated out of control and the 125 elementary children in the locked classroom were forgotten in the ensuing evacuation (Satapathy& Walia, 2006). A Fire breaks out in a private school in Thane West District of Maharashtra. However, no one was injured in the accident. Similarly many incidents occurred in Thane and Mumbai.

2. Methodology

The objective of this research is to obtain a baseline assessment of "perceived risk and disaster/emergency preparedness for school resilience ". It also focused on discovering the variables are associated with the preparedness for resilience of any given school. Factors associated with preparedness include location of schools, type of schools, students with disability, greater risk of schools. The study was commissioned in 2019.

The study was conducted in South Goa district of Goa and Thane district of Maharashtra. About 180 schools in each state were selected based on convenient sampling method and the total sample size is 360 schools. User friendly questionnaire was prepared and the data collected from School head masters/mistress through google form. Area wise schools covered under this study are given in Table 1.

Table 1: Area Wise No. of Schools

Location	Goa	Maharashtra	Total
Rural	130	116	246
	72.0%	64.0%	69.0%
Semi Urban	4	8	12
	2.0%	5.0%	3.0%
Urban	46	56	102
	26.0%	31.0%	28.0%
Total	180	180	360
	100.0%	100.0%	100.0%

3. Results and Discussion

The study found that among the surveyed schools, majority (29 percent) of the schools are having 101- 300 students followed by that more than one fourth (26 percent) of the schools are having 501-1000 students. Another one fifth of the schools are having 301-500 students. Only eight percent of the schools are having less than 100 students. About 16 percent of the schools are having more than 1000 students. The table is evident that more than 40 percent of the schools are having above 500 students. Among the surveyed schools majority (93 percent) of schools are coeducation and only three percent of the schools are for boys and four percent of the schools are only for girls.

Majority (62 percent) of the schools covered under this study are government aided schools and 29 percent of schools are only government schools. About nine percent of the schools covered under this study are private school. Among the schools covered under this study, More than two third (67 percent) of the schools are high schools. About 18 percent of the schools are higher secondary schools. Only three percent of the schools are primary schools (Table 2).

Table 2: Student's Classification

No. of Students	Frequency	Percent
101-300	106	29.0
301-500	76	21.0
501-1000	92	26.0
Less than 100	30	8.0
More than 1000	56	16.0
Total	360	100.0

3.1 Student's Classification

One third of the schools are having above 25 teachers and nearly one third (32 percent) of the schools are having 10-15 teachers. About 20 percent of the schools are having 16-20 teachers. About seven percent of the schools are having 21-25 teachers. Only eight percent of the schools are having less than 10 teachers. Majority of the schools are having good number of teachers. More than one third (46 percent) of the teachers average age is 30-40 years which is evident that the middle aged teachers can protect the students from any disasters. Only three percent of the teacher's average age is more than 50 years who can't save the students and they may need help from others to save themselves.

3.2 Students with Disability

The study found that more than one third (34 percent) of the schools are not having any disabled students. More than half of the schools are having 1-5 percent disabled

students and about two percent of the schools are having above 10 percent disabled students. About 66 percent of the schools having disabled students are required to give special focus on disabled students at the time of disaster or emergency for their resilience (Figure 1).

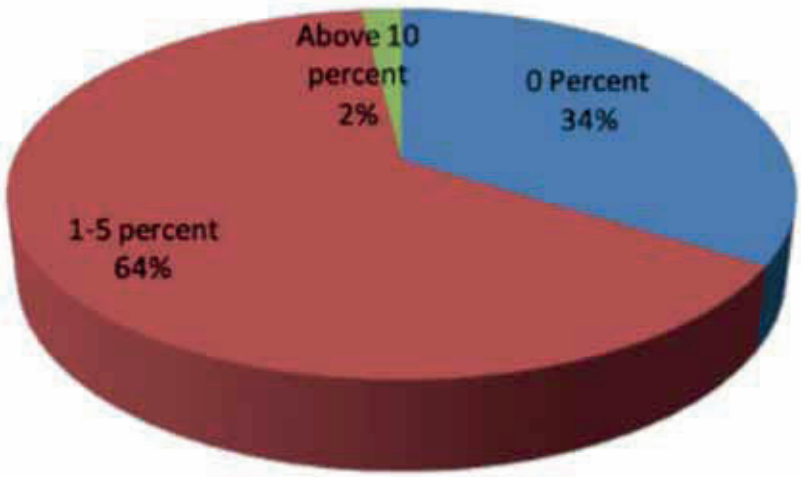

Figure 1: Percentage of Students with Disability

3.3 Availability of Safe Room for the Resilience

The schools are having a greater number of children should have safe rooms to protect the children from any type of emergency or disasters. "A safe room is a location where staff can rapidly seek refuge from a potentially violent person and order building-wide protective actions, such as an emergency lockdown and summon emergency assistance". The study found that about 30 percent of the schools are not having even single safe room in school premises. About 23 percent of the schools are having 1-2 safe rooms and six percent of the schools are having 3-5 safe rooms. Majority (41 percent) of the schools are having more than 5 safe rooms in their school for their resilience.

Table 3: Number of Safe Rooms

No. of Safe Rooms	Frequency	Percent
1-2	82	23.0
3-5	22	6.0
> 5	148	41.0
0	108	30.0
Total	360	100.0

3.4 Perception of Risk

It is observed from the figure 2 that, more than one third (37 percent) of the teachers perceived that fire as immediate risk for their school. About 22 percent of the respondents perceived that earthquake as immediate risk for their school. About 11 percent of the respondent's perceived building collapse as immediate risk for their school. It is assumed that 11 percent of the schools building are not safe. About nine percent of the respondents perceived that food poison as immediate risk followed by about six percent of respondent's perceived flood and landslide as immediate risk respectively. Only eight percent of the respondents perceived epidemic disease as immediate risk. It is observed from the table that all teachers are having perception about risk and proved that all schools are having a perceived risk.

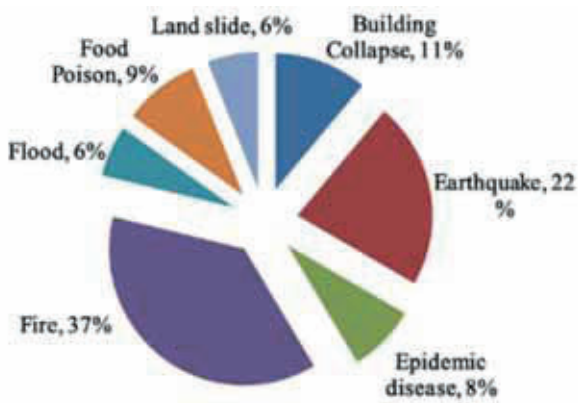

Figure 2: Perception of Immediate Risk

3.5 Most Devastating Disaster

This section analyses the perception of teachers about disaster which has most devastating consequences. Majority (43 percent) of the respondents perceived earthquake as most devastating disaster followed by nearly one fourth (24 percent) of the respondents perceived fire as most devastating disaster. About 12 percent of the respondent's perceived food poison as most devastating disaster. About six percent of the respondents perceived flood, building collapse as most devastating disaster respectively. Only five percent of the respondents perceived epidemic disease as most devastating disaster. Over all it is observed that all the teachers could able to identify the most devastating disaster.

Table 4: Most Devastating Disaster

Type of Risk	Frequency	Percent
Building Collapse	22	6.0
Earthquake	154	43.0
Epidemic Disease	18	5.0
Fire	88	24.0
Flood	22	6.0
Food Poison	42	12.0
Land Slide	14	4.0
Total	360	100.0

3.6 Greater Risk and Preparedness Plan for Resilience

It is observed from the figure 3 that one third (33 percent) of the respondents perceived that earthquake as greater risk to their school but only 27 percent of the schools are having earthquake preparedness plan for the resilience followed by 29 percent of the respondents perceived fire as greater risk and about 58 percent of the schools are having fire preparedness plan. It is observed from chart majority of the schools are having preparedness plan for fire only. About 10 percent of the respondents perceived flood as greater risk and only six percent of the schools are having flood preparedness plan. About eight percent of the people perceived building collapse as greater risk and

only four percent of the schools are having preparedness plan. It is observed from the chart that, all types of risks are prevalent in study area and some schools are having preparedness plan for the resilience. It is a step towards child centric disaster risk reduction and the effort needs to be appreciated. At the same time, other schools also should follow the schools which have preparedness plan to strengthen their resilience.

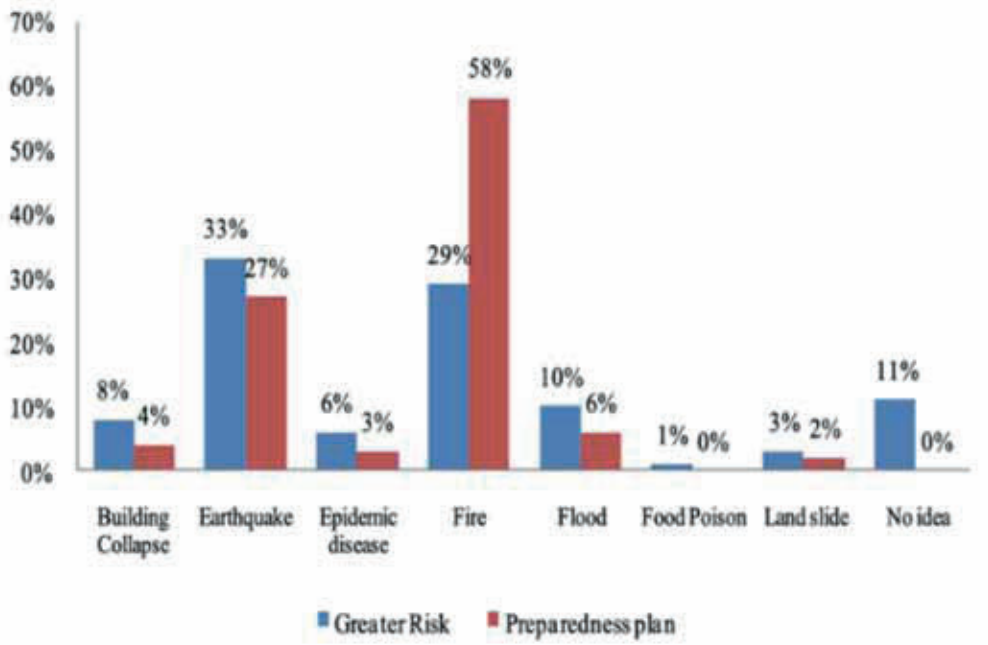

Figure 3: Greater Risk and Plan

3.7 Experience

It is evident from Table 5 that, fortunately majority (77 percent) of the schools have not experienced any type of disasters in past five years. Remaining 23 percent of the schools are experienced any one of the following disasters such as building collapse, earthquake, epidemic disease, fire, flood and food poison. About five percent of schools are experienced fire, flood respectively.

Table 5: Experience of Disasters

Type of Disaster	Frequency	Percent
No	278	77.0
Yes	10	23.0
Total	360	100.0

3.8 Frequency of Disaster Experience

It is revealed from the figure 4 that, 10 percent of schools experienced one time earthquake in past five years and two percent of schools are experienced two times earthquake in past five years. About three percent of schools experienced three times earthquake and followed by only one percent of schools experienced more than five times in past five years. It is evident from chart that the frequency of experience of earthquake is much less.

Seven percent of schools experienced one time fire and one percent of schools experienced three times fire in past five years. About eight percent of schools experienced one time flood and one percent of schools experienced three times flood and four times respectively. Only two percent of schools are experienced more than five times flood. Building collapse is one of the major risks perceived by the teachers and reported that about four percent of schools experienced one time building collapse followed by one percent of schools experienced two times building collapse in past five years.

The five percent of respondents reported that one time their school experienced food poison. Followed by one percent of respondents reported their school experienced more than five times food poison. Food poison is a manmade disaster that is repeated in same schools which needs mechanism to reduce the risk. About eight percent of respondents reported one time they experienced epidemic disease. About five percent of schools experienced three times epidemic disease. Only one percent of schools are experienced epidemic disease more than five times. Five percent of schools experienced one time landslide and one percent of schools experienced three time land slide in past five years. It is observed from the figure that frequency of experience of disaster is high but number of schools experienced is much less.

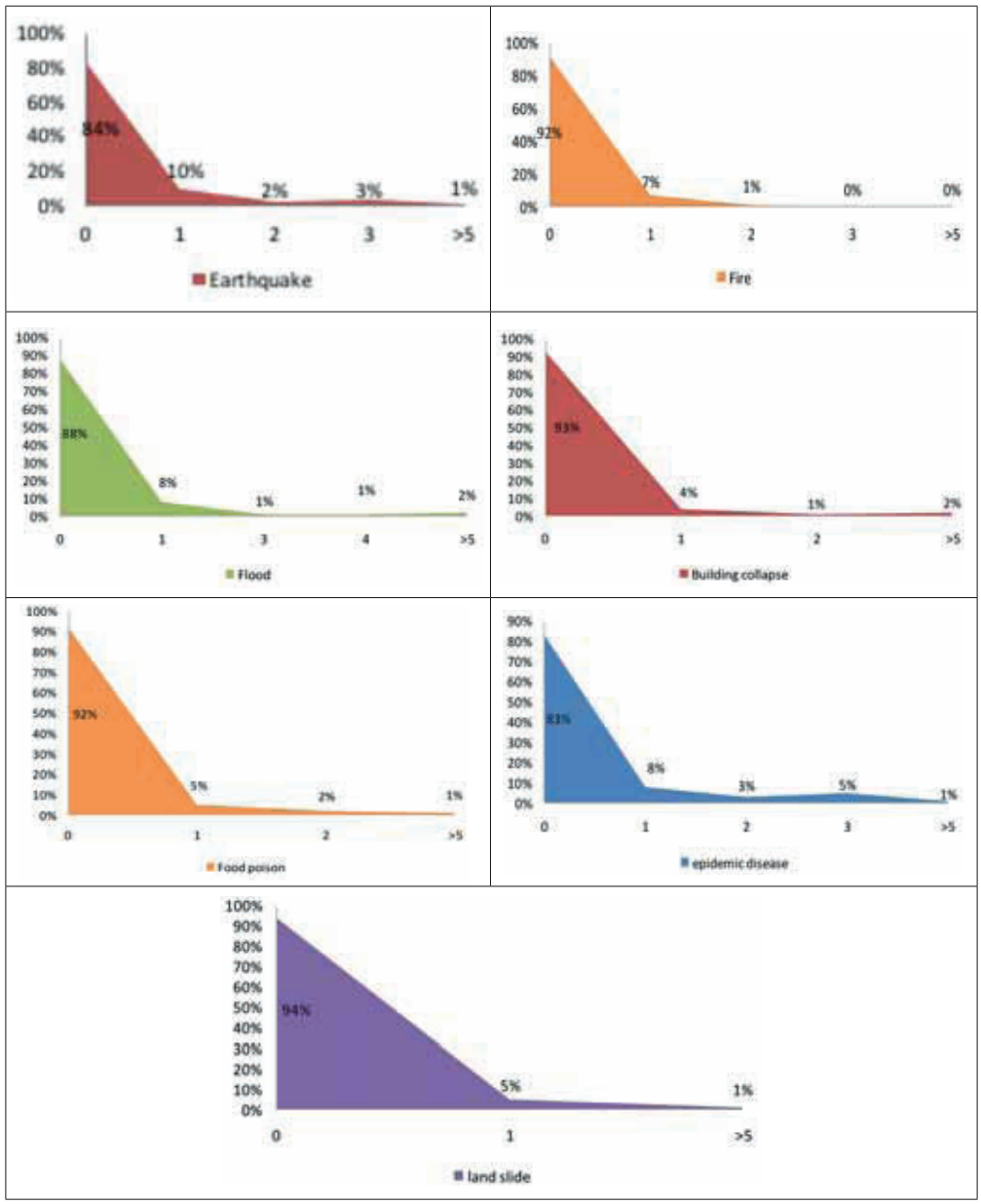

Figure 4: Frequency of Disasters

3.9 Perception of Students on Resilience

It is evident from table 6 that majority (78 percent) of students are agreed they are resilient to any disasters and remaining 22 percent of students are vulnerable. Similarly, about 80 percent of students agreed they are resilient to fire emergency and remaining 20 percent of students are vulnerable. More than half (70 percent) of the students are resilient towards flood disaster followed by only 62 percent of the students said they are resilient to building collapse. More than one third of respondents reported their students aware are resilient to epidemic disease. Less than half (48 percent) of the respondents reported their students resilient towards landslide disaster. It is appreciable that schools in both the state have taken good initiatives to create awareness and strengthen the resilience among the students at the same time about 20 percent of students are said they are not resilient on any disaster which is a most vulnerable group and their capacity needs to be enhanced.

Table 6: Students Perception on Resilience

Types of Disaster	No		Not Sure		Yes		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Earth quake	18	5.0	60	17.0	282	78.0	360	100.0
Fire	28	8.0	44	12.0	288	80.0	360	100.0
Flood	34	9.0	74	21.0	252	70.0	360	100.0
Building Collapse	50	14.0	86	24.0	224	62.0	360	100.0
Epidemic Disease	46	13.0	64	18.0	250	69.0	360	100.0
Land Slide	70	19.0	116	32.0	174	48.0	360	100.0

3.10 Teachers Perception on Resilience

It is evident from Table 7 that majority (86 percent) of teachers said they are resilient to any disaster and remaining 14 percent of them are not agreed. Similarly, about 88 percent of teachers and staffs said their school is resilient to fire emergency and remaining 12 percent not agreed. More than half (74 percent) of the teachers said their school is resilient to flood disaster followed by only 76 percent of the teachers said their school is resilient on building collapse. More than three fourth of teachers said their school is resilient to landslide. Nearly three fourth (73 percent) of teachers said their school is resilient to manage epidemic disease. It is appreciable that both the state has taken good initiatives to strengthen the school resilience. At the same time, about 10 percent of teachers are not agreed that their school is resilient to any disaster.

Table 7: Teachers Perception on School Resilience

Types of Disaster	No		Not Sure		Yes		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Earth quake	6	2.0	46	13.0	308	86.0	360	100.0
Fire	12	3.0	30	8.0	318	88.0	360	100.0
Flood	28	8.0	66	18.0	266	74.0	360	100.0
Building Collapse	24	7.0	62	17.0	274	76.0	360	100.0
Epidemic Disease	44	12.0	52	14.0	264	73.0	360	100.0
Land Slide	24	7.0	12	3.0	324	90.0	360	100.0

3.11 Conduct of Safety Drills to Strengthen Student's Resilience

It is revealed from the figure 5 that 16 percent of the schools never conduct the safety drill being located in earthquake seismic zone III and experienced disasters many times. About 43 percent of schools are conducting safety drills once in a year which will not help the students at all. About 60 percent of schools are not concern on safety drills. About 11 percent of schools once in a month, 20 percent of schools once in a quarter and 11 percent of schools once in six months only conducting safety drills to strengthen

the resilience of school children. As per NDMA guidelines, once in a week, the schools are supposed to conduct safety drill but schools are not conducting.

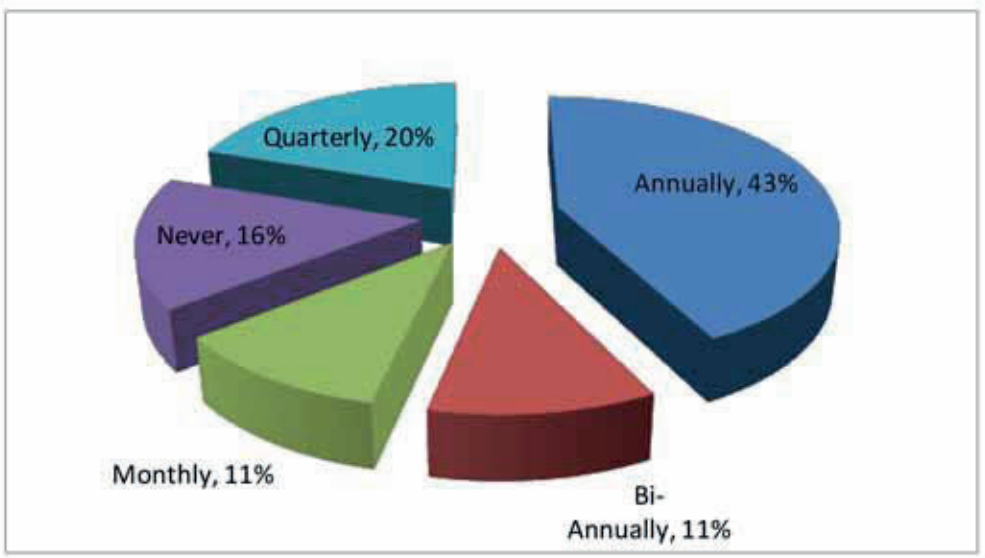

Figure 5: Conduct of Safety Drills

3.12 Constraints for Safety Drills

It is revealed from the Table 8 that majority (60 percent) of the schools reported that lack of expertise is constrain for conducting safety drills followed by 18 percent of the schools reported that lack of manpower is a constrain to conduct safety drills. About 14 percent of schools reported manpower is constrain to conduct the safety drill. Only 8 percent of the schools reported that budget is constrained for conducting safety drill. State Disaster Management Authority should take necessary steps to solve the issue of expertise, budget and manpower to ensure regular conduct of safety drills for strengthening school resilience .

Table 8: Constraint for Conduct of Safety Drill

Constraints	Frequency	Percent
Budget	4	8.0%
Expertise	34	60.0%
Manpower	10	18.0%
Time	8	14.0%
Total	360	100.0%

3.13 Disaster Management Plan

It is revealed from the figure 6 that, majority (48 percent) of school disaster management plan is good. Only five percent of schools having very good disaster management plans. One third of schools disaster management plan is fair. About six percent of schools disaster management plan is weak and seven percent of schools disaster management plan document does not exist. It is observed from the figure that half the schools disaster management plan is not good where intervention is required.

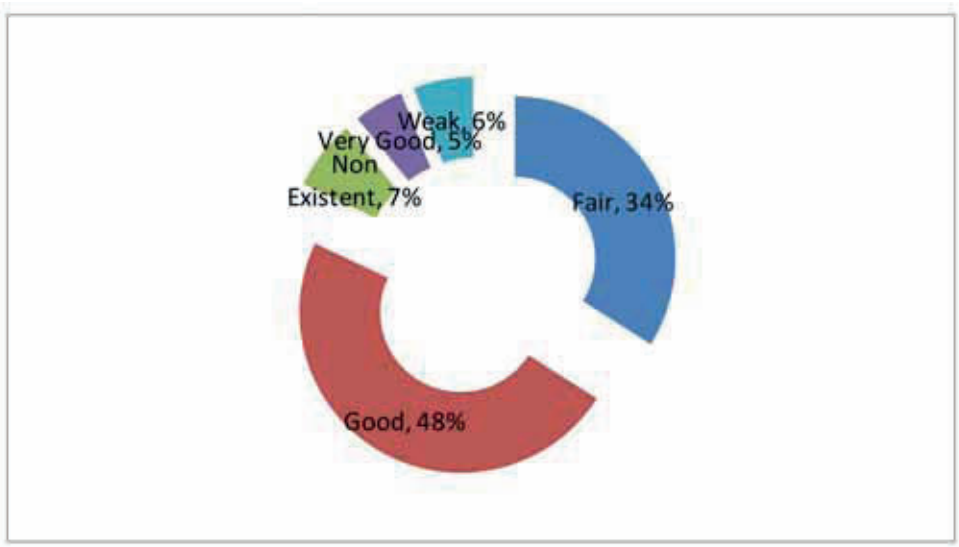

Figure 6: Status of Disaster Management Plan

It is apparent from the Table-9, that nearly three fourth (74 percent) of the respondents reported their staff should undergo disaster management training. The SDMA and training institutes should take necessary steps to train the teachers to strengthen school resilience. One fourth (27 percent) of the schools have allocated budget for disaster/ emergency planning which is a good intervention by the schools. Allocated budget should be used effectively. Only 56 percent of the respondents reported that their school disaster management plan considered students with disabilities. The remaining schools should give special focus on students with disability. More than half (62 percent) of the respondents reported that their school needs to conduct different safety drills for different disasters. Overall there is a demand for training, sensitization on disability inclusive disaster risk reduction, and conduct of safety drills. SDRF and DMA should take this opportunity to strengthen the school's resilience.

Table 9: Needs of the School

Types of Disaster	No		Not Sure		Yes		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Training	78	22.0	16	4.0	266	74.0	360	100.0
Budget for Plan	220	61.0	44	12.0	96	27.0	360	100.0
Consier Disabled	116	32.0	44	12.0	200	56.0	360	100.0
Conduct of Different Drill for Disaster	112	31.0	26	7.0	222	62.0	360	100.0

3.14 Association of Selected Independent Variables with the Disaster Management Plan

3.14.1 State

The table depicts that the calculated chi square value (17.600) is higher than the tabulated value leading to a null hypothesis. "There is no association between state and Disaster management plan is rejected". It means that there is a significant association between states and disaster management plans.

3.14.2 Location of School

The table reveals that the calculated chi square value (47.395) is higher than the tabulated value leading a null hypothesis. "There is no association between location of schools and disaster management plan is rejected". It means that there is a significant association between location and disaster management plans.

Table 10: Association of Selected Independent Variables with the School Resilience

S. No.	Independent Variables	Chi-square (X^2)
1	State	17.600
2	Location of School	47.395**
3	Number of Students	69.345**
4	Ownership of School	13.819
5	Type of School	31.372
6	Percent of Students with Disability	71.646**
7	Greater Risk of Schools	103.25**
** Correlation is significant at the 0.01 level of probability * Correlation is significant at the 0.05 level of probability		

3.14.3 Number of Students

The table reveals that the calculated chi square value (69.345) is higher than the tabulated value leading a null hypothesis. "There is no association between number of students and school resilience is rejected". It means that there is a significant association between number of students and school resilience.

3.14.4 Ownership of School

It is evident that the calculated chi square value (13.819) is lesser than the tabulated value leading a null hypothesis. “There is no association between the ownership of school and school resilience is accepted.” It means that there is no association between the ownership of school and school resilience.

3.14.5 Students with Disability

The table reveals that the calculated chi square value (71.646) is higher than the tabulated value leading a null hypothesis. “There is no association between percent of students with disability and school resilience is rejected”. It means that there is a significant association between percent of students with disabilities and school resilience.

3.14.6 Greater Risk

The table reveals that the calculated chi square value (103.25) is higher than the tabulated value leading a null hypothesis. “There is no association between greater risk of schools and school resilience is rejected”. It means that there is a significant association between greater risk of schools and school resilience.

4. Conclusion

Schools in Goa and Maharashtra have taken a good effort towards school resilience in terms of disaster/emergency plan, awareness among students on do’s and don’ts and awareness among teachers, conducting safety drill and doing their level best. At the same time, one fifth of the schools are weak in disaster management plan and lack of awareness among students so the teachers needs to give importance to strengthen the resilience among the students . The schools also mentioned their constrains on conducting safety drill such as lack of budget, lack of expertise and lack of time. The SDMA, NDRF and SDRF have a greater role to build the capacity of those vulnerable schools.

Acknowledgement

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Impact of Drought at Household Level: Field Observations from Aspirational District of Karnataka – Yadgir

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Abstract

About 60 percent of agriculture in Karnataka state is rainfed and thus prone to successive droughts, affecting various aspects of quality of life. There are studies on drought impacts on development, but a few of them have examined its impacts at the household level, for instance on income, nutrition, water, sanitation, health, education etc. This study was undertaken to find out the impacts at the household level and presents the findings, based on a survey of 120 households in 30 villages of Yadgir district (during Feb- April 2019). Yadgir, a northern district of Karnataka was chosen as it is prone to frequent droughts and as a consequent result, has a lower Human Development Index (HDI) than the average HDI of the State. Random selection of households based on their vulnerability to droughts (dependence on agriculture and economic status) was made. Research tools like Checklists, Questionnaires, Focus Group Discussions, Key Informant Interactions were employed to collect the information on the impact of drought. Results have indicated that present drought specific interventions by the State, for instance, Input-Subsidy, increased work-days in Rural Employment Guarantee Scheme etc have helped the community in overcoming drought in that particular year, but not in their coping capacity. On the other hand, measures, such as Integrated Child Development Services (ICDS) were found to have a significant impact.

***Keywords**: Yadgir District, Karnataka, Drought and its Management, Socio-economic Impacts, State Interventions*

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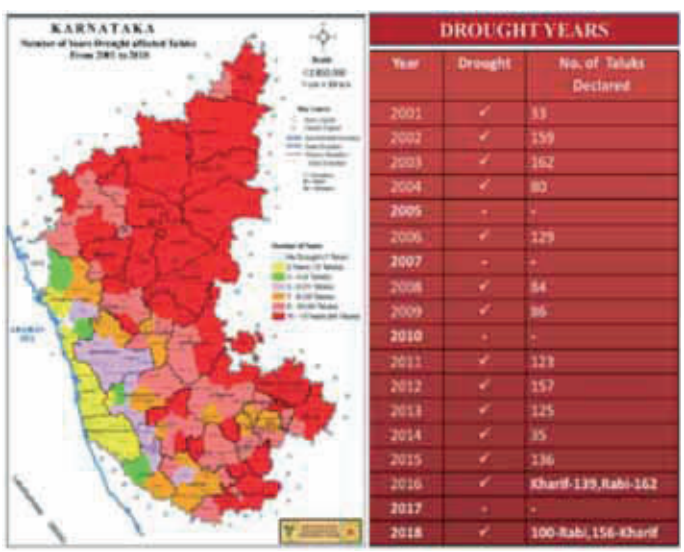
1. Introduction

Karnataka state with an area of 19.1 M ha accounts for 5.8 percent of the total area and 5.05 per cent of the total population of the country, consisting of four major regions namely 1) North Interior Karnataka, 2) South Interior Karnataka, 3) Malnad region and 4) Coastal region. Administratively, it is divided into 30 districts and 176 Taluks, home to 61.5 million people (2011 Census), with a decadal growth rate of 15.7 percent. The State is prone to different natural disasters like droughts, floods, cyclones, hailstorms, landslides earthquakes, etc., but drought is found to cause maximum damage and also impacts large geographical areas within the State. The extent of the affected area, loss of property and socio-economic losses due to different disasters in the State are in the order: Droughts > Floods > Hailstorms > Cyclones > Landslides > Earthquakes (KSDMA, 2016). Nearly 80 percent of blocks in the State are drought-prone. The recurring water scarcities, as Grey (2007) has presented, would impact economic growth and human development and increase the vulnerability of the community. According to the Ministry of Agriculture and Farmers Welfare (MoAFC&W), 16 districts of the state, mostly from North Interior Karnataka, have experienced drought for a period of 10 years during the last 15 years (2001 to 2015).



DROUGHT YEARS		
Year	Drought	No. of Taluks Declared
2001	✓	33
2002	✓	159
2003	✓	162
2004	✓	80
2005	-	-
2006	✓	129
2007	-	-
2008	✓	84
2009	✓	86
2010	-	-
2011	✓	123
2012	✓	157
2013	✓	125
2014	✓	35
2015	✓	136
2016	✓	Kharif-139,Rabi-162
2017	-	-
2018	✓	100-Rabi,156-Kharif

Figure 1: Drought Vulnerability Details (Source: KSNDMC)

Drought, though is a slow creeping disaster, once sets in, is likely to hurt the village economy and the degree of impact depends on the severity of the drought. In rainfed regions, drought may have long-lasting impacts as compared to irrigated regions. For instance, in rainfed regions, if the rains are delayed, those crops with short sowing window may other crops. In such eventuality, the farmer has to arrange for an alternate cropping pattern for instance seed etc. Similarly, any significant deviations even in the number of rainy days or amount of rainfall may have an impact on the crop yield and also on the intensity of farm operations and demand for agricultural labour and ultimately may have an impact at household levels.

Seventh Finance Commission (1980-85), based on the speed of the different disasters, i.e., between rapid (floods, cyclones) and slow (drought) onset disasters, has recommended that in the event of slow-onset disasters like drought, the expenditure of a State, even if it is over and above the margin money, has to be funded out of the contribution from the plan outlay of that State only (Lenin Babu 2019). On the other hand, the adverse impacts of this creeping disaster - drought are many folds (Joshi 2019). Directly, it causes crop loss, scarcity of drinking water, fodder and unemployment in the farm sector. These issues generally are addressed by the State to some extent through Input Subsidy, extending the number of days under Rural Employment Guarantee Scheme etc. At the same time, drought has several indirect impacts as well. For instance, inadequacies in water, sanitation and health (WASH)malnutrition among children and women, higher infant and maternal mortality, high incidence of childhood diseases, school dropouts etc (UNICEF 2016). These indirect impacts are largely ignored but, they tend to have a negative influence on Human Development Index (HDI) (Shivashankar and Ganesh Prasad, 2015; PPMSD 2014, Amarasinghe et al 2020) The Impacts of drought on HDI can be observed as the majority of the North Interior Karnataka districts, that are prone to drought have lower HDI in comparison with other regions of the state (Table 1) Two districts viz., Raichur and Yadgir, which are most vulnerable to droughts have been, are already been categorized as Aspirational Districts by the NitiAayog(NITI 2018 a & b).Though significant research efforts are made into the drought risk reduction measures. The impact of drought on households that are primarily dependent on agriculture has not drawn much attention and therefore, this study.

Table 1: Comparison of Human Development Index in Various Districts

	Human Development Index	Year 2001		Year 1991	
		Value	Rank	Value	Rank
1	Bagalkot	0.591	22	0.505	20
2	Bangalore Rural	0.653	6	0.539	11
3	Bangalore Urban	0.753	1	0.623	4
4	Belgaum	0.648	8	0.545	9
5	Bellary	0.617	18	0.512	18
6	Bidar	0.599	21	0.496	23
7	Bijapur	0.589	23	0.504	21
8	Chamarajnagar	0.576	25	0.488	24
9	Chikmaglur	0.647	9	0.559	7
10	Chitradurga	0.627	16	0.535	13
11	Dakshina Kannada	0.722	2	0.661	1
12	Davangere	0.635	12	0.548	8
13	Dharwad	0.642	10	0.539	10
14	Gadag	0.634	13	0.516	17
15	Gulbarga	0.564	26	0.453	25
16	Hassan	0.639	11	0.519	16
17	Haveri	0.603	20	0.496	22
18	Kodagu	0.697	4	0.623	3
19	Kolar	0.625	17	0.522	15
20	Koppal	0.582	24	0.446	26
21	Mandya	0.609	19	0.511	19
22	Mysore	0.631	14	0.524	14
23	Raichur	0.547	27	0.443	27
24	Shimoga	0.673	5	0.584	5
25	Tumkur	0.630	15	0.539	12
26	Udupi	0.714	3	0.659	2
27	Uttara Kannada	0.653	7	0.567	6
Karnataka		0.650		0.541	

Note: Shaded districts are in North Interior Karnataka and prone to drought
(Source: Compiled from HDI Reports of Districts, published by Planning Dept, GoK)

1.1 Research Objectives

Such a causal linkage between drought and HDI needs a detailed probe. Therefore, this study in the drought-prone district was undertaken to assess the impacts of drought at the household level on various aspects. The focus of the study was more on access to basic services and coping mechanisms at the household level, viz., –income, health, nutrition, education etc. The purpose of the study is to provide insights for concerned stakeholders to devise strategies to help affected community for an effective recovery, mitigation measures and intervention for achieving long-term disaster resilience.

2. Description of Study Area

Yadgir district in the northern part of Karnataka between 16º 11' – 16 º 50' N. latitudes and 76 º 17' - 77 º 28' E. longitudes, has a geographical area of 5234.4 sq. Km (Fig 2). It is predominantly an agricultural district divided into two agro-climatic zones namely eastern transition and northeastern dry zone, indicating the dependence on rain. Though the river Bhima passes through the district, it does not contribute much to the irrigation within the district. However, a distribution canal from Krishna River irrigates two taluks of the district, viz. Surapura and Shahpur. Traditional wisdom has created water storage structures –tanks, to collect and store the run-off. But with advent of modern technologies like bore well, these tanks systems were ignored and were not maintained. According to the Drought Vulnerability Composite Index (DVI) based on the four indices (CI, CSI, CCI and LI), about 33 percent under Class 4 of DVI and 67 per cent under very highly vulnerable class 5. The Normal rainfall of the district is 699 mm but, from the year 2000, the district had drought conditions for 14 years. This factor has its impact on socio-economic conditions with the highest out-migration to Bengaluru, Pune, Sholapur and Hyderabad. The literacy rate is 51.8 percent while female literacy is at 41.8 per cent with 23.2 percent of Scheduled castes and 12.5 percent of Scheduled Tribes (Yadgir District At Glance 2019). Of the three taluks in the district, viz., Shorapur, Shahpur and Yadgir, Yadgirtalukhas the lowest, 30 villages were selected from Yadgir taluk (Yadgir District At Glance 2019).

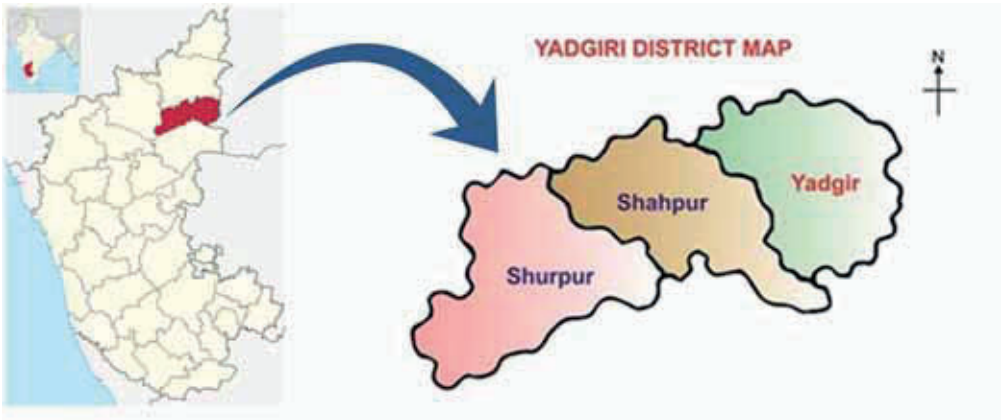


Figure 2: Study Area

2.1 Methodology Adopted

Subscribing to the fact that vulnerability is directly influenced by economic status, a random selection of household was made based on the economic status. Indicators such as landless households, marginal and small farmers in the village were considered for the selection of households. Such households were identified with the help of personnel of Anganwadi Centers. To the extent possible, efforts were made to elicit responses from a female member of the household as they are the first respondents to any drop in income and are more affected. 30 villages were selected across the Yadgir taluk and in each village, seven schedules were used to collect information on vulnerability and coping measures and details are given in Table 2. The fieldwork was conducted during March-April 2019.

Table 2: Research Tools Employed

Sl.	Schedule/ Checklist	Information Sought	Mode of Information Collection	Total Number
1	Village Information	Physical and Social Infrastructure of Village	FGD and Key Informant Interaction	30 Villages
2	Anganwadi Center Information	Details of ICDS Services Provided and Beneficiaries	Questionnaire	30 Anganwadi Centers
3	School Information	Availability of Water for Drinking and Sanitation Purposes	Questionnaire	30 Schools
4	Household Information	Impact of Drought on Children	Questionnaire	30 Households
		Impact of Drought on Adolescent Girls	Questionnaire	30 Households
		Impact of Drought on Pregnant Women	Questionnaire	30 Households
		Impact of Drought on Lactating Women	Questionnaire	30 Households
		Total Schedules		210

3. Results

Along with other damages, disasters tend to damage the livelihood support base of the ecosystem. Such damages may reduce the coping capacity of the affected community and increase their vulnerability. Hence, more attention was given to the details of the livelihood support base in the sampled villages, i.e., agriculture. As drought has a direct influence on agriculture, on the yield and farm employment. It also has a tangible influence on animal husbandry, these three issues were probed in detail.

3.1 Drought and Livelihood

In all 30 villages, agriculture is the mainstay of activities. Out of the total 120 households interviewed, 93 households have owned agricultural land while 27 families do not own agricultural land. Out of the landowning households, about 48 households have owned irrigated land and about 45 households own rainfed land only. Approximately

11 households own both irrigated and rainfed lands. The Average landholding in case of the irrigated lands was 1.15 acres and for rainfed land, it was 1.36 acres. The highest rainfed landholding was recorded in village Alipur with 10 acres. For irrigated land, highest landholding at 6 acres was recorded in the village Vagalapura, indicating the vulnerability of the farming community. In addition to their own cultivation, all households engage themselves as farm labour as well. Agriculture is the primary livelihood for the majority of households (75%). During normal monsoon years, respondents opined that, agriculture provides gainful employment from two to ten months and is a significant source of household income. However, during the poor monsoon (drought years), employment potential drops drastically and forcing them to seek livelihood options elsewhere like textiles industries in Sholapur or construction sector in Bengaluru city or other urban centres(Table 3).

Table 3: Contribution of Agriculture to Family Income

Per cent of Contribution	**Number of Families (%)**
0 to 30	28
31 to 60	42
More than 60	30
Gainful Employment from Farm Operations during Normal Year	
% of Households	**Gainful Employment in Months**
5	0
40	6
42	10

(Source: Primary Survey)

In terms of monthly income, about 13 households, the average monthly household income was up to Rs. 3000. For 55 households, average monthly income reported being between 3000 to 5000. For 10 households, the average monthly income is more than Rs. 5000. The average monthly income of all households of the survey was Rs. 4600/- About 40 households have declined to divulge the income details.

3.1.1 Yield Reduction

Due to the drought, it was observed during the study that both irrigated and rainfed field was affected. In the case of the former, it was due to inadequacy of water for irrigation and in the latter case, it was on account of the uneven distribution of rainfall, resulting in damage to standing crop during the onset of the inflorescence. This resulted in significant yield reduction, more than half of the normal yield, and in turn, reduction of farm income. Ramasamudra, Malappanahalli, Jinikere, Kaulur are some of the villages that have registered higher yield losses in farm production. Bandalli, Bachivara villages have reported a moderate reduction in farm production due to the drought and households in Bachivaratanda have reported a lower quantum of yield reduction due to drought. Overall survey results indicate that there has been a reduction in farm yield up to 51 percent (Table 4).

Table 4: Reduction in Agricultural Yield Due to Drought

Per cent of Households	Per cent Reduction in Agricultural Yield
13	Upto 30
47	30 – 60
24	More than 60
15	No Impact

(Source: Primary Survey)

3.1.2 Reduced Demand for Farm Labour

For landless and marginal farmers, farm labour is an important source of income. Drought has a direct and negative impact on demand for farm employment. The drought resulted in subdued farm activities and so was the demand for farm labour. This has resulted in the shrinking of the livelihood support base of landless and marginal farmers. An attempt is made to estimate the extent of the drop in farm labour (Table 5). For more than 60 percent of households, the loss of income due to drought was about 60 percent.

Table 5: Impact of Drought on Farm Labour Demand

Number of Households (%)	A Decline in Income (%)
27	Upto 30
55	30 – 60
15	More than 60
3	No impact

(Source: Survey)

3.1.3 Animal Husbandry

Traditionally, animal husbandry is an integral part of the farming system in India. Crop residue, for instance, rice straw or maize stalks etc, serve as fodder to livestock and in turn livestock providing manure, traction power and dairy products such as milk, meat etc. Livestock owning pattern and impact of drought on the livestock was collected during the study and details are as follows.

Mulch Animals: About 40 percent of households reported to own livestock. On an average, each of these households own about 3 animals each. Out of the livestock families owning households, 71 percent own cows/buffalos and milk is consumed at household levels (25nos). About 10 households reported that they sell milk to the market also. Preferred feeding practices for livestock is stall feeding for oxen/bullocks and grazing in common property resources (CPR) for cows/ buffalos and Goat, Sheep. It was opined by respondents that even before the drought was declared by the government, livestock faces problems due to shortages of water and fodder. But, only a minuscule portion of households (only 2 out of 49 households) have made use of the 'Goshala' (Cattle camps) and fodder banks established by the Department of Animal Husbandry. Primary reason quoted for this was their location of or the logistical problems. For about 95 percent of the households, help from friends/relatives to purchase fodder to tide over the drought was a primary coping measure. Similar responses were recorded from sheep and goat farming households.

Thus, drought has affected both primary and supplementary sources of livelihood, viz., a) farm yield, b) farm labour and c) livestock. In addition, it has impacts on social capital as described in the following sections.

3.2 Effect on Social Aspects

During the Interaction with 120 households, an assessment was made with reference to their social environment and how the drought has affected it. Each household was requested to share their personal experiences of drought with reference to their day to day life, for instance, prioritisation, resilience, coping mechanisms adopted etc. For 12 percent of households, the impact of drought was minimal as they draw their sustenance from the organized sector. About 61 percent of households expressed that they are forced to reprioritise due to drought. For about 27 percent of households, drought has forced them to alter plans of asset procurement and/or postpone events.

3.2.1 Impact of Drought on Food Basket

Drought induces changes in food basket due to a) reduced household income and also b) non-availability of certain farm products. In about 49 percent of households, number and quantity of animal protein were intentionally reduced, and for 26 percent of households, the impacts were moderate as they have reduced the consumption of animal protein and also lentils. For 16 percent of households, the food basket has significantly reduced to cut the costs. For two percent of households, the changes were extreme (Table 6). Despite awareness about the adverse impacts of malnourishment, the survey indicated that households were helpless.

Table 6: Impact of Drought on Food Basket

% of Households	Forced Food Basket Change
7	No Change
49	Nominal Change
26	Moderate
16	Significant
2	Extreme level

(Source: Primary Survey)

3.2.2 Drought and Water

Yadgir region was prone to droughts and to overcome drought and drought-like situations, in the traditional wisdom,emphasis was given to the construction of surface

water storage bodies. Over the years, these traditional water harvesting systems have deteriorated as borewells became primary sources even for day to day water requirement. Point of water collection was a public point with less than two percent of respondents have a private water supply. Every year during summer months, water supply through tankers is required in a few villages, viz., Ramasamudra, Jenikere, Kaulur, Nagalapura, and Venketashapura villages, constituting about 12 percent of respondents. In a drought year, Potable Water Supply System ((PWS) was able to meet cater to the water demand for only 40 percent of respondents and for about 60 percent of respondents, water supply through Tankers by the district administration is the only source. The uncertainty of tanker timings interferes with several other activities and inadequate water supply forces compromises with personal hygiene. Results indicate that every household faces water shortage of about 31 percent (about 100 l shortage per day) (Table 7), forcing them to collect water from far off borewells or wait a long time for the water tankers.

Table 7: Water Demand and Availability Details

	Normal Year	Drought Year
Average Water Requirement for Domestic Purpostes (l/day)	440	380
The Average Amount of Water Available (l/day)	350	260
% of the Inadequacy of Water	18	31
% of Intentional Reduction in Water Demand During a Drought Year		20

(Source: Survey)

Implications of the Inadequacy of Water: About 45 per cent of households have compromised with poor quality of water. Regarding the changes in quality of water, 54 percent of households felt there was a marginal change in the quality of water during a drought year, 39 percent felt that they experience a considerable change in water quality during a drought year, but for six percent, significant change is the norm.

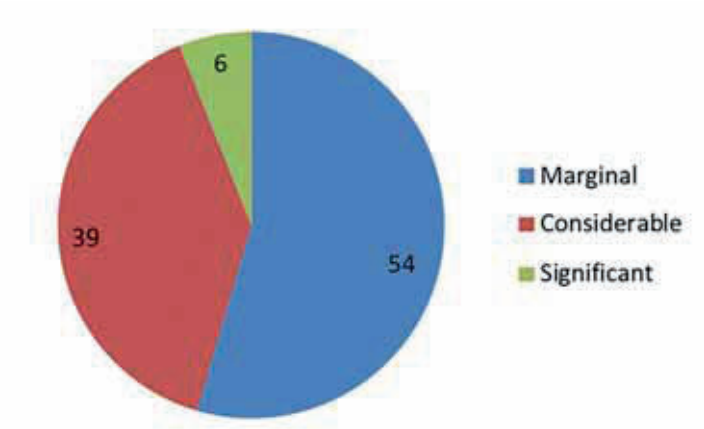


Figure 3: Deterioration in Water quality (% of Households)

About 50 percent of households have indicated that they have spent additional money on the water during the drought years on one hand and reduced consumption on the other. About 35 percent of households took the help of their children, particularly, a girl child in fetching water for domestic purposes. Petty clashes, according to 76 percent of respondents, were common during the collection of water. Another significant impact of water shortage was observed in the form of reversal to Open Defecation Practice.

3.3 Drought and Health

As mentioned in earlier sections, in the sampled population, landholding is low and agricultural labour is a major source of income. Drought conditions have resulted in a significant reduction in demand for agri-labour which has resulted in reduced household income of agricultural labour. Assuming a direct relationship between reduced income and food consumption and health, enquiries were made to understand the impact of drought on household nutrition.

3.3.1 Drought and Nutrition

Regarding our enquiries about hunger and any member of household forced to remain hungry, 29 percent of households preferred not to reply while 43 percent of households opined that it was not an issue. But 27 percent of households, replied that there were instances that a member or two of the family slept with hunger due to inability to

find employment to generate resources. Households from Mandargi, Gowdagere, KanchagaranalliTandavillageshave reported such instances. Drought conditions are known to affect the quantity and quality of farm products like vegetables and tend to influence the availability as well as the prices. To capture consumption changes induced by drought, respondents were asked about changes in their food basket influenced by drought conditions. Only 46 households have replied to quarry and 23 percent of households have reported some changes in their food basket, primarily as a means to cut down expenses. Respondents from Ramasamudra, Kaulur and Vadnalli reported significant changes in their food basket. Enquiries were made about the impact of the drought on diet provided to children. Household members have accepted that drought has resulted in decreased feeding to the children. Measures to tide over the drought conditions varied from shift to cheaper food items, reducing the quantity of food intake, taking loans from friends and relatives etc (Table 8). Taking loans to purchase food grains was adopted by a maximum number of households (88%).On the other hand, about 82 percent of households have mentioned that migration to urban centres for unskilled work offers an attractive alternative route to escape from the drought conditions. Only 17 percent of households have felt that migration is not an answer to the drought. Bengaluru remained the most preferred place of migration followed by Mumbai. Hyderabad was the least preferred.

Table 8: Measures Adopted to Overcome Drought and Malnutrition

Sl. No.	A shift to less preferred and less priced food items	Reduction both in quantity and number of meals	Procuring foodgrains on loan from friends/ relatives	Consumption of seed materials	Taking loans to procure food grains	Distress sale of livestock, household items etc	Dependence on Mid Meal Scheme for children	AWC support for mother
No of Households	54	42	97	97	105	96	62	48
Percent of Households	45	35	81	81	88	80	52	40

Respondents were asked to their opinion on the efficacy of the various measures undertaken by the government to mitigate the drought. Afforestation program was

in general and more specifically in common property resources were suggested as measures to provide good impacts. It was followed by measures such as agro-forestry and shift to less water demanding crops (Table 9).

Table 9: Opinion of Respondents to Prevent/Mitigate Drought

Sl. No.	Afforestation	Agroforestry	Aforestration in Common Property Resources	Optimum use of Groundwater	Shift to Less Water Demanding Crops	Changes in Copping Pattern
No of Households	73	67	69	63	64	58
% of Households	61	56	58	53	53	48

About the benefits taken from the Anganwadi Centers (AWC), Health Referral Services and healthcheck-up services were availed by most of the respondents (85 and 84 percent respectively), About 83 percent of households availed the nutritious food from AWC. Children from 66 percent of households were sent to Pre-school Education by AWC. About 10 households were covered under the Bhagyalakshmi Stcheme.

Table 10: Benefits Availed by Members of Household

Sl. No.	Nutritious Food	Immunisation	Health Checkup*	Health Referral	Pre-school Education	Bhagyalakshmi
No of Households	99	79	101	102	79	12
% of Households	83	66	84	85	66	10

*From AWC

3.4 Drought and Pre-School Education

Before a child can be sent to school, the child should be school-ready. School readiness has three dimensions, viz., a) Child Readiness (help children to be ready to get exposed to the school environment, b) School Readiness: (focusing on the school environment along with practices that foster and support a smooth transition for children into primary school and advance and promote the learning of all children, and c) Family Readiness (focusing on parental and caregiver attitudes and involvement in their children's early learning and development and transition to school) (UNICEF, 2019) and this survey has looked into these factors as well. The smooth and efficient functioning of the AWC is the result of several factors, such as water, playground, space for preparation of food, WASH facilities etc. A survey of 30 AWC was made to assess the status of these facilities available.

3.4.1 Water

Adequate quantity of water supply is essential for everyday operations of AWC. Water is required for the drinking purposes of children, preparation of food and also for the WASH activities. Survey results suggest water supply is a concern in the majority of AWC that operate from private buildings and intensifies during summer months and drought years. For those AWCs that are operating from school premises or in close proximity, water is procured from the water source of the school itself and hence, water procurement is not a concern. On the other hand, AWC functioning away from the school premise have to depend on other sources of water, i.e., Potable Water Supply system. Due to limited supply in PWS, water has to be collected at a particular time and store in AWC. For some AWCs, it was observed that the tap connection is more than 300m away, resulting in hardship in collecting the water (Figure 4). This, in turn, found to result in discouraging children to use water, affecting WASH activities. Water storage is also a concern for those AWCs which collect water either from PWS or borewell. It was observed during the survey that with little more care, the quality of potable water can be maintained throughout the day.

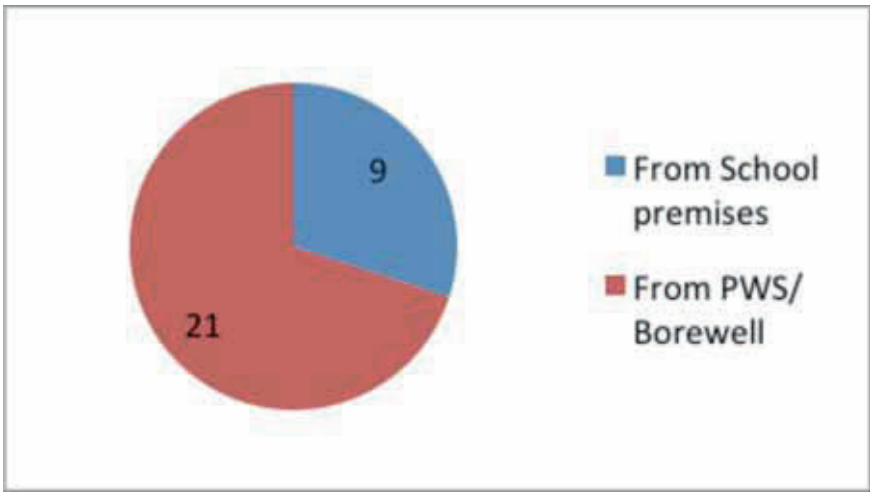


Figure 4: Water Source for AWC

4. Coping Measures

Coping Measures adopted for overcoming the drought varied from consuming less food to shift to low-cost food items to considering the distress sale of livestock to exploring the child employment. Most of the households have adopted to reduce the expenditure to tide over the drought and shifting to low-cost food items found to most often resort measure. However, this solution appears to be the source of several other problems and beginning of deepening crisis (Figure 5).

4.1 Seeking Help from Government

53 percent of household expressed willingness to register with the government for drought relief and participate in MGNREGA activities. However, 31 percent of respondents were against this idea and wanted to resolve problems on their own. About 34 percent of households took financial help from friends/ relatives while all others have taken a loan from individuals with interest.

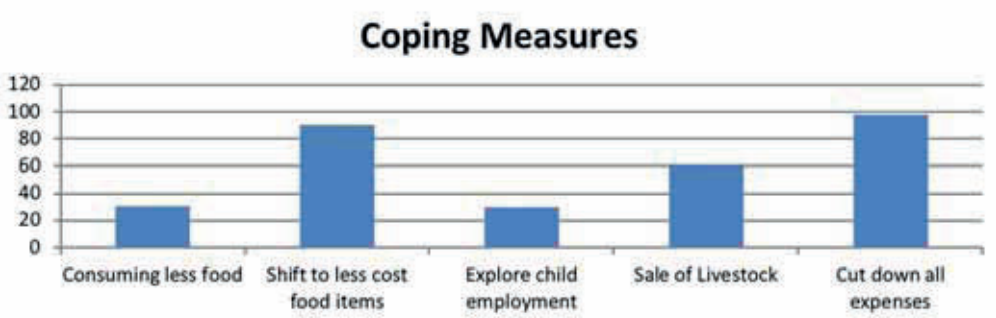


Figure 5: Coping Measures Considered by Households (in %)

4.2 Efficacy of Drought Proofing Measures

During the survey, respondents were requested to provide their opinion about the efficacy of drought-proofing measures implemented by the government such as desiltation of tanks, water supply through tankers etc. Among various measures, new borewells in water-scarce villages were appreciated by maximum respondents (98%). It was followed by the tank desiltation measures (89%) and water supply through tankers was welcomed by 82 percent of respondents. Agricultural extension services were appreciated by only 46 percent of respondents. There were some respondents opined that desiltation measures are very beneficial, but their efficacy to deal with drought conditions is limited due to a) limited area of tanks influence and b) lack of appropriate means to harvest groundwater with farmers, belonging mostly to marginal and small farmer category (Table 11).

Table 11: Perceptions on the Efficacy of Drought Proofing Measures (in %)

Measure	Effective	Not so Effective
Tank Desiltation	89	11
Water Supply through Tankers	82	18
New Borewells in Water-scarce Regions	98	0
Agricultural Extension Services	46	54
Input Subsidy	55	45

(Source: Survey)

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4.4 Recommended Future Research

This research, based on the survey of 120 households in Yadgir district, finds that drought has very adverse impact lower income sections of society as they are most vulnerable with lower levels of resilience. As majority of area comes under rainfed cultivation system and drought conditions being inevitable part of climate changes, most suitable adaptations would to develop coping measures either in terms of changes in cropping pattern or in terms of diversification of livelihood. Again, the regional conditions vary significantly and therefore, future research may focus on these two specific aspects, but with focus on local, if possible, or regional conditions.

5. Conclusion

Yadgir district is known for its Red Gram and Jowar crops but persistent drought conditions have credited this district with a notoriety of low Human Development Index (HDI) in the state. Drought has not only pushed the district into the list of Aspirational Districts but to at 101st position in 2nd Delta Ranking during 2019. According to Karnataka State Natural Disaster Monitoring Center data, from the year 2000, the district has witnessed drought for almost 14 years. The frequency of drought recurrence is such that, it is not far from fact to say that children below 16 years in Yadgir district have not yet got a chance to experience how a normal monsoon year would be.

Government efforts constitute a) desiltation of surface water bodies, b) recommendations from the district contingent cropping plan, c) employment under MGNREGA etc., on the other hand, community efforts to cope with drought have dropped to almost nought and out-migration remains as the most preferred strategy to be employed in the event of drought. Such a situation warrants another paradigm shift to risk reduction strategies.

Acknowledgements

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Role of Green Governance and Green Finance in Regulating the Environmental Pollution

Tripura Sundari C.U.[1*], T. Kadalarasane[1]

Abstract

The first step of a green economy is to protect the environment through green finance, funds for this investment have to come from private and public sectors, comprising both domestic and international sources. The current paper attempts to study the impact of pollution on India and the need of future Green finance, Secondary data of various sources from Sustainable Development report, water pollution report, Carbon dioxide Information Analysis, World Bank, etc., is collected. Simple graphs, growth rate, percentage analysis, data visualization techniques are used to verify the above aim, based on which we provide policy suggestions.

Keywords: *Environmental Pollution, Green Governance, Green Finance, Green Economy, Data Visualization Technique*

1. Introduction

India is the fourth highest largest emitter of carbon dioxide in the world, accounting for 7 percent of global emissions in 2017. Because of the advancement of industrial revolution the polluted gas is pumped into the atmosphere which leads to warming the planet, rise in sea level and leading to severe food shortage. The carbondioxide (CO_2) emissions include a myriad of toxic air pollutants which is the most important human-produced climate-altering greenhouse gas. Green finance is defined as comprising "all forms of investment or lending that consider environmental effect and enhance environmental sustainability" (Volzet al., 2015: 2). "Green", means green projects and activities. The first step of green economy (Green banks, green bonds, green loans, green finance, etc.)

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should attempt to involve environmental and social considerations. We must protect the environment through green finance, funds for this investment has to come from private and public sectors, comprising both domestic and international sources. The first Japanese green bond issuance of EUR 250 million in October 2014 engaged the Development Bank of Japan (AllensLinklaters, 2015). Singapore has entered the First Catastrophe bond market for insurance-linked securities for ILS Expansion in Asia-Pacific (Ralph, 2017). Financial authorities in Bangladesh, the PRC, Hong Kong, China, India, Indonesia, Japan, Mongolia, Singapore and Vietnam have already taken concrete steps to support the financial system or parts of it with sustainable development goals. It is our fundamental rights to tussle for a clean and healthy environment - green governance is an emerging field which is defined as sustainable development. It is defined as long-term economic, social and environmental sustainability (Post et al., 2011).

Figure 1 depicts the sector wise world's Electricity generation from renewables by source and it is clear from the graph that since 1990 to 2016, hydro power is the leading electricity generation in the world.

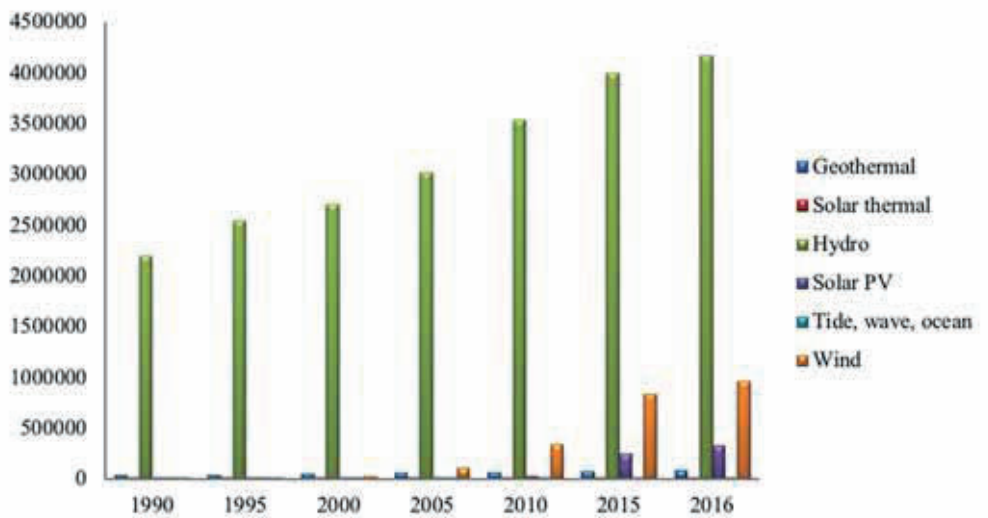

Figure 1: Electricity Generation from Renewables by Sources

Source: IEA Renewables Information 2018 - https://webstore.iea.org/renewables-information-2018.

1.1 Green Investment

As per the United Nations list of countries by Urbanization levels, "India ranks 160th with around 34 percent of its population live currently in Urban area" (World Economic Forum, Jan., 2019). The living standard has risen in urban India, where middle-class consumers extend their purchasing power beyond their basic needs which creates new opportunities for international businesses connecting digital technology. Infrastructural investment need for Asia by sector wise from 2016 to 2030 is forecast by ADB and is provided in the Table 1 and Figure 2. It is clear from the table that overall 26.2 trillion USD dollar is the need of infrastructure investment in Asia, the maximum amount sanctioned for power sector is 14.7 trillion USD dollars and that of Transport sector is 8.4 trillion USD dollars and that of telecommunications sector 2.3 trillion USD dollars. it clearly reveals this in the Figure 2 below.

Table 1: Asia Infrastructure Investment Needs by Sector, 2016–2030 (in trillion USD)

Sector Wise	(in Trillion USD)
Transportation	8.4
Telecommunication	2.3
Sanitation	0.8
Power	14.7
Total	26.2

Source: ADB (2017).

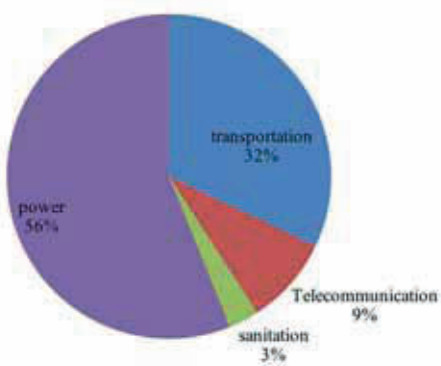

Figure 2 : Asia Infrastructure Investment Needs by Sector, 2016-2030

Source: Computed from ADB (2017).

Recent studies by the researchers on the green bonds/finance/investment are many, few like Morlotet al., (2012), Lalon (2015), Voica (2015), Kaur (2016), Sahooet al., (2016), Goodness and Ebruvwiyo (2017), Hoshenet al., (2017), Menonet al., (2017), Shaumya and Arulrajah (2017), Tripura Sundari (2017), Reddy (2018), Volz (2018), Noh (2019), Sachs et al., (2019) focused on global investment and green finance.

2. Motivation of the Study

According to the recent UN report, 'Economic Losses, Poverty and Disasters for 1998-2017', "India suffered economic losses of about Rs 6 lakh crore in the last two decades because of natural disasters, India is one of the top five countries to have reported absolute economic losses, which hurt the global economy by $3 trillion during the 20-year period from 1998 to 2017". The United Nations Office for Disaster Risk Reduction (UNISDR) noted that "climate change is increasing the frequency and severity of extreme weather events such as tsunamis, floods and storms, particularly in lower-middle countries like India. The economic losses from extreme weather events are unsustainable and a major brake on eradicating poverty in hazard exposed parts of the world". The report also added that "the number of climate-related disasters between 1998-2017 at over 6,600, which killed 1.3 million people and left 4.4 billion injured and homeless". According to a WHO study, 13 of the 20 most-polluted cities in the world are in India. The latest urban air quality database released by the WHO says that "India ranks among the world's worst for its polluted air". India's air quality ranks among the lowest five countries in the world, according to a Yale University (2016)study that assessed 178 nations. Average level of Particulate matter (PM 2.5) Pollution for 2018 is presented in the graph and we can clearly see it.

3. Objective and Methodology

Based on the above theory the current paper attempts to study the impact of pollution on India and the need for future Green finance, secondary data of various sources from Sustainable Development Report, water pollution report, carbon dioxide Information Analysis, World Bank, etc., is collected. Simple graphs, growth rate, percentage analysis, data visualization technique are used to verify the above aim. Introduction, motivation and objective and methodology of the study is provided in section I, section II briefly

explains the data analysis with the help of table and data visualization techniques. The need of green finance is discussed in Section III and finally the conclusion and policy suggestions are provided in section IV.

4. Data Analysis and Interpretation

As per the Carbon Dioxide Information Analysis Center, "China, India and the European Union represent 40 percent of global carbon emissions and the top 10 emitters were China, the US, the EU, India, Russia, Japan, Germany, Iran, Saudi Arabia and South Korea". As per the first round of Paris Agreement in 2015, these economies will achieve more than what they agreed to review the commitments made during Paris Agreement. In 2017, China (27 percent), US (15 percent), the European Union (10 percent) and India (7 percent) covered 58 percent of global emissions and the rest of the world contributed 41 percent (The Hindu Business Line).

As per the Health Effects institute: State of Global Air 2018, the data on death because of Air Pollution (Age - Standardized deaths per 100,000 people attributed to air pollution (2016), death percent in Afghanistan due to air pollution is about 31, the main reason is because of fuel and pollution due to household works and that of India is 15 percent. Figure 3 presents the India's Total Fossil-Fuel Emissions (1950-2014), and it is clear from the chart that from 1980 onwards there is an increase in the Fossil-Fuel Emissions.

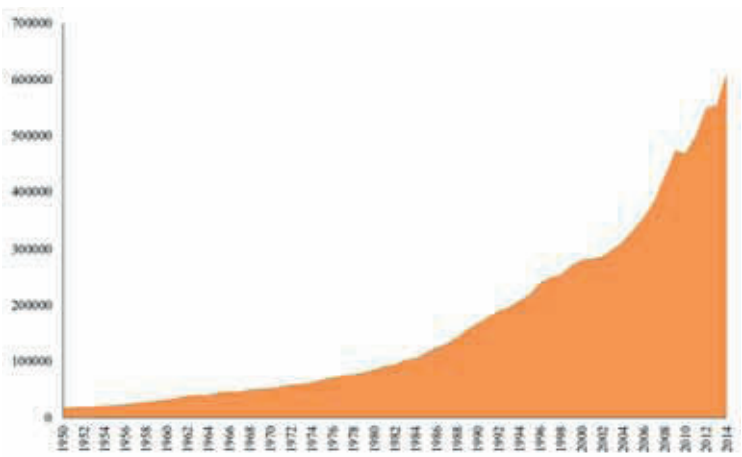

Figure 3: India's Total Fossil-Fuel Emissions (1950-2014)

According to the WHO study (2016), 13 of the 20 most-polluted cities in the world are in India. The latest urban air quality database released by the WHO says that "India ranks among the world's worst for its polluted air". India's air quality ranks among the lowest five countries in the world, according to a Yale University (2016) study that assessed 178 nations. The average level of Particulate Matter (PM 2.5) pollution for 2018 is presented in the Figure 4 and it is clear that the top 15 cities of India emits consistent pollution.

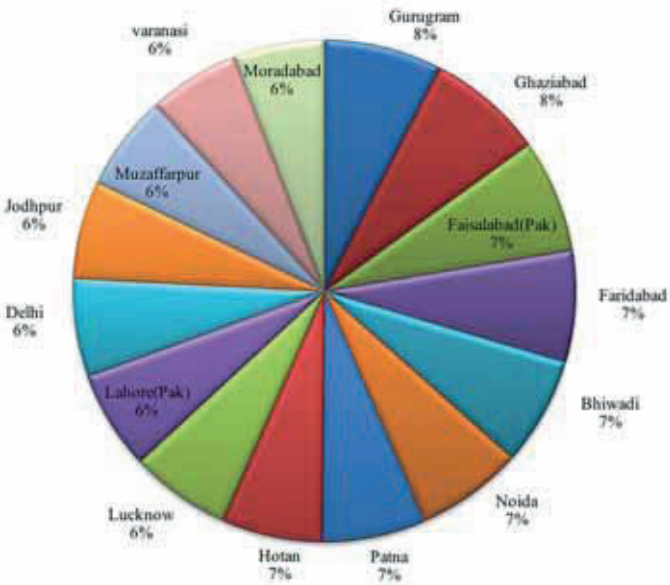

Figure 4: Highly Polluted Cities of India

Source: Computed from Health Effects Institute: State of Global Air 2018

Figure 5 depicts the India's CO_2 emission in all sectors and it is clear from the graph that energy sector releases the highest pollution among the other sectors. According to World Resources Institute (WRI), the world's water systems face formidable threats. More than a billion people currently live in water-scarce regions, and 3.5 billion could experience water scarcity by 2025". Regarding waterless economies, just 10 countries accounts for 60 percent of the global population without access to clean water. As per the report of "The Water Gap-The State of the World's Water 2018" that India accounts for 19.33 percent, which is the foremost waterless economy.

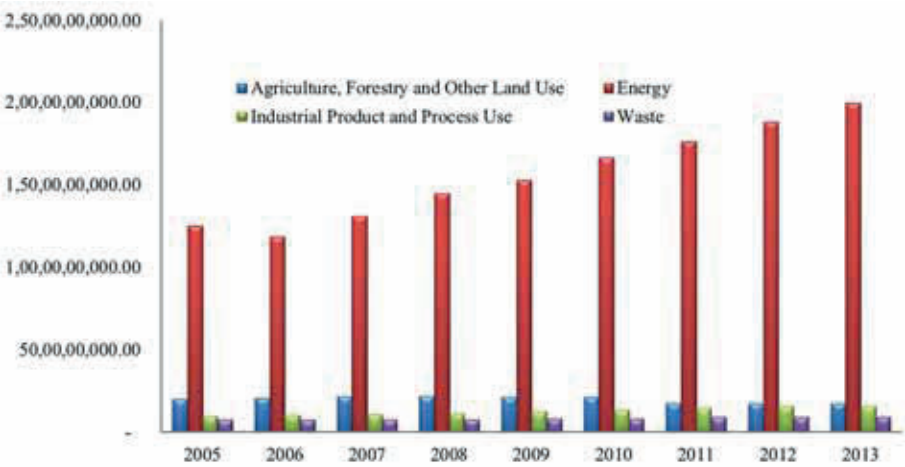

Figure 5: India's CO_2 Emission in all Sectors

Source: Computed from Carbon Dioxide Information Analysis

Figure 6 reveals the Total Damages crops, Houses and public utilities in India from 1953 to 2016. It is clear that the when compared to total population, the damage caused is implausible since 1998. As per GLOBAL CLIMATE RISK INDEX 2018, we find the death toll in 2015 to be 2119, the Deaths per 100,000 inhabitants is 0.16, Absolute losses in million US$ (PPP) is 21,482.79 and Losses per unit GDP is 0.247 percent.

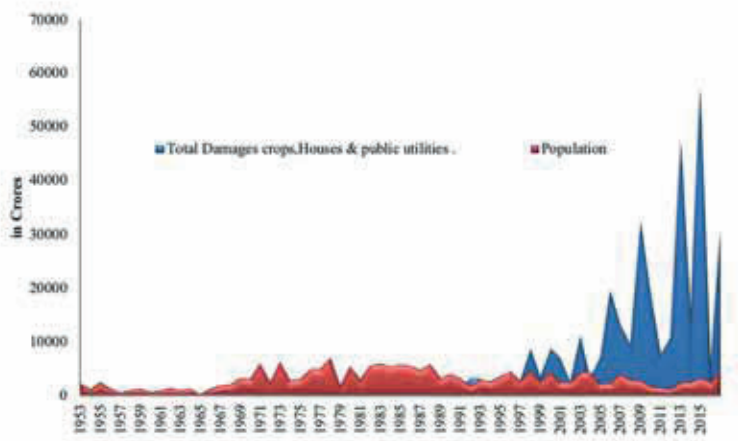

Figure 6: Damage Due to Flood and Heavy Rainfall in India

Source: Computed from Global Climate Risk Index 2018

As per ILO estimates based on data from the ILOSTAT database and the HadGEM2 and GFDL-ESM2M climate models, the total (primary, secondary and tertiary sector) working hours lost due to heat stress, in Southern Asia, 1995 and 2030 is 4.02% and 5.29% and that of India is 4.31% in 1995 is estimated to increase to 5.8% in 2030. This concludes that when compared to South Asia in India the working hours lost due to heat stress is estimated to be high (Figure 7)

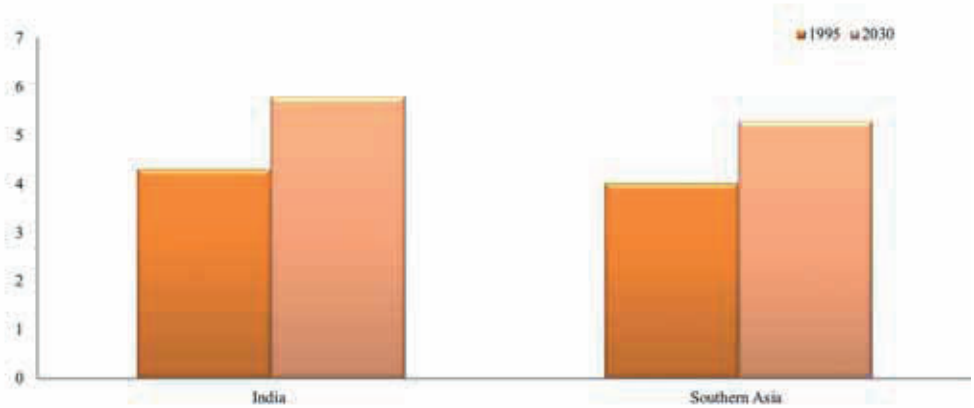

Figure 7: Total Working hours lost due to heat stress in India and Southern Asia, 1995 and 2030

Source: Computed from ILO estimates based on data from the ILOSTAT database and the HadGEM2 and GFDL-ESM2M climate models

As per IEA, Energy Access Outlook 2017, the energy access in Developing Asia for 2016, in rural is 97 percent and urban is 74 percent, and the population with electricity access is 239 million. Figure 8 presents the Electricity capacity from renewable energy sources 2010-2030 (GW), it is clear from the chart since 2010 and in future solar is the only renewable energy sources for a green and sustainable future. Figure 9 reveals that wind and solar is the most renewable capacity target in India.

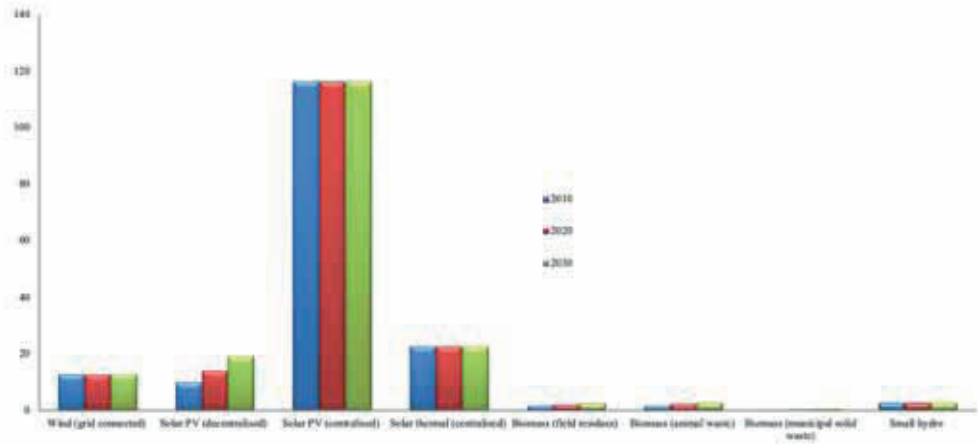

Figure 8: Electricity Capacity from Renewable Energy Sources 2010-2030 (GW)

Source: Farooq and Kumar (2013)

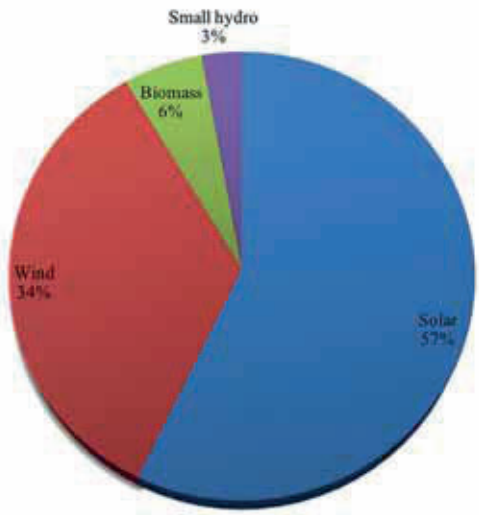

Figure 9: India's Renewable Capacity Target

Source: India's intended nationality determined contributions

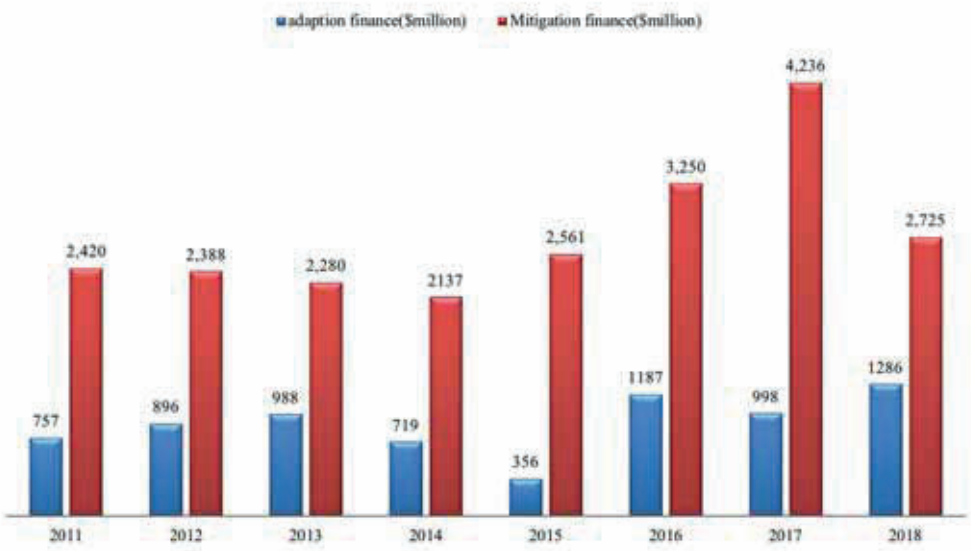

Figure 10: ADBI Historical Climate Finance ($million)

Source:Climate Change Financing at ADB (2018)

Figure 10 presents the ADBI Historical climate Finance ($million) regarding adaptation fiancé and Mitigation Finance since 2011.The carbon intensity of selected countries are provided in figure 11, it is clear from the chart that the carbon dioxide emission of people Republic of China in 1993 was 2.44 and it gradually decreased to about 1.24 in 2014 this must be the country which has undertaken the sustainable development goal and working on it so China must be appreciated for this. India's carbon dioxide emission in 1950 was 1.39 and has declined to 1.05 in 1993. Other countries like Pakistan, Malaysia and Thailand is more or less following a consistent trend in maintaining the carbon dioxide emission. One among the top five countries which is experiencing the Leading Environmental Threat of global economy is India $3 trillion during the 20-year period from 1998 to 2017 and the total losses have increased by 120 percent compared to the previous 20 years.

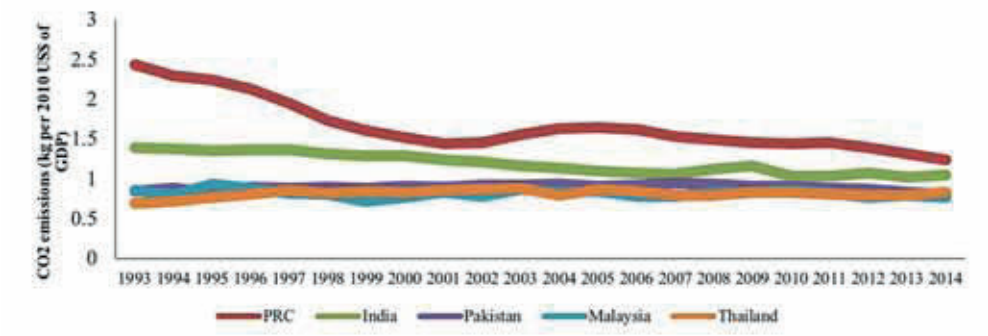

Figure 11: Carbon Intensity of Selected Asian Countries

Source: Compiled with data from World Development Indicators (December 2017)

As per the data of Banking on climate change fossil fuel finance report card 2019, it is clear from figure 12 that fossil fuel financing is provided since 2016-2018 for total 33 banks. This clearly reveals the green Investment and bond in Asia and India.

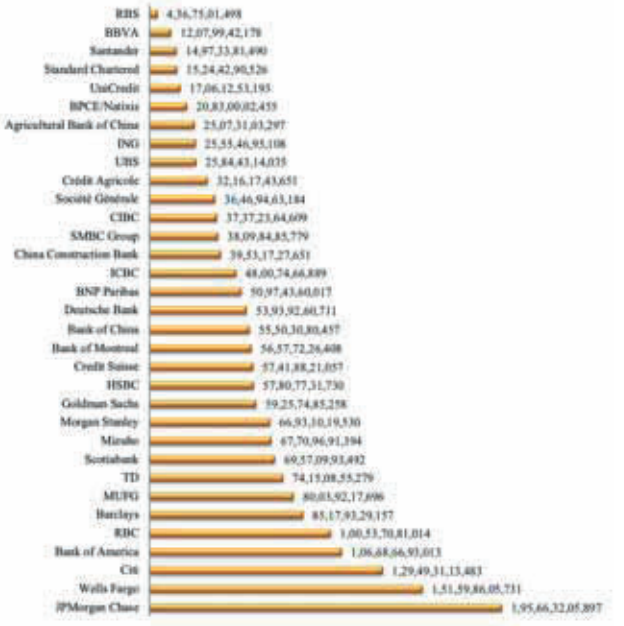

Figure 12 : Banking on Fossil Fuel Financing($)

Source: Banking on Climate Change Fossil Fuel Finance Report Card 2019

As per RBI data in 2016, we provide the Renewable energy financing in Table 2. The renewable energy target and capacity for each outlook is specifically provided.

Table 2: Renewable Energy: Financing Outlook in India

Renewable Energy (RE) Targets	Capacity
Installed Renewable Energy (RE) Capacity	45 GW
Target RE Capacity (by 2022)	175 GW
RE Capacity to be Commissioned	130 GW
Cost of Financing & Existing Exposures	USD billion
Cost of Installation (assuming ~ USD 1 million per MW)	130
Non-equity Financing Requirement (@ 70:30 Debt-equity)	90
Aggregate Exposure of Banks/FIs to Power Sector	152
Scheduled Commercial Banks	86
Power Finance Corporation (PFC)	36
Rural Electrification Corporation (REC)	30
Source: RBI; Exposure Data as on March 31, 2016	

Figure 13 reveals the India's investment trend and the green investment is increasing since 2016.

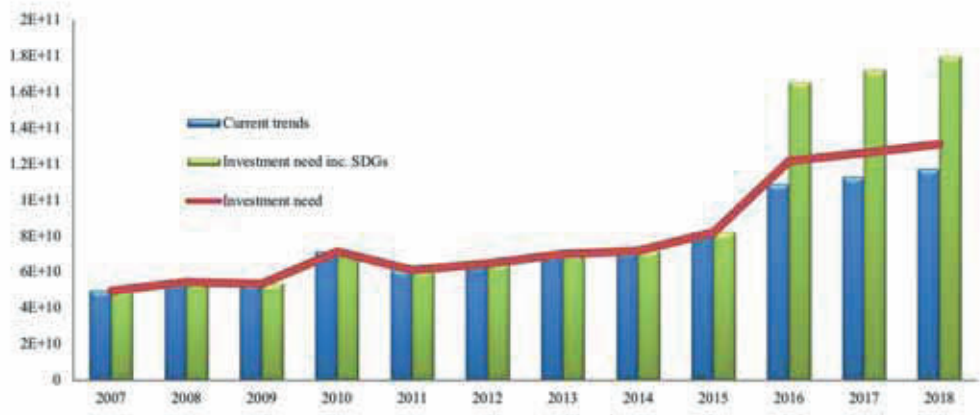

Figure 13 : India's Investment Trend

Source: Outlook.gihub.org and Global Infrastructure Outlook

The Power Generation Capacity by Type in India in the New Policies Scenario, is provided in Figure 14, which clearly reveals the situation in 2014 and 2040.

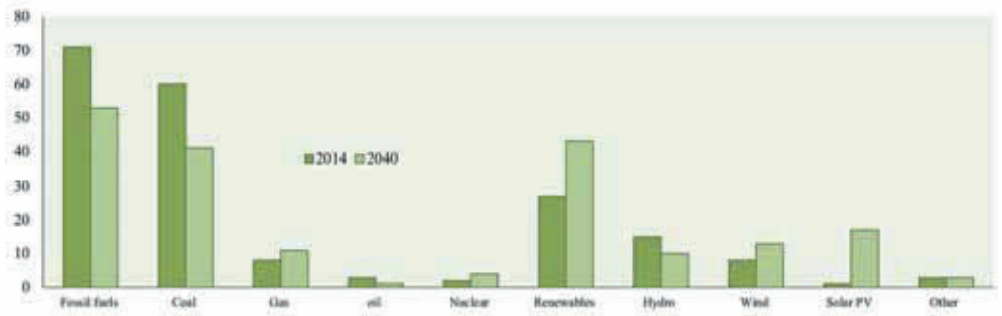

Figure 14: Power Generation Capacity by Type in India in the New Policies Scenario

Source: IEA (2015)

5. Conclusion

Air pollution is the top killer in the world (Thomson Reuters, 2018), every year all countries face heavy natural calamities disaster which results in huge human loss and financial losses leading to global inequality and environmental injustice. Increase in CO_2 emissions produces more heat, directly affecting the natural resources which results in more disease and increase in water level. Tropical deforestation and human activities are the primary cause of global warming. European cities are clean now than generation ago. In 1960 California had the highest pollution levels in the world, measures to tackle pollution by adopting eco-friendly policies and investment we can reduce the pollution (World Economic Forum, March 5, 2019). India's electricity and heat producing sector releases the highest pollution since 1981. There is a huge gap between the current trend and future Investment trend, so the need of the study is clear, the gap must minimized to attain the goals of sustainable development agenda 2030. According to United Nations climate change panel, just 100 companies have been the source of over 70 percent of the world's greenhouse gas emissions since 1988 (IPCC,2017), and the major players contributing to climatic changes are coal, oil and gas companies. Based on the above exploration we can follow the following policies (i) protecting Mangroves, (ii) making water resource management more efficient, (iii) improving dry land agriculture,(iv)

adopting eco-friendly policies and investment we can reduce the pollution(v) energy-efficient technologies must be implemented in Industries and businesses. Hence, there is a need of green finance/green bond for the sustainable development in India.

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A Study of Gender-based Issues on Field of Corona Warriors Amid Lockdown

Vivekanand V. Kadam[1]*, Sarika V. Kadam[2]

Abstract

The outbreak of covid-19 has posed a major threat to the high-density areas of the country. During the corona war in the Palghar district, women employees from various departments of the district administration played an active role in providing services. There are 2210 ASHA workers, 3183 Anganwadi workers, 38 doctors, and 293 nurses and 70 female bus conductors in the Palghar District. At present, these women are playing dual responsibilities. One of a housewife and other of a covid warrior. These great warriors who contributed to the corona epidemic by risking their lives during corona warfare have to face various problems while serving in the field. Despite being more vulnerable than men, women employees continue to serve at par with their male counterparts.

This paper aims to highlight the problems faced by female employees on the duty during the lockdown period. Make society sensitive towards them and foster support for women warriors in this corona war.

For this study, using the simple random sampling method, information was collected from 100 random female employees from a group of 6000 consisting of women doctors, nurses, Asha workers, bus conductors, cleaners, and police all across the district.

This research study is very important for corona war workers because the availability of female workers is considered as very important to fulfill the need for mental support and affection in such illnesses. It will help employers to understand and fulfill the special needs of female employees to ensure their continued active participation and increased efficiency.

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Keywords: *National Institute of Disaster Management (NIDM), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA), Palghar Disasters, Gender, COVID-19, Warriors, Female problems, Corona Virus, Insecure Pandemic Warriors.*

1. Introduction

The origin of the corona virus appears to be in China's Wuhan province in December 2019. The World Health Organization announced the Public Health Mission for Health on January 30, 2020 and on March 11, 2020, announced that COVID-19 diseases had spread worldwide. Women employees of various departments like the revenue department, police department, health department, sanitation department and public transport department are serving the people. The huge numbers of warriors like doctors, nurses, cleaners, Asha workers, paramedic staff, police, and revenue department mostly this corona war is going on their strength. But many more employees are working on a contract basis. The contribution of women employees to service providers from all walks of life is unparalleled. But female employees serving in the workplace during the Corona lockdown have to deal with a variety of issues. Facing various problems female employees during the lockdown period of the corona pandemic in Palghar district. It affects their personal health.

1.1 Study Area

The district of Palghar Northeast Konkan coast region of the Maharashtra state spread over the area 4,69,699 hectares of the geographical area (Figure 1). On the east side of the district, there is Thane and Nashik, on the west, there is the Arabian Sea, on the south side Mumbai, Thane and on the northside Walsad (Gujrat), Dadara and Nagar Haveli. Palghar has a coastline of 112 Km.

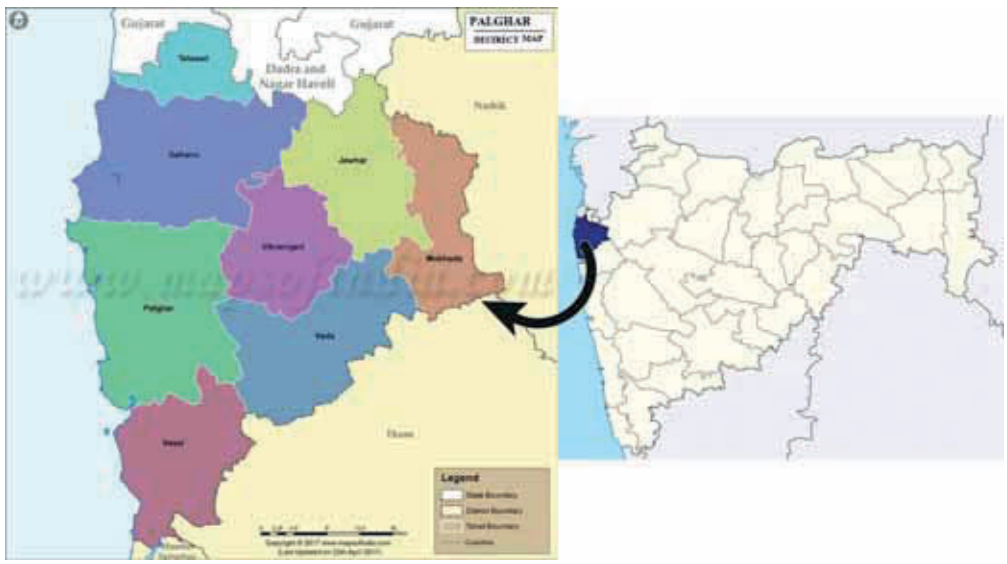

Figure 1: Study Area Map

2. Data Sources & Methodology

The methodology used in this research is a simple random sample method. The present study was conducted based on primary and secondary data sources. The study survey was based on a semi-structured questionnaire that encompassed a large set of queries on problems of corona women workers while working duty of corona on field experience with, in particular, impact on women's corona warriors' life. Content of the government's reports, research papers and electronic newspapers information has been collected from women doctors, nurses, Asha workers, bus conductors, cleaners, and police from the district by selecting 100 samples using questionnaires.

3. Need of the Study

Insulting female employees while on duty. Not given correct answers, looking at them with lustful eyes, speaking in double meaning. In Tribal areas, women workers are not allowed to enter the village and the Padas after performing their duties. Constantly harassing their families. Sanitary pads are not available during the period when female

employees are on the duty. The educated woman of today's has become caring. Even if she carries a sanitary pad with her, the question is where the changing room will be available to uses it. At the same time, the PPE kit is made of 6 feet for a man and a woman. While she's wearing PPE Kit fits if then the menstrual cycle will come then the time how it is possible to hygiene maintain. Raised in very critical situations to maintain hygiene. And that's why she's too many health problems. The mother has to stay away from the baby. That's why babies are going to another way like gaming, the Internet. Public transport closed due to lockdown. The cost of traveling from home to field was more than salary. It is tough to travel long distances with no transport available, however, at the intangible gain of the satisfaction of serving the folks, and families makes all the distinction, female corona workers say with an enormous smile on their face.

Firstly, because most of the masks are designed for a larger male face and need to be pulled tightly across the face for a woman. This can result in skin injuries by tightening the mask or trying to seal the Nose Bridge, as well as area over the chin. Secondly, even if one does find a comfortable fit, it is not necessary that the same brand or size would be available always. In fact, even the smallest size of the critical PPE like goggles, shields, coveralls, and masks are too big for some of the smaller built female HCWs. Table 1 represents COVID-19 Positive Doctors, Police, Paramedical Staff & Frontline workers Information.

Table 1 : Covid-19 Affected Warriors

COVID-19 Positive Doctors, Police & Paramedical Staff Information (Date: 07/08/2020)					
Sr. No.	**HW Positive**	**Total Positive**	**Recovered**	**Active**	**Death**
1	Doctors	45	34	11	0
2	Nursing Staff	47	74	0	0
3	Others	56	45	09	0
4	Police	228	184	41	3
Total		376	310	61	3

Source: Civil Surgeon Office, Palghar

4. Meaning of Lockdown

"When a natural or human-made disaster or accident occurs in a particular region, province, or continent. The imposition of legal restrictions on people in the affected areas, provinces, and continents not to leave their homes to protect themselves from the disaster" that is called lockdown.

5. Result and Discussion

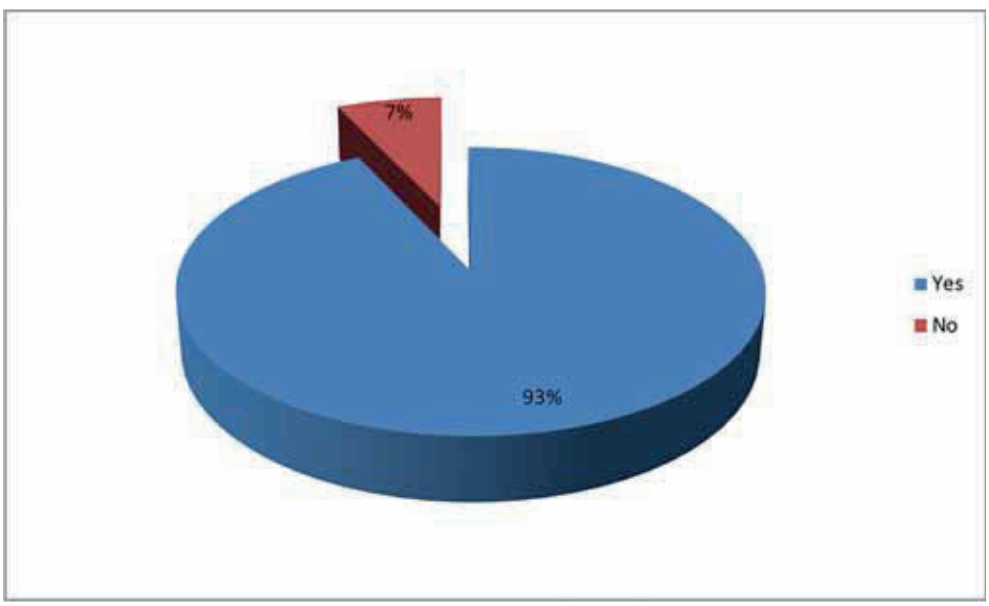

Figure 2 : While you were providing services during COVID-19 lockdown did you face any difficulties? If yes, then please explain.

93 percent of female employees (Figure 2) said that they face various problems while serving during the Corona lockdown period as the reasons are as follows: living difficulties, can't travel, mental stress, fear of corona infection, the inconvenience of meals, not being able to rest, not being able to pay attention to children as well as older adults at home, visiting once a week to go home but people in the community are not ready to take. There is no set time for work; citizens have closed roads in their area. There is a shortage of PPE kits and neglect of one's health.

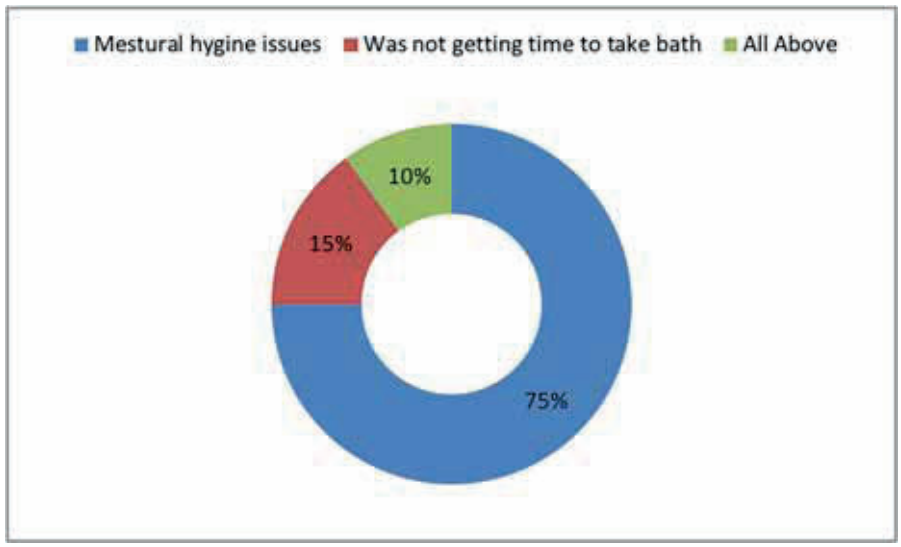

Figure 3 : What Personal Hygiene Issues were Noticed?

Seventy-five percent of female employees explained that menstrual problems are one of the most common personal hygiene issues. 15% of female employees say they don't have time to take a bath. According to 10 a percent of female employees, all the above problems are clear.

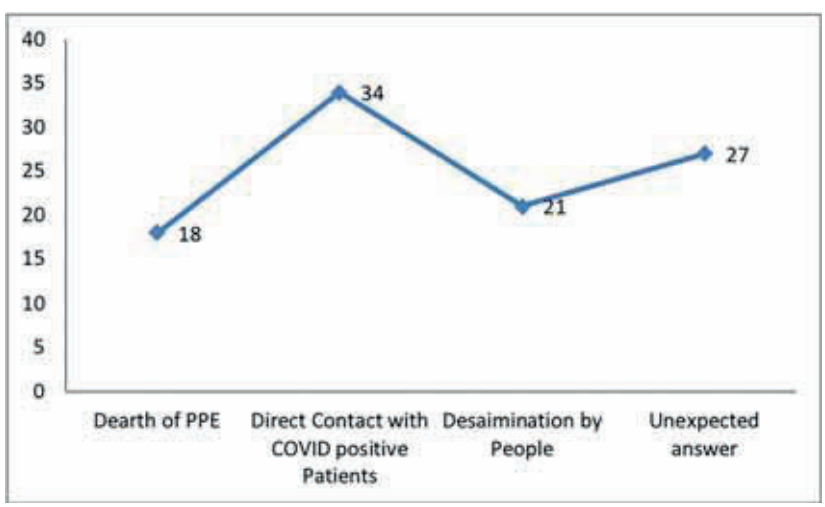

Figure 4 : What were the difficulties you faced while working as a frontline?

Women warriors face various problems while providing services amid virus Lockdown in the field. 18% of female employees say that there is a shortage of PPE kits. 34% of women have experienced direct contact with a COVID patient. People are disrespected when they work for people. So 27 percent of female employees say they meet to hear unexpected answers from people.

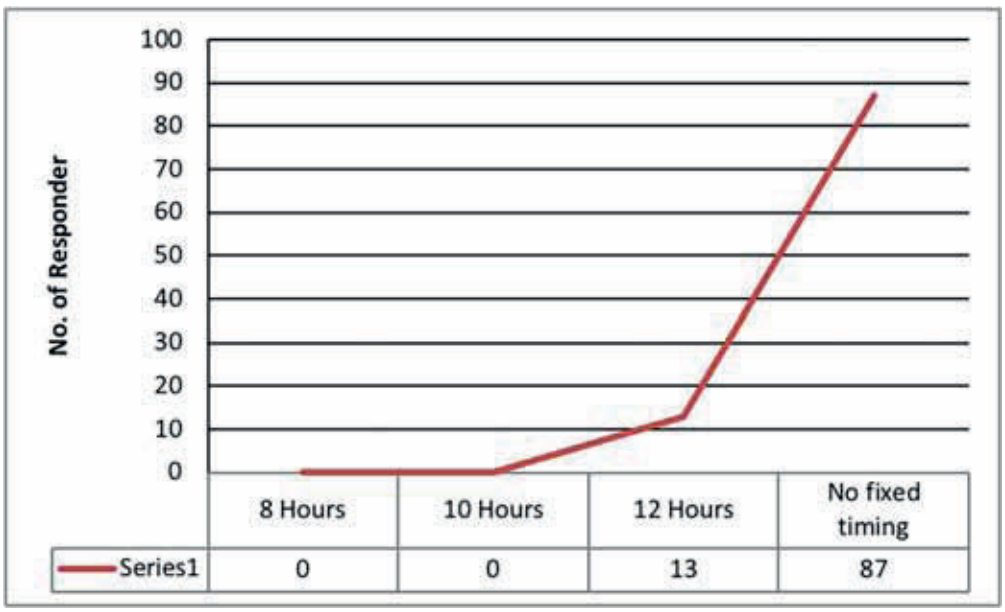

Figure 5 : How long did you have to work during COVID-19 Lockdown?

While on duty during the corona lockdown, 87 percent of female employees report that there is no set time to go home after work. So 13 percent of female employees say they have to work at least twelve hours.

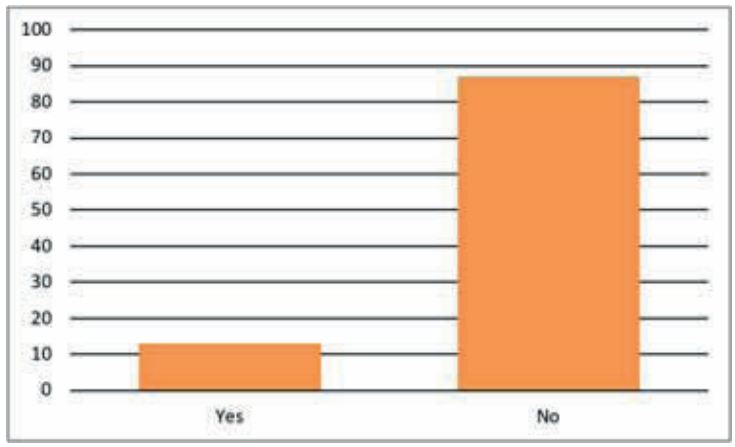

Figure 6: After returning to your hometown from work, did you receive love from husband/child? If No, then why?

Eighty-seven percent of female employees say that the physical pleasure and a maternity pleasure do not meet after 8 to 10 days after returning home from work in the Corona a lockdown period. COVID has to stay out. They Can't go to home there is an atmosphere of fear in the house. It is necessary to keep a distance of at least one a meter. The physical pleasure is not obtained. Working in the containment zone does not allow babies to get close. Because babies, the probability of getting the corona.

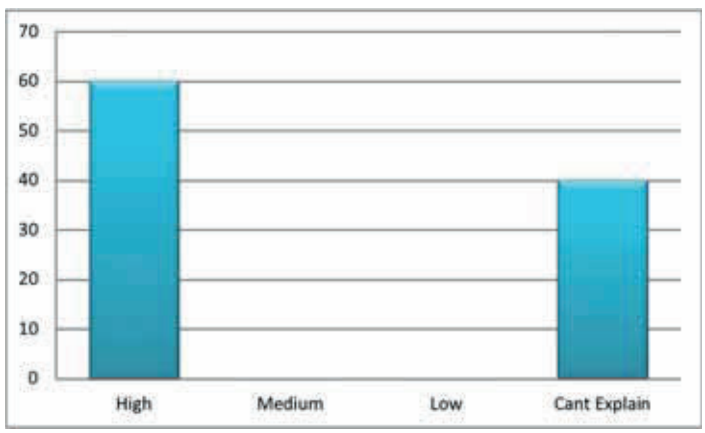

Figure 7: How much are the chances of getting affected by COVID-19 while you are working on the field?

About 60 percent of female employees feel that they are more likely to be infected with corona while working in the workplace. And forty percent of women feel like they can't say anything about coronavirus infection. Not speak in a medium and low context.

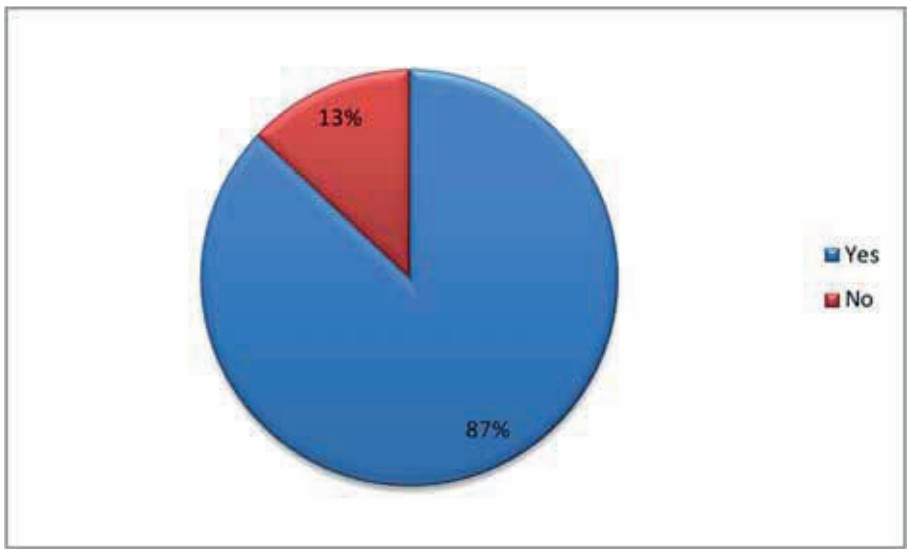

Figure 8 : Are you facing difficulties while traveling from home to work and? If yes, then what are they?

87 % of female employees face difficulties while traveling from home to work and from work to home (Figure 8). The reasons for this are the lack of travel facilities because there are no tools for travel. Most of the employees working in the field are fourth class and third level of social class. They don't have their own vehicle which makes daily travel difficult. Due to the closure of village roads by the villagers, there are difficulties in coming and going. Since public transportation is closed they can't be reached on time at home and in the workplace.

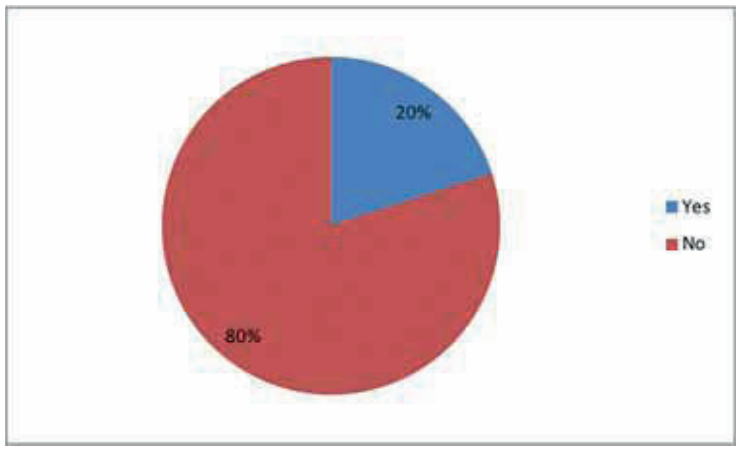

Figure 9 : Did you get time for your safety meantime for delivering your job?

80 percent of female employees reported that during corona lockdown periods they were feeling physically and mentally exhausted as they were unable to get time to take care of themselves while providing services in the field (Figure 9). Working hours are not fixed for the employees. Corona warriors have to go to work even on holidays and there is a need to pay attention to both home and work. The workload is higher on corona warriors due to less working staff.

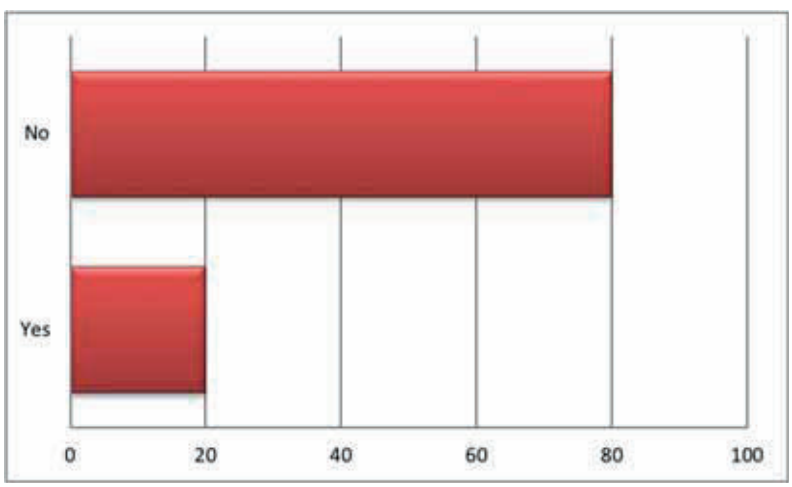

Figure 10 : Was there a restroom/changing room at your workplace? If No, then how you were managing?

During the pandemic lockdown work period, 80 percent of workers explained that there were no changing rooms or washrooms in a workplace where female employees were on duty (Figure 10). They have to go somewhere to search for a sanitation place and no sanitary napkins, no separate changing room was available in most places. They added that they have to go to someone's house and make a request to use their bathroom for sanitation.

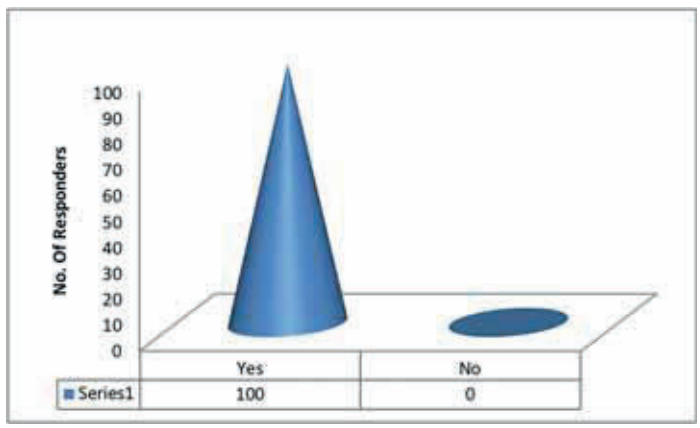

Figure 11 : Did you face gender discrimination?

Everywhere in the field, while working amid the coronavirus pandemic situation, a hundred percent of female employees say that they are facing gender discrimination. Looking at them with lustful eyes, speaking in double meaning.

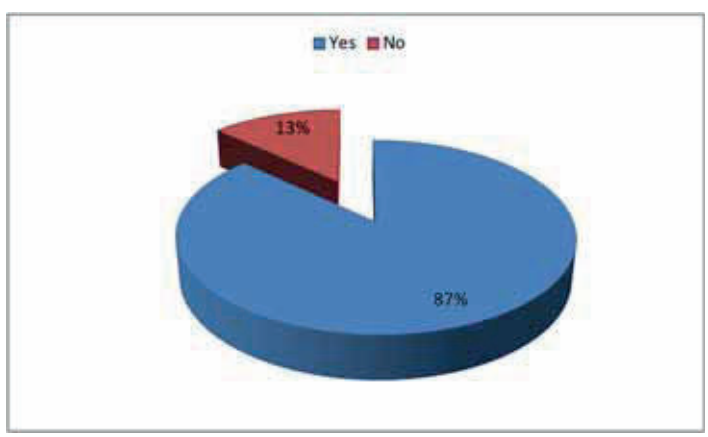

Figure 12 : If you reach home late at night. Did your family doubt on you?

According to 87 percent of women, family doubt on them if they come home late from work.

6. Conclusion

This study has been found that during the lockdown period, while working in the field during such epidemics, various problems have plagued them. The main points of some difficulty while performing duty on this occasion is some women have difficulty in fieldwork due to menstrual problems, feel fieldworks are complex. The cloth in a changing room is not independent for women at ground level. It is essential for women to take care of their children and the elderly; this should be considered in organizing the fieldwork duty to ensure better participation of women, lack of toilet and sanitation facilities. Amid pandemic, fieldwork is resident and held in locations far away from home. Living difficulties, Can't travel, mental stress, fear of corona infection, the inconvenience of meals, not being able to rest, not being able to pay attention to children as well as older adults at home, visiting once a week to go home but people in the community are not ready to take. There is no set time for work; citizens have closed roads in their area. There is a shortage of PPE kits and neglect of one's health. Corona has to go to work even on holidays. You have to pay attention to both home and work. And the workload is higher due to less staff. There are no tools for travel. Due to the closure of village roads by the villagers, there are difficulties in coming and going since public transportation is closed, financial problems and mutual feelings about society. Loyalty to work, commitment, and determination to support the administration in any situation increases his ability to fight the corona.

7. Recommendations

1. Sanitary pads should be available at the workplace during work on the pandemic situation for women workers. Sanitary pads are made available may be in the city but not made available in the village.
2. There should be a separate changing room or washroom.
3. Consider engaging women/getting feedback from women in designing the content of the fieldwork. Because identifying what kind of problems they are facing amid the Corona Pandemic is very important.

4. There should be at least one mobile toilet for each Tahsils during the pandemic for corona warriors.
5. There is a need to work into the challenges faced by the Asha workers and Anganwadi workers to reach their workplace. They often reach late to workplace due to the unavailability of vehicles or public transport.
6. Develop the indicators to review the problems of women warriors in the district suggesting issues faced and solutions to solve their problems in the field workplace.
7. Health Department, police department, Panchayati raj is responsible for implementing the recommendations during any kind of pandemic situation.
8. Give relaxation from work at least few hours so that they can prepare for work enthusiastically for next day.
9. There is a need to give respect for their sacrifice in society. They work for the society in a pandemic situation.
10. Raising awareness through social media as well as local newspapers to eradicate the feeling of sexism and lust from the minds of the people in the society will definitely show good results
11. Making a custom PPE kit for women warriors is important. Many doctors, nurses, etc. fighting COVID are women and have to wear ill-fitting PPEs not designed to be women-friendly, especially during periods.
12. Extra PPEs to be made available during periods.
13. The female HCW should be allowed a change of PPE at least once during her duty allowing her to use the restroom especially when she has periods.
14. Providing PPE to all frontline workers to protect themselves.

Acknowledgement

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Agency, Contestation and Subalternity: Re-imaging the Mahim Koliwada as a Disaster Resilient Urban Quarter

Pritam Dey[1]*, Swapna Deshmukh Deshpande[2]

Abstract

A city is a complex coalesce of social pluralities and multiple webs of activities that defines the very essence of it, The people, communities and the activities they perform creates a sense of identity for the city and eventually the morphological dialogue they set up forms the image of the city. Does the developing city with a financial polarization and significant allocation of conveniences considers the criticality, social need, and all the more the crumbling debacle to place the right of the working and the proletariat class in the society? How those situated on the other side of power and privilege do negotiates the conditions of existence of these communities within the same urban territory? What strategies of existence and act of resistance do those trapped and wrung by social, legal and financial orders posit?

This paper in the primary stage studies and presents an account on one such indigenous community and their informal dwelling area (Koli area) squeezed and barely marking its presence in the city of Mumbai. It poses an important question in front f us, how the planning and development framework for a hyper capitalistic city like Mumbai accommodates the agency and representation of these subaltern groups in the city of Mumbai? Do they have right and voice in the regeneration policies of the city? If so what are the important considerations and sensitive strategization needed for a holistic and inclusive urban re-development. These are not new communities and had been living here for a long time, more gentrification happened in these areas by accumulation of more people from outside and exhibits a robust and unique collage of urban informality.

The subsequent stage is to prognosticate and strategise aggregate procedures that would re-affirm the rights of the community and the local area legitimately, thereby

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rightfully placing these vulnerable grey spots in the growing city through a holistic urban renewal programme with a disaster resilient approach. It is imperative to arrive at a rational, humane in the wake of new urban challenges and making new feasible potential outcomes.

Keywords: *Community, Hypercapitalistic, Subaltern, Legitimacy, Gentrification, Disaster*

1. Introduction

"The question of the subject and subjectivity directly affects colonized peoples' perceptions of their identities and their capacities to resist subject/subjectivity the conditions of their domination, their 'subjection'." – Ashcroft, B., Griffiths G., Tiffin H., (2004). Key Concepts in Post Colonial Studies. New York: Routledge Publishing House.

Urban areas are not constant entities, like some other living creature, they evolve and physically enlarge. In older neighborhoods of the city, with time the conundrum of informality, subjectivity, and an unkempt order creates an imbalance leading to inefficient urbanism and environment, asset overutilization, and future sustenance is under question. The act of adding more dwelling units and creating more space within a finite boundary leads to unchecked morphological adjustments. The issue escalates to a detrimental level when it compromises with the environment. The evolving and planned city considers these areas black spots and very soon they become the backyard to the elite city, completely neglected and left to decay slowly. The 1901 evaluation says there were around 1830 metropolitan territories in India. This demonstrates in excess of 1800 urban areas in India are extremely old. This maturing of urban communities has lead to crippling morphological fabric, and contestation of land-use, environmental contamination, poor social infrastructure, and absence of character.

The ideological and interactional roles and links between the city and societies are always in a state of dynamism and change. Ideological ties (patterns of values) bind the society to the city and vice versa. It demonstrates the rules that compose the cultural roles of societies and the cities and tries to seek their diffusion from the urban sphere into the cultural setting. The interactional role of the city as a socio-economic and political factor in the organization of the entire society studies the actual behaviour lines that tie the physical rubriks to its social setting. It seeks to understand the city as a performer of cultural roles within the overall organization.

Because of the technological, physical changes, cities are in a continuous state of adjustment to the socio-cultural environment and overtime creates a complex pattern, it thus undergoes adaptations. The physical realm evolving is thus directly linked with the adaptive capacity of the children and their concept of play. Two adaptation scenarios thus manifest – The internal and external adaptation. Internal adaptation is the spatial arrangement and social life evolving in relation with or apart from the larger society. Family structure, social life, and community configurations are in a state of continuous evolution and they manifest through a series of social behaviours.

External adaptation is the external conditions, urban values, lifestyle changes that affect the social phenomenon. For example, the advent of gated communities, the Bombay kurla complex, modern societies, transportation systems and ways of urban life have altered the way the subalterns used to interact with city earlier. Physical interactions, exchange of ideas, notions, and the sense of collective identity get diluted somewhere in this process.

"In the global South, urban growth is a hybrid of both models, turning urban real estate into a high-profit sector where political corruption, capitalist development and international finance intersect..." – Keyder Caglar,(1999).The Housing Market from Informal to Global. Istanbul: Between the Global and Local.

With the unchecked growth and massive densification of urban communities, old-local quarters of the city and its immediate vicinities face massive physical pressure and somehow fail to maintain a balance between them and the need of resources to sustain the density. In case of Mahim Koliwada, the proximity of the sea presents an enormous threat to the growing shoreline and slowly encroaching the coastline, extending towards the sea. The high tide is an immediate threat to a cataclysmic event for these communities.

Few Slums recovery projects under SRA (Slum Rehabilitation Authority) in Maharashtra watched out to acquire developers on board the way toward creating new dwellings. The thought was in the event that they could work in-situ to concrete finished dwellings for the home of the slum like Dharavi slum they would build up the rest as they thought that it was appropriate. The 2004 DRP made a further footstep ahead in which they channelled in private designers/developers that would reconstruct three square feet condo/small house buildings.

This was an ineffective endeavour on account of insufficient information and absence of land inside the region combined with inability to accept slums spokesperson along these lines overlooking the casual financial organizations which is an essential part for the entire arranging measure.

2. Mahim Koliwada

Mahim area is one of the oldest area in Mumbai where we can find traces of old settlement pockets and British impact on surrounding architecture. Our study area is Mahim where we see immediate proximity around the Mahim fort (Figure 1). Mahim fort is right now lying in ruins and encroached by unauthorised slum dwellers. Mahim Koliwada or the Fishermans village is surrounded by all such conditions. at same time we found government housing and public structure is protecting this area's growth. Just across the main road which divide the site naturally for its identity, the development is quit planned and a good mix of housing and open spaces along with few public buildings.

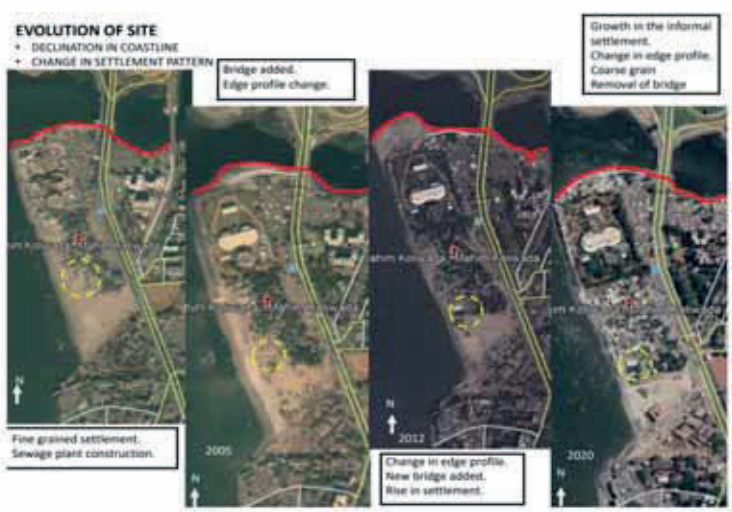

Figure 1: Evolution of Site, Declination in Coastline and Change in Settlement Pattern

(Image Courtesy : Dhanashree Dhoke & Arti Phadtare, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020
Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

Basic Infrastructure for any liveable condition is considered when there is regular supply of water, toilet facilities and electricity connection is provided by government. But this happens when every structure at any place is authorised by government. But in Mahim Koliwada we found that only few structures are in perfect shape and functional, 50% of it is not authorised by the local authority almost every second house was not having proper toilet facility. Some of the major landmarks of the site are represented in Figure 2.

Figure 2: Major Landmarks of site

(Image Courtesy: Dhruv Parikh, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

The fishing villages are the first inhabitant of any settlement near the sea. So we assume that the Kolis, who started fishing at the edge of sea in Mumbai are the first occupants of Mumbai City. They catch fish in the deep sea and sells fish and as one promenade around the near villages/gaothan. Mahim Koliwada is one of them and there is a solid sensorial feel of the presence of business fish-arranged society.

Boat is the primary source for fishing activities it is the only transport mode for local fisherman. The Kolis worship their boats and that is why it is prominent in any Koliwada. Mahim Koli's have defined the boat parking spaces for boat near to the ocean and there it is noticeable feature along with nets where usually fish drying activities

happens. Because fishing settlements are very close to sea and even fish drying spaces too anybody who passes from that locality can easily identify it due to strong smell of fish around the year.

The beauty of Mahim Kolwada is very natural, the grown of this area happened due to the sea frontage but at same time that frontage is becoming reason for negativity in that zone. Beautiful fort converted into ruins due to unauthorised development at sometime the land cost is drawing attention of local development authority at same time the private developers are also indulge into it. Every level of stakeholder really want to witness the vertical growth of these areas. Koliwada in western suburbs are prim and focus.

As shown in figure 1 we can identify that mangrove depletion is happening and the footprint of structures too. Unauthorised slums have housed near the mangrove area of Mahim Koliwada. It has become very noticeable in recent year. Mangroves are the main reason of city stability in terms of natural calamities near sea areas. City authority needs to attend this issue on priority basis. These are the natural protectors from flood and Tsunami. At same time mangrove are the house of many living organism like various verity of fishes, crabs and many more. Knowing the potential of this dense element it has been ignored for many years and that is why we see such built structures are there.

About history of Mahim Koliwada, the fishing community was nomad before twelfth century, when King Pratap bimb set up his Kingdom mahikawati he welcomed sixty six kulas or clans to be essential for his new kingdom, there community become locals of western sea shore of India. They setteled and at present we found the prominent impact of history in the present Mahim Koliwada.

Mahim is connected to areas of most prominent commercial areas in Mumbai in terms of economy and job opportunities (Figure 3). Proximity to these areas makes it one of the most sought-after land Patch in Mumbai from real estate perspective.

Figure 3: Three most Prominent Commercial Areas in Proximity to the Mahim Koliwada.

(Image Courtesy: Pranjali Mali, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

Being a linear city, Mumbai coastline became a prominent feature for the development, Mahim has one of the biggest coastline it covers roughly eight thousand six hundred meter. Mumbai has beautiful coastline in the country. major tourist visit few on regular basis, Mahim is one of them. Worli which is on south of Mahim is again important coastline for understanding the sea connecting channel from north to eastern corner of coastline. It was one of the important point in the history of Mumbai development.

This channel has very important natural feature which is Mangrove, which covers almost connecting spaces of Mithi River and sea. Mangrove are present at the starting tip of Mithi River and the reserve forest of mangrove is detoriating and due to contamination bought from near by changes in development. Change is unavoidable but authority can take incharge for such decisions where we can preserve the natural protectors of sea. Major Road connectivity and major junctions for activities at the Koliwada is represented in Figure 4 and 5. Figure 6 represents Cross Section, Topography of the Mahim Koliwada site.

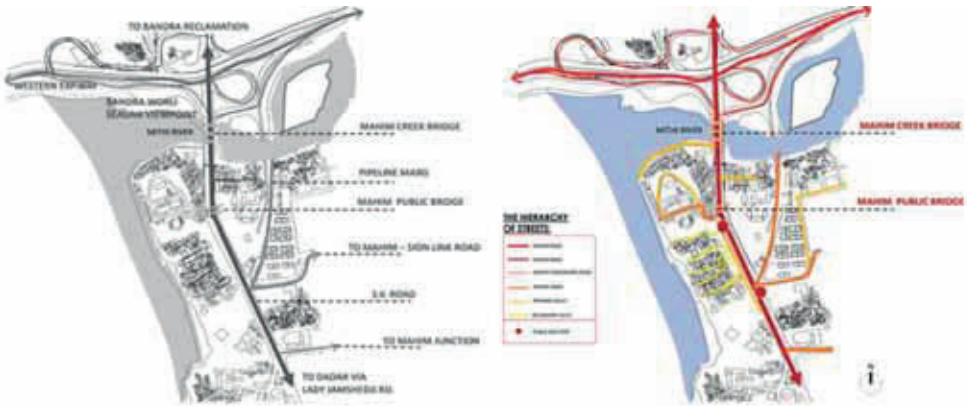

Figure 4 & 5: Major Road Connectivity and Major Junctions for Activities at the Koliwada.

(Image Courtesy: Joel Jutsna, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

Figure 6: Cross Section, Topography of the Mahim Koliwada Site.

(Image: Joel Jutsna, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

Figure 7 & 8: Mapping of Land Use and existing basic Infrastructure on the Mahim Koliwada Site and its Condition.

(Image: Yash, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

Figure 8 showing housing condition like structure hight which is not beyond G+1 and unfishied structures around with narrow unpaved streets/lane connectivity, in this fig its is prominent that there is a big open ground which is used by community for social gathring and various festivals.

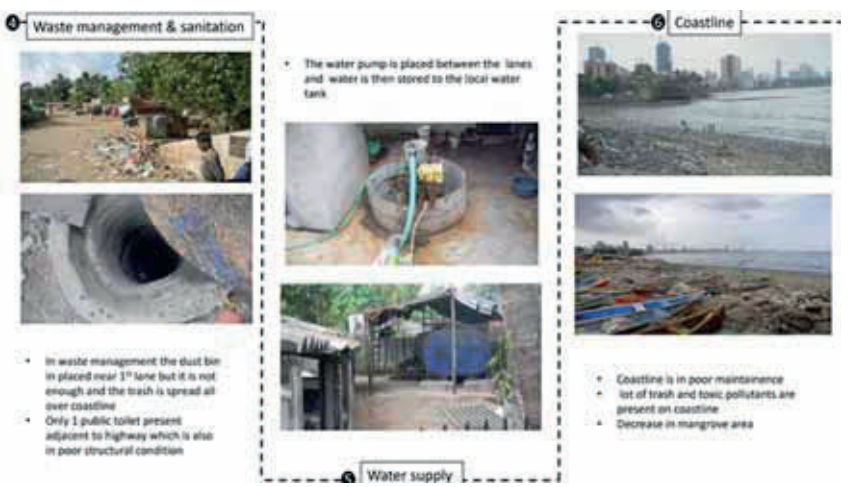

Figure 9: Mapping of Waste Management, Sanitation and Water Supply along the Coastline to understand overall conditions for Natural Disaster situation in Koliwada.

(Image: Yash K, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

3. Mahim Koliwada Narrative - The Physical Setting and Future Aspirations.

3.1 Population and Household Data

As per primary source (Mr. Vaibhav Koli, 30, Mahim Koliwada) the total population is around 15000 and its spread around five major areas in the vicinity of Koliwada. Five hundred families stays in our selected site which is facing the ocean and Mangroves, they are housed here in recent years as unauthorised slums. More than two hundred families are staying here from British era and they have huge houses with all the amenities along with commercial spaces.

3.2 Significance of Woman in Koli Community

As per essential source (Ar. Sanman Koli, 30, Thane Koliwada, Mumbai) Women assumes critical part in fishing local area, they are the most dynamic part in the family for fish drying and selling. Roughly 20% of absolute population stays in joint family and 80% in nucleated families.

3.3 Limitations to 'Open Access' and Land Economics

As per essential source (Ar. Sanman Koli, 30, Thane Koliwada, Mumbai) Fishermen in Mumbai's various Koliwada voiced their anxiety over the limitations on open admittance to the ocean laid by the Marine Fishery Bill, 2009. According to 1771 paper warning during British period British has given free admittance to fisherman in the ocean to 5 nautical miles however according to new bill there are limitations. Since the proprietorship feeling to the ocean has disappeared and it is the fundamental concern raised by angler.

They have spoken about their emotion that they would be eliminated from the seaside towns for setting up new enterprises or new structure activities to profit manufacturer entryway and industrialist in different stages. The sea shore the travel industry on the shores are creating to profit encompassing region populace, they are major league salary gathering and it would transform into vacation destination point for outsider too Indian traveller, because of which anglers would become outcasts in their own territory. Aside from this the open space was initially mangrove cover however because of infringement on location now we can see just 20% of unique cover.

3.4 Local Area Housing and Public Participation

The vast majority of the Koliwada redevelopment projects in Mumbai are portrayed by high land worth of the settlement region, here land financial matters assumes a significant part to create uncommon ocean confronting private or business regions. These proposition were worked by stakeholders in not many Koliwadas like Sion, Mahul and Masjid Bandar. Specialists like Maharashtra Housing and Area Development Authority, Mumbai Metropolitan Region Development Authority, Slum Rehabilitation Authority and similar authority can support the redevelopment of Koliwada, in the event that they own the rights over these terrains yet these grounds are claimed by Kolis and to build up that land specialists need assents from them. According to annexure II of DCR 33(10) of SRA arrangements, when assent from the major share (70% of complete existing apartments of that land package) is demonstrated by developers, at that point Slum Rehabilitation Authority plan can carry out on that specific land bundle.

Mumbai saw a sharp increment of more than 700% in land esteem between the times of 1966-1981. Post development during the 1990s, housing markets become more theoretical as land esteems shot up, inferable from the expanding request; hence, expanding land esteem multiple times somewhere in the range of 1998 and 2012.

As indicated by essential source (Mr. Girish Salgaonkar, Thane) Developers pulled in because of housing business sector of that land bundle and no center has been given to the local area necessities, which bobs back with the adverse consequence to the general development of that specific region and that is the reason Koliwadas/Gaothan/ Adiwasipadas are left lacking for such countless years.

4. Light on Natural Disaster Management aspect Environmental Impact and Coastal Zone Management Regulations

According to Maharashtra beach front Zone Management Authority this territory falls under CRZ-III, as Koliwada are viewed as uncommon arranging or special planning zone so they are not totally reliant upon CRZ standards for improvement.

According to Development Control and promotion Regulations 2034, Reconstruction/Redevelopment of Koliwada region Floor Space Index necessity for remaking/redevelopment of any property under Koliwada/adiwasipada so in our study

area DCPR 2034 gives freedom to add 0.5 additions FSI in permissible FSI of 1.5 that FSI will become 2.(MCGM. Development Control and Promotion Regulations 2034. Page 255)

Figure 10 &11: Costal Regulation Zone Mapping and all Mangrove Area Understanding in Mahim Koliwada.

(Figure 10: Siddhi Sanas & Mohit Shetty, Bharati Vidyapeeth College of Architecture, fourth year Housing Design Studio 2020, Studio Coordinators: Prof. Swapna Deshpande and Prof. Pritam Dey)

(Figure 11: source:https://mczma.gov.in/content/approved-czmp-greater-Mumbai)

Environmental law Considerations are really important to consider while planning for any site which are very close to CRZ that is why propose complete protection of mangroves in our site for considering criticality of site in disaster situations (Figure 10 and 11).

5. Why SRA Scheme only ?

SRA projects give wide scope of choices for any developers/designer to build up that land bundle at own expense however consequently it gives Transferable Development rights to the engineer. Essentially, Koliwada lands are not claimed by government neither one of them are totally individual Koli's inhabitants. As Koliwada is first and unique occupants of the city they request to the public authority to find way to save these networks.

(As indicated by essential source (Ar. Sanman Koli, 30, Thane) Koliwada people group is against Slum restoration plans since developers and builders alongside metro authorities have done a ton of harm to Koli local area in past, one of the model is mahul Koliwada and masjid bandar Koliwada. According to data, these settlements were moved under Slum Rehabilitation Authority plot long back and from ocean edge they have be moved to the city centre in chwal and Slum Rehab building which prompts word related misfortune to whole local area.)

5.1 Extract of Slum Rehabilitation Authority

1. Better arranging and Consideration close to mangrove territory for calamity the board. According to Slum Rehab guideline gives freedom to assemble any construction without taking conveniences and regular passageways in FSI estimation, which permits designer to fabricate more units around there. This will permit us to exhaust the plot close to mangrove inclusion and it will assist the improvement with battling against calamity like flood or tsunami a typical natural disaster circumstance close to the ocean.
2. Social foundation and conveniences like social gathering or skill development spaces Conveniences like Aaganwadi, wellbeing focus/station, local area lobby/ gym/wellness focus, ability improvement focus, ladies business venture focus, yuvakendra/library society office, Balwadi/s and strict constructions, social framework like School, Dispensary and Gymnasium run by Public Authority or Charitable Trust in the recovery segment not count towards the Floor Space Index even while processing reasonable Floor Space Index on location.

5.2 Exchangeable Development Rights (TDR)

TDR is a big reason for implementation of SRA scheme and its making all the schemes successfully. as by this mechanism developers are getting benefitted and that is why they are venturing into this business. There are two different types of TDR in the market as below:

a. Land TDR: Land TDR will go to the owner which means the Koliwada for creation of revenue for maintenance of the proposed structures (Figure 12).

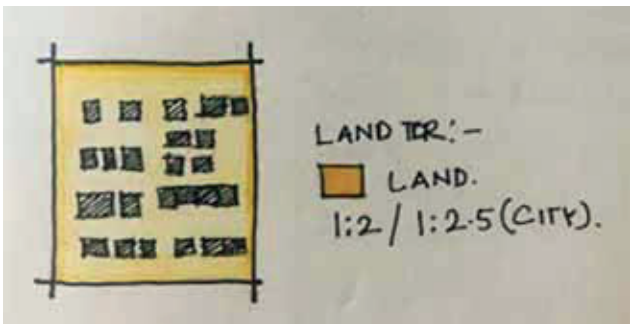

Figure 12 : Understanding Land TDR for Mumbai Slums.

(Image: Author Swapna Deshpande)

b. Construction TDR: Construction TDR usually goes with the developer who is developing the land parcel. the revenue will be generated for construction cost of the proposed area (Figure 13).

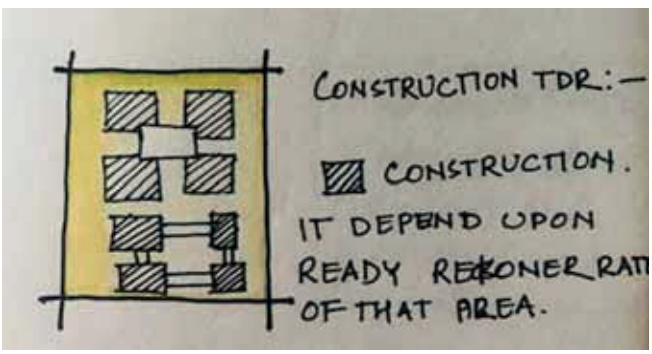

Figure 13 : Understanding Construction TDR for Mumbai Slums.

(Image: Author Swapna Deshpande)

6. Anticipated Model

We propose a participatory model where Government organizations alongside private land owner/Government land/Developer will build up a model which will profit Community more to be strength and which will protect the coastline mangrove. We are thinking about Slum Rehabilitation scheme arrangements for a similar where the thought has been given to conveniences simultaneously the various stakeholders who is giving prepared level/houses to the local area to our Koliwada will receive Transferable Development Rights consequently. We are attempting to approx same apartment size which is consistent, here we are discussing local area improvement and that will occur with suitable methodology.

The proposed model thinks about after as a the primary partners and attempt to set up an interrelationship between subject for a productive and versatile actual model of improvement:

1. Builder/Developer and Contractors
2. Fishing Community
3. Master Architects or Planner
4. Environmental Activist
5. Financial Support Agencies

6.1 Koliwada Redevelopment Representation

Stakeholder Map for Mahim Fishing Village Redevelopment Model (Figure 14)

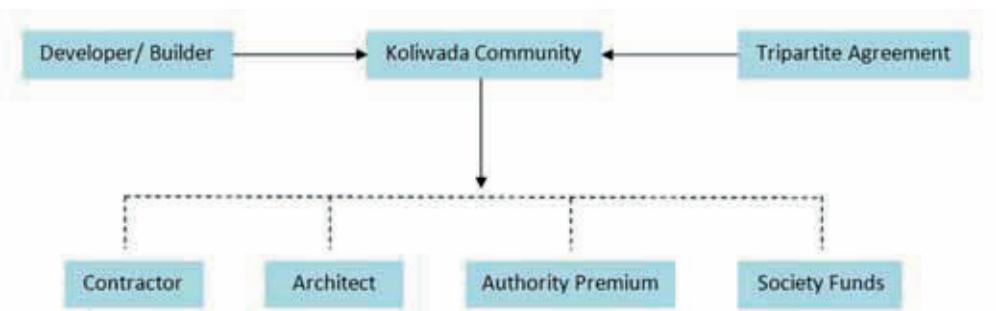

Figure 14: Participatory Model (Stakeholder Map for Mahim Koliwada Redevelopment) (Flow Chart: Author Swapna Deshpande)

- Preferences must to be considered for individuals of fishing local area.
- Sufficient society reserves.
- The habitable area to be larger or same.

Saleable component if any:

- To be chosen by the general public of Koliwada.
- Rate per sq. ft.
- Types of individuals.
- Size of flat.

In this model we examined the part of Koliwada local area as one of the partner and they will be one of the leader and will choose the prerequisite of local area around there.

Engineer will propel that land and would construct new structures for Koliwada according to standards, rules and guidelines yet they won't be proprietor of offer part. Consequently will get profited with TDR.

6.2 Highlights of Strategies

- Transferable Development Rights advantage will go to land developer, Land TDR and Construction TDR both.
- Half Sale component fund of Rehab Building would remain with Koliwada for local area improvement funds as society assets and half deal part will go to Developers.
- Take away from Slum Rehab Schemes would be social convenience spaces which are given in DCPR 2034 to generally speaking improvement of local area.
- Consideration to natural laws for catastrophe the executives of site.
- Open spaces plays important role during Natural Disaster on site as Koliwada is closely connected with sea and during rainy season it is necessary to provide solution for flood.
- Consideration for stilt design provision in over all site plan, stilt acts as parking space for many boat and it acts as water channel during flood, thus concept of floating village becomes impactful in our land use and structural plan.

Site is very versatile in summer it is a place for other commercial activities and winter is full of festive time where in rainy season fishing is prominent but same time safety of village houses and storage along with human. Floating village can become a village when we provide complete ground floor open, water can flow any way it want to and during normal days open ground can act as part space for boat and at some junctions community space too (Figure 15).

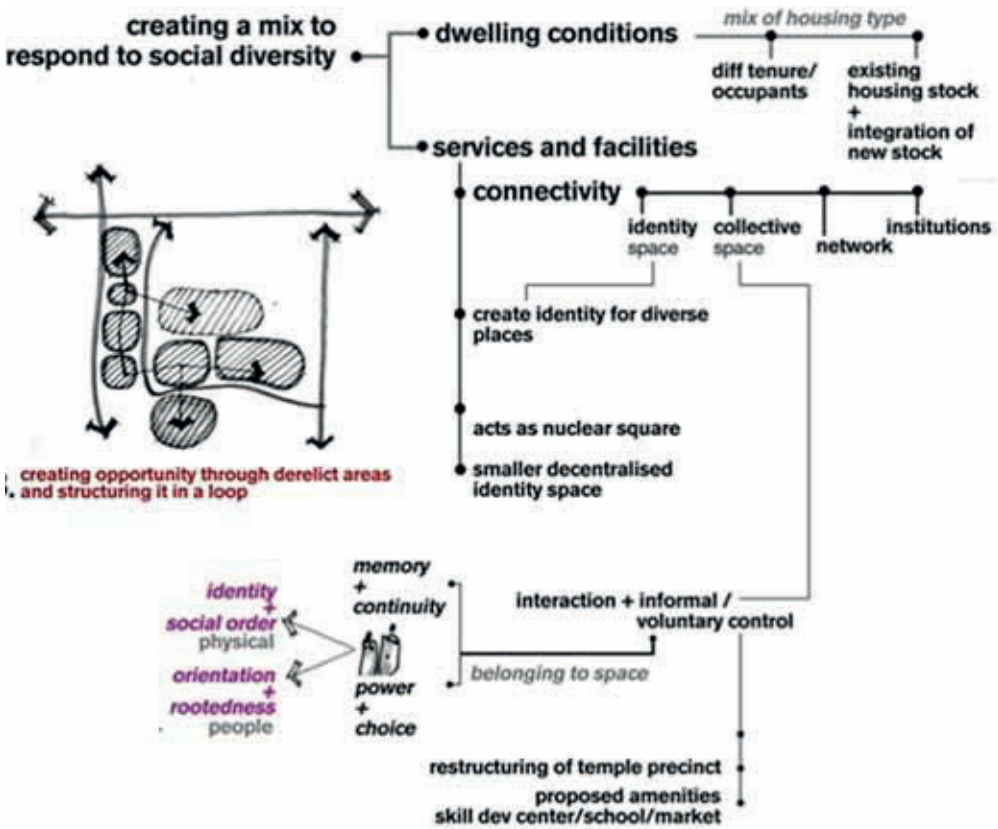

Figure 15: Understanding Community Network and its Dependency

(Images: Author Pritam Dey)

Figure 16: Creation of Informal Spaces for Gender Sensitive aspect.

(Images: Author Pritam Dey)

For the redevelopment of Mahim Koliwada its also important to consider:

a. Until collective cooperation between various stakeholders, re-development proposal is futile: There should be smooth co ordinations between various stakeholders as was evident from all the redevelopment attempts undertaken at Mahim. Until and unless every stakeholder arrives to a common conclusion and decide the course of the process it is practically impossible to achieve the common goal.

b. Reassert the important of bottom up approach of planning: Through the process of redevelopment of Mahim over 4 decades we have seen at every step there was a need of a bottom up approach of planning instead one size fits all concept of planning. The failure to realize all the schemes on ground was primarily because none of the developers and the government machinery thought about the context driven, community oriented redevelopment for MAHIM and it's a big lesson to be learnt from the process.

c. Until collective cooperation between various stakeholders, re-development proposal is futile: There should be a smooth co ordinations between various stakeholders as was evident from all the redevelopment attempts undertaken at Mahim. Until and unless every stakeholder arrives to a common conclusion and decide the course of the process it is practically impossible to achieve the common goal.

d. Need for consistent and real focus group discussions and consulting the community beyond just saying-thereby create an efficient local area planning framework: Though on the papers there was mentioned about community representation however on ground often the private developers who are appointed towards the redevelopment work never creates any direct engagement with community and also assess the land ownership records. This top down approach results in a poor understanding of the situation on the part of both developers and planners.

Figure 18: Infuse Social Dignity to Women and Create Choice

(Images: Author Pritam Dey)

Figure 17: Creation of Spaces for NGO, Vocational Training Centre, Community Programmes

(Images: Author Pritam Dey)

7. Conclusion

Are the working subalterns taken for granted in this hypercapitalistic and neo liberal society? If no, then what justifies the staggering inequality in the quality of life within a mile of radius of another Urban dystopia, Dharavi? The study of dharavi and failed attempts to redevelop the urban quarter proves the fact that unless everyday life, socio cultural aspects and economic factors of the proletariats and the working class in the city are legitimised and taken into consideration by the state,no degree of law and city can be in conjunction with each other. Tokenism is an important process in a bottom up approach of urban regeneration. "The question of the subject and subjectivity directly affects colonized peoples' perceptions of their identities and their capacities to resist subject/subjectivity the conditions of their domination, their 'subjection'." – Bill A., Gareth G., Hellen T, Post Colonial Studies (7th Edition, Routledge, 2004).

In the declaration of Descartes "I think, therefore I am", the centrality of human individuality was confirmed. It is important here to uphold the legitimisation of the proletariat group of the society, their collective identity and the very essence of their existence as part of the city as an important aspect in envisaging an urban regeneration by the state. Law of the state should be more humane and people centric reflecting the aspiration of the community for a seamless conjunction of the various socio-economic and cultural forces converging within a particular area, in this case Mahim Koliwada in the context of Mumbai city. It is also important to create an ecological planning taking into account the traditional knowledge systems and educating the community in the planning process so they becomes aware citizens.

Acknowledgement

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Governance and Public Health: Indian Response to COVID-19 Disaster

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Abstract

COVID-19 has descended as a "black swan" marking a turning point in human existence. "Black swan" is a metaphor used to describe a rare and shocking event having a catastrophic impact. 2020 has been of uncertainties all around the globe. India recorded its first COVID-19 case on 30th January in Kerala. The cases amplified very swiftly before going into lockdown in late March, the country had reported 360 confirmed cases and 7 deaths. On 15th November, 2020, the tally stood at 88,45,616, including over 1,30,109 deaths. This paper attempts to analyse the role of government in planning and dealing with COVID-19 disaster. The study has used primary and secondary data sources. It also tries to bring into light the infrastructural shortage in health which needs to be rectified and put in order to deal with future events of such scale and magnitude. The pandemic has taught the importance of basic saying that "health is wealth". We have incorporated some suggestions which are in sync with international agreements such as Sendai Framework for Disaster Risk Reduction and Sustainable Development Goals. Public health has been focussed upon in all these agreements.

Keywords: *COVID-19, Disaster, India, Health Infrastructure, Government's Response*

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1. Introduction

COVID-19 is a zoonotic (transmission from animals to humans) and infectious disease which was first identified in Wuhan, China and has since become a health disaster all over the globe (UNEP, Wang Z et al. 2020, WHO 2020). As per UNEP Frontiers Report, 2016, around 60 per cent of all infectious diseases in humans are zoonotic (Woolhouse, M.E.J. and Gowtage-Sequeria, S, 2005) as are 75 per cent of all emerging infectious diseases (Taylor, L.H et al., 2001). Previous strains of several corona viruses have been known to cause respiratory infections ranging from common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) in humans (WHO, 2020). On an average, one new infectious disease appears in humans at an interval of 4 months (UNEP, 2016).

On 11th March 2020, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) a pandemic (Son KB et al., 2020). As defined by WHO, a pandemic is "an epidemic that occurs globally or over a very large area, crossing international borders and usually affecting huge number of people". Within months, it caused an unparalleled turmoil in the lives of people by affecting their health and socio-economic conditions (R Djalante et al, 2020). COVID-19 affected almost every country in the world within three months of its first reported case. The widespread scale of the outbreak called for coordinated efforts from all countries. World's highest health body, WHO released its first situation report on 21st January, 2020. After that, daily and weekly reports have been released to update people all over the globe with current developments. Total confirmed cases recorded on 20th Jan, 2020 were 282 with 6 casualties which spiked to 5,49,11,612 confirmed cases with 13,25,346 deaths from around 220 countries and territories by 15th November, 2020. (Table 1). Country wise, United States has been the worst affected followed by India and Brazil (Table 2). The virus got spread like wildfire. India is the second most populous country in the world and the largest in South Asia with a population of nearly 1.38 billion, therefore, risk of potential infections and deaths are more. Lockdowns, curfews, emergency like situations, closure of country borders, massive airport screenings, quarantines, and physical distancing have become the new normal all over the world.

Table 1: Confirmed COVID-19 Cases

Timeline	Total Confirmed Cases	Total Deaths
15 Nov	5,49,11,612	13,25,346
15 Sep	2,94,08,424	9,31,167
15 Jul	1,31,50,645	5,74,464
15 May	43,38,658	2,97,119
15 Mar	1,53,517	5,735
20 Jan	282	6

Source: WHO COVID dashboard and John Hopkins University

Table 2: Distribution of COVID-19 Cases

Country	Total Confirmed Cases	Total Deaths
USA	1,09,62,835	2,45,933
India	88,45,617	1,30,109
Brazil	58,63,093	1,65,811

Source: WHO, Situation Reports

World Health Assembly in 2011 had rightly stressed upon the point that health hazards and its related disasters could be dealt with and avoided effectively only when the health system of a country is well equipped. The International Covenant on Economic, Social and Cultural Rights, 1976 and the recent Sustainable Development Goals (Goal 3: Good Health and Well Being) lays emphasis on importance of health. Healthy people are pre-requisites for prosperous nations. The Sendai Framework for Disaster Risk Reduction's (SFDRR) goal is to reduce disaster (technological, biological and environmental) risk and losses as well as the laying of the foundation stone for a speedy and sustained recovery and sustainable development (UNISDR 2015, R Djalante et al. 2020). Epidemics and pandemics are grouped into biological hazard category in the SFDRR (UNISDR, 2015). Importance on focussing on health was stressed upon in Sendai Framework and all the stakeholders were suggested to act upon it. Countries should realise that healthy environment and healthy people go hand in hand (UNEP, 2016). The World Health Organization (WHO) defines public health as "all organized measures (whether public or private) to prevent disease, promote health, and prolong

life among people as a whole" (Acheson, 1988). "Global public health" connotes globalisation effects on health as cross border health risks have increased because of increase in communication and trade (Virginia Murray et al. 2015). The role of "science" has been effective in reducing infectious diseases (HIV, Tuberculosis) in public health system across the globe (CDC 2011, Basher 2013).

2. Methodology

2.1 Data Sources

Primary and secondary data sources have been used to complete the present study. A questionnaire survey was conducted online using google form where 406 responses were collected (zip file inserted in the end). Secondary data sources include various portals as well as reports published by the government. Global data regarding coronavirus cases has been taken from (https://COVID19.who.int/) and World Health Organisation as well as John Hopkins University website. State wise confirmed cases and testing have been taken from https://www.COVID19india.org/, https://www.mohfw.gov.in/ and https://nidm.gov.in/COVID19/ministries.asp. Total sample data has been collected from (Indian Council of Medical Research (ICMR)) website and The Press Information Bureau (PIB) bulletin of Ministry of Health and Family Welfare. Various newspaper articles have also been referred to know about the latest updates on COVID-19. National Health Profile-2019 report has been used to get state wise hospital beds (government hospitals only) and number of doctors as well as trends in public expenditure on health. Various countries expenditure on health has also been compared to get an idea where India stands. Policy aspects of government have been taken from The Epidemic Diseases Act (EDA) and National Disaster Management Act (NDMA, 2005).

2.2 Methods

Purposive Random Sampling technique was used to select respondents. People's perception on issues of governance and disaster management was collected by conducting a questionnaire survey online through google forms. A total of 406 responses were received which comprised of academicians (45.6 per-cent), researchers (36.3 per-cent) and working professionals (18.1 per-cent). Primary data was analysed with

the help of charts and graphs. Secondary data sources were used to assess the health infrastructure and compared with confirmed COVID-19 cases. International standard guidelines regarding health have been highlighted and how India faired comparatively has been mentioned. Illustrative charts have been used widely for easy readability. Numbers at times can be confusing but illustrations are easy to interpret.

2.3 COVID-19 Spread in India till mid-November

India registered its first case in last week of January in the state of Kerala. Till 15th March, 2020 cumulative confirmed cases in the country were 112 with 1 fatality. Till mid-July, 2020, 9.7 million cases were recorded. The country recorded 88,45,616 cases and over 13,000 deaths by 15th November, 2020. We have divided the country into 5 zones for better comparative analysis of spread of COVID-19. North zone includes states and Union Territories (UT) of Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Uttar Pradesh, Uttarakhand, Ladakh and Chandigarh. West zone consists of Dadra and Nagar Haveli and Daman and Diu, Goa, Gujarat, Rajasthan and Maharashtra. East zone has Bihar, West Bengal, Odisha, Chhattisgarh and Jharkhand while states of Karnataka, Andhra Pradesh, Telangana, Kerala, Tamil Nadu, Puducherry and Andaman and Nicobar Islands (UT) lie in South zone. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are grouped in North-East zone. The initial cases were recorded from southern states and these states had the maximum number of infected people till 15th November, 2020. Number of casualties were more in Western states (Table 3). Sate wise total confirmed cases, recovered and casualties has been plotted with the help of a bar chart. With 17,47,242 COVID-19 cases, Maharashtra reported the largest number of infections, followed by Karnataka (8,61,647) and Andhra Pradesh (8,54,011)till 15th November, 2020. According to Health Ministry of India, age group above 60 years recorded 63 per-cent casualty while 30 per-cent mortality was shown among people aged 40-60 years (K Ghosh et al., 2020).

Table 3: Zone-Wise Categorization of Cases in India

Zones	15-Mar		15-May		15-Jul		15-Sept		15-Nov	
	Total Confirmed Cases	Total Deaths	Total Confirmed Cases	Total Deaths	Total Confirmed Cases	Total Deaths	Total Confirmed Cases	Total Deaths	Total Confirmed Cases	Total Deaths
North	41	1	17143	281	209034	5317	846423	14531	1561988	24931
West	36	0	43795	1799	350234	13558	1348393	35237	2210558	52507
East	0	0	6104	238	78616	1316	664113	6755	1283724	13927
North-East	0	0	264	3	25926	61	193873	817	308337	1836
South	35	1	15551	193	285192	3995	1871178	22931	3297082	33818
INDIA	112	1	85856	2753	970169	24929	5018033	82091	8845617	130109

Source: Compiled by Author using data from https://www.COVID19india.org/

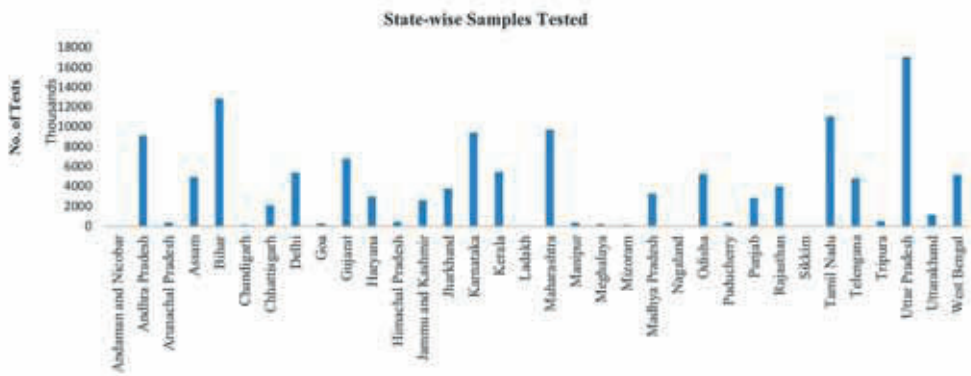

Figure 1: Total No. of Samples Tested

Source: Compiled by Author using data from https://www.COVID19india.org/

2.4 Indian Government's Policy Response

The World Health Organization recommended that countries should actively test, track and isolate as many cases of COVID-19 as possible to contain its spread. Testing showed the rate of infection. Laboratory approved cases are considered as confirmed. This means that the number of confirmed cases would depend on how much a country was actually testing. No data is available without testing. Without data on who is infected with

the virus, we cannot plan for the aggravating pandemic. WHO Director General Tedros Adhanom Ghebreyesus had said that the world needs to "test, test and testTest every suspected case (July, 2020)." Coronavirus cases in the country were on a continuous rise. WHO in its Guidance Note on "Public Health Criteria to Adjust Public Health and Social Measures in the Context of COVID-19" had advised that a country needs 140 tests per day per million population. 22 States/UTs in India were already conducting 140 and more tests per day per million according to PIB updates released on 15th July, 2020 (MoHFW, 15th July, 2020). As per Government of India, total samples tested up to 15th November, 2020 were 13,36,14,975 (Figure 1). For detecting COVID-19, the country was mainly using Antigen, True Nat and real-time-polymerase chain reaction (RT-PCR) test method along with various other tests introduced by the Health Ministry. India did implement its policy of "test, track and treat" to contain the spread of coronavirus. That is why the low fatality rates and higher recovery rates than all the other countries in the world were recorded in 2020.

2.5 COVID-19 Timeline in India

India issued its first travel advisory for people flying to China on 17th January, 2020. The country finally suspended all international travel on 22nd March, 2020 which was also observed as Janata Curfew. This was the time around which almost 150 countries over the world had confirmed cases of corona virus (Table 4). India had recorded 360 confirmed cases and 7 deaths till 22nd March, 2020. Prime Minister declared a complete lockdown for 21 days on 24th March, 2020. He reportedly declared that the lockdown applied to "every district, every lane, every village", and warned about the severity of the pandemic by informing citizens that "If you can't handle these 21 days, this country will go back by 21 years". The lockdown was further extended till 3rd May, 2020 and then till 31st May, 2020. "Phased Unlocks" started from 1st June, 2020. These lockdowns varied with one another in the form of rules and regulations. After that lockdowns were followed by phased re-openings of places in the country based upon various criteria (Figure 2). These criteria's were zonal classifications by the government itself.

Table 4: Chronology of Covid-19 events

30 January, 2020	• First COVID-19 case confirmed by Ministry of Health and Family Welfare in Kerala (a student who arrived from Wuhan, China).
03 March, 2020	• Travel ban imposed by India to China, South Korea, Italy and Iran.
10 March, 2020	• Kerala government closed educational institutions and cancelled all public functions until 31st March. • India's tally of coronavirus cases reached 50 (MoHFW).
12 March, 2020	• India reported its first COVID-19 death. • WHO declared COVID-19 outbreak a pandemic.
14 March, 2020	• Government of India declared COVID-19 a "Notified Disaster".
15 March, 2020	• 112 coronavirus cases reported in the country. • All para military forces ordered by the government to keep quarantine camps ready for virus suspects.
16 March, 2020	• Central government recommended closing of all educational institutes till 31st March. • Social distancing measures suggested by the government as precaution against the virus.
17 March, 2020	• ASI closed 3000 monuments and 200 museums in wake of increasing cases. • Health experts pointed out that India had entered the second stage of transmission of Coronavirus.
19 March, 2020	• No plying of commercial international flight in India for one week from 22nd March.
21 March, 2020	• Rajasthan declared lockdown till 31st March, 2020.
22 March, 2020	• The country observed Janata Curfew. • Railway suspended all trains till 31st March. • Gratitude offered to all people supplying essential services during ongoing pandemic by clapping and clanging utensils as called for by the Prime Minister.

24 March, 2020	• Centre imposed 21 days lockdown all over the country. • Coronavirus cases touched a total of 512 as per MoHFW.
07 April 2020	• Train services suspended further till 30th April, 2020.
09 April	• Odisha became the first state to extend lockdown till 30th April.
14 April	• Lockdown extended till 3rd May in whole country.
17 April	• COVID-19 rapid testing done by Rajasthan.
01 May	• Lockdown extended till 17th May. Ministry of Home Affairs announced relaxation in green and orange zones. • Shramik special trains for migrants started by Railways.
04 May	• The country entered third phase of lockdown
07 May	• India recorded 52,952 confirmed cases.
17 May	• Government extended lockdown till 31st May in the country. India became the first country to impose such longest lockdown.
19 May	• 100000 confirmed coronavirus cases in the country.
08 June	• Phased reopening began after 75 days lockdown.
01 July	• Unlock 2.0 started. Coronavirus cases exceeded 600000 mark.
14 July, 2015	• WHO warned that pandemic could get worse and worse if precautionary healthcare steps are not followed by world.
15 July	• ICMR issued statement that human trial of COVID-19 vaccine initiated in India, • World's most affordable COVID-19 diagnostic kit Corosure developed by IIT Delhi launched by HRD Minister.
17 July	• COVID-19 cases reached more than 10 lakh.
01 August	• Unlock 3.0 started. Gyms and yoga centres opened. Night curfew revoked.
11 August	• "Sputnik V" vaccine by Russia approved for civilian use.

26 August	• India started trials of Covishield started by Serum Institute of India.
29 August	• Centre issued Unlock 4.0 guidelines
07 September	• India reached second spot in the world to record COVID-19 infections.
14 September	• Monsoon session of Parliament began.
19 September	• DGCI approved the "Feluda" COVID-19 test for commercial use.
21 September	• Schools reopened with terms and conditions in many states.
22 September	• 80.86 percent recovery rate recorded.
30 September	• Unlock 5.0 guidelines issued. Cinemas and multiplexes were opened with 50 percent capacity from 15th October.
12 October	• Government briefed that India recorded declining trend in active COVID-19 cases.
15 October	• Doubling time of cases were nearly 73 days in India.
23 October	• Total test count in India stood at 10 crore.
31 October	• India's death rate fell below 1.5 percent.
08 November	• India reported less than 40,000 daily new cases.
20 November	• 50,000 Ayushman Bharat Health and Wellness Centres functional in the country.
25 November	• Almost 13.5 crore tests done.
28 November	• Maharashtra, Delhi, Kerala, West Bengal, Rajasthan, Uttar Pradesh, Haryana and Chhattisgarh contributed around 69 percent of daily new cases.

Source: Compiled by Author from various sources such as PIB and ICMR

Figure 2: Criteria for Zone Classification

Legal regimeis important in emergency situations as it describes the scope of state's response to public health emergencies and the duties and rights of its citizens. The Indian Constitution has no provision for environmental or public health Emergencies as the Epidemic Diseases Act, 1897 does not clearly define the purview of "epidemic disease."(The Statesman, April 30, 2020). The government invoked two laws, the Disaster Management Act and the archaic Epidemic Diseases (ED) Act to manage and control COVID-19 situation. In India, health is a state subject. The Centre holds greater administrative power (decision on national and international trade and travel, testing strategy and imposing or relieving lockdowns) while the states bear most of the administrative responsibility in tackling COVID-19 situation on ground. The country has three-tiered public health infrastructure. Ministry of Health and Family Welfare is the nodal agency at central level for implementing health programs and allied activities (Figure 3). Integrated Disease Surveillance Project (IDSP) tracks trends in incidences of communicable and non-communicable diseases across the country. It has been doing the same and releasing bulletins during the COVID crisis.

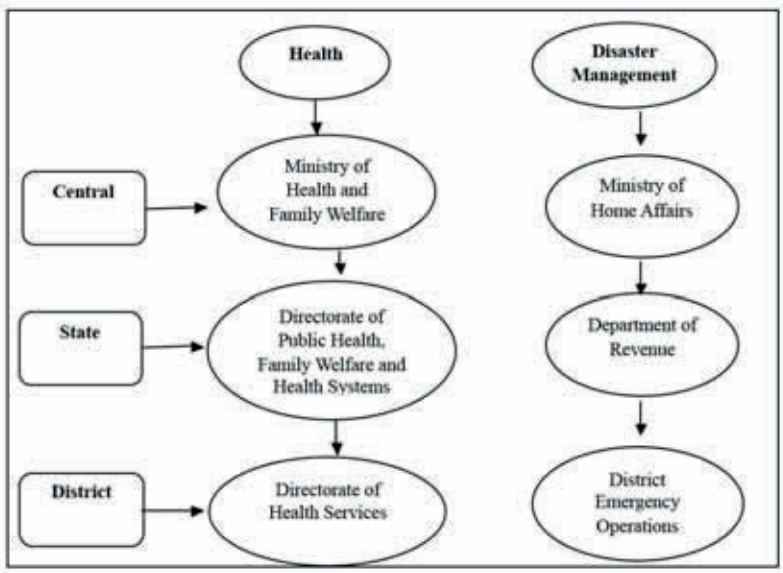

Figure 3: Health and Disaster Management

Source: Author.

The Ministry of Home Affairs issued an order citing the Disaster Management Act, 2005 which authorized the Union Health Secretary for better management and control of COVID-19. The "nationwide lockdown" was imposed under Section 10 of the National Disaster Management Act (NDMA). The government ordered the states to implement The Epidemic Diseases Act, 1897 to execute the advisory effectively (The Print, 23 March, 2020). Quarantine and mandatory screening rules were ordered under the ED Act by the states.

The National Disaster Management Authority (NDMA) issued various notifications to implement the provisions of the Disaster Management Act, 2005. When lockdown was imposed in the country, several states under the ED Act, 1897 passed the COVID-19 Regulations, 2020.

Section 144 of the Code of Criminal Procedure, 1973 was used to impose restrictions on assembly and movement of people within and among states. Religious freedom was also curtailed to limit public interaction.

Under section 2 of The Epidemic Diseases Act, 1897, Himachal Pradesh government announced The Himachal Pradesh Epidemic Disease (COVID-19) Regulations, 2020,

the Delhi government announced The Delhi Epidemic Diseases COVID-19 Regulations, 2020, and the Government of Maharashtra announced The Maharashtra COVID-19 Regulations, 2020 where particular measures have been taken by these states to tackle and control the pandemic.

The Epidemic Diseases (Amendment) Bill, 2020 was introduced on 14th September, 2020 in the Rajya Sabha to amend the original Act of 1897. This had provisions for healthcare workers who are in the frontline fighting with the deadly virus and saving people's lives. The Act also described "act of violence" against healthcare workers and the punishment it will draw for the said offence.

The Integrated Disease Surveillance Programme has been activated as a response to the pandemic by the Centre. It was launched by the Ministry of Health and Family Welfare, in assistance with the World Bank in 2004. The government has a dedicated website https://www.mygov.in/COVID-19/ to provide country wide data as well as updates to the citizens (Figure 4).

Figure 4 : Screenshot of Front Page of COVID-19 website of Government of India

India developed for the first time a Participatory Disease Surveillance (PDS) model to track coronavirus based on mobile location with the name Aarogya Setu which translated to "A bridge to health" in Sanskrit. Participation of people was said to be voluntary initially, however, several states made it compulsory afterwards (Singh S. 2020, Garg, S. et al., 2020). Social protection support and fiscal stimulus packages were adopted by the Government. Rupees 20 lakh crore (10 percent of India's GDP) were allocated under economic package which aimed at making the country self-reliant

and voicing for locally manufactured items under "Atmanirbhar Bharat Abhiyan" in the post-COVID world. As COVID cases started to expand its footprint all over the country, the government strengthened its infrastructural capacity. There was only one testing lab at Pune in January which was rapidly increased to 1223 by mid-July. Dedicated COVID Hospitals were set up and ventilators capacity increased to support the patients (Table 5). Dedicated COVID Hospitals were meant for severe cases. Dedicated COVID Health Centres dealt with moderate assigned cases while mild/very mild/COVID suspect cases were treated in Dedicated COVID Care Centre.

Table 5: COVID-19 Infrastructure

Dedicated COVID Infrastructure	15 May	15 July
Dedicated COVID Hospitals	919	1,378
Dedicated COVID Health Centres	2,036	3,077
Dedicated COVID Care Centres	5,739	10,351
Ventilators	18,855	21,738
Total Labs for Testing	509	1,223

Source: Compiled from Ministry of Health and Family Welfare Data.

3. Results and Discussions

3.1 Government Policies and Programs

Most of the respondents agreed that the government was successful in making people aware about the virus and its effects (Figure 5) For example, the government widely used Information and Communication Technology (ICT) tools to inform its citizens about the communicable disease and precautions required to stay safe. Of all the respondents, 60.3 percent people did know about Aarogya Setu app while 27.3 percent were confused about it (Figure 6). However, they also felt that health machinery requires more improvement in dealing with COVID crisis (Figure 7). As per WHO guidelines,

there should be one doctor for every 1,000 people. However, Bihar has one allopathic doctor for 43,788 people which describes the abysmal situation of healthcare in some states. Delhi had one doctor for 2,208 people. However, all the states failed to meet WHO criteria on doctor-patient ratio.

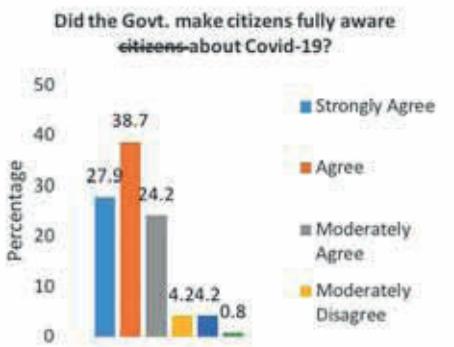

Figure 5: Perception of People about Govt. Initiatives

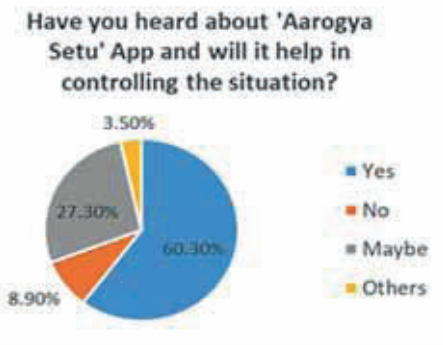

Figure 6: Awareness about "Aarogya Setu" app

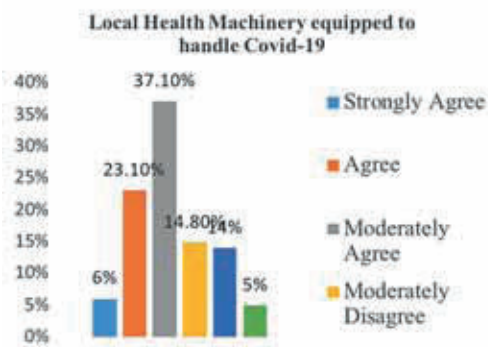

Figure 7: Local Health Machinery and COVID-19

Figure 8: Government's Role in Pandemic

About 40.3 percent respondents ranked the government as moderately accountable in managing the pandemic while 36.3 percent answered that the government was highly accountable (Figure 8). This showed that people had faith in their elected government. India scored 100/100 in Oxford University's Tracker Measuring Governments' Response to COVID-19 which was published on 11th April, 2020. However, this tracker is not an absolute one since some countries which flattened the curve didn't even get a place in this index.

3.2 Social Aspects and Disaster Management

However, when asked whether they were prepared for the sudden lockdown announced, same number of people affirmed and negated it (Figure 9). One limitation might be that the respondents were basically academicians and might be well off economically than poor people and hence the answer. Almost 70 percent people agreed that people are panicking and scared because of loss of livelihood (Figure 10). Daily earning is a crucial factor in a country like India where people live from hand to mouth. Approximately, 46.4 percent respondents strongly opined that hunger and poverty are a bigger threat than the virus to marginalised people during lockdown (Figure 11). The lockdown had severely impacted the lives of daily wage earners.

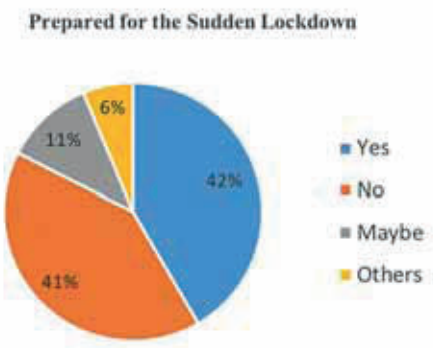

Figure 9: Whether prepared for Sudden Lockdown?

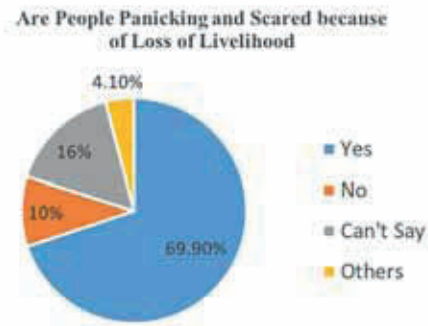

Figure 10: Lockdown and Livelihood

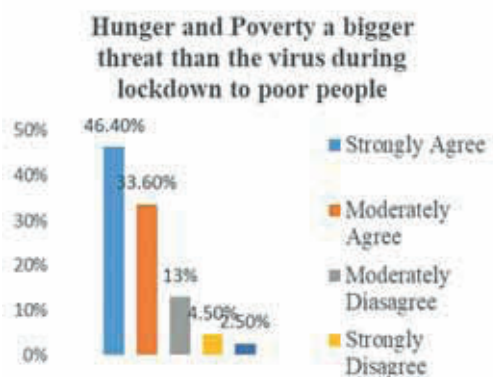

Figure11: Hunger, Poverty and Lockdown

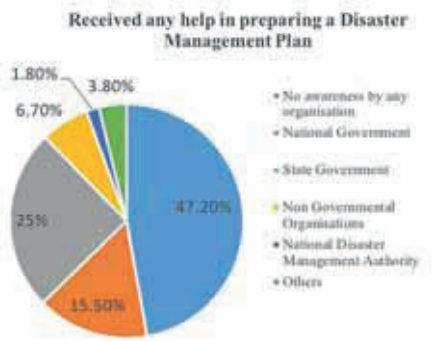

Figure12: Awareness about any Disaster Management Plan

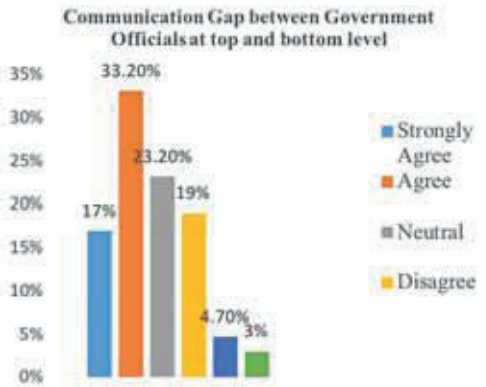

Figure 13: Communication Gap

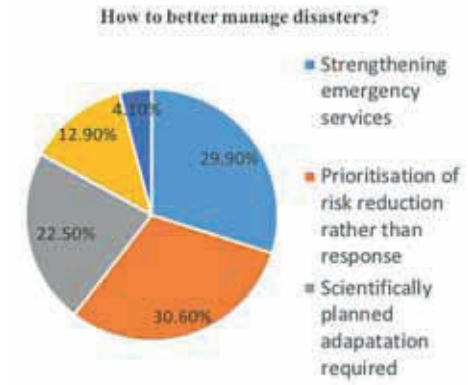

Figure 14: Disaster Management

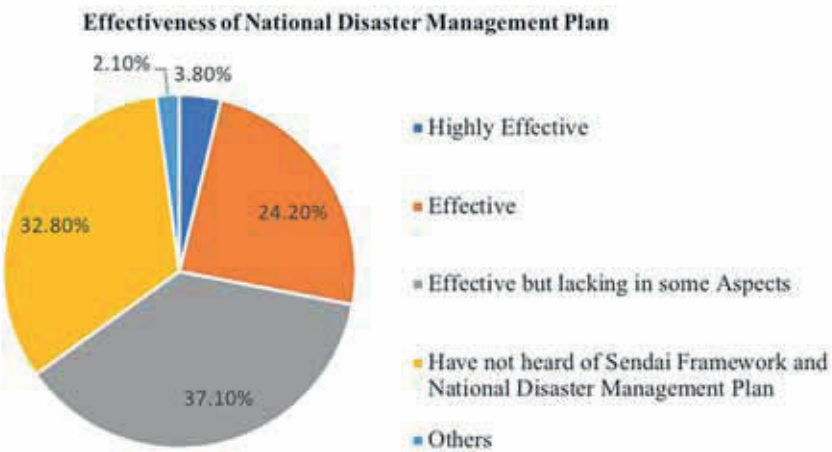

Figure 15: Effectiveness of Disaster Management Plan

Even though the country is prone to hazards, disaster management awareness and training is comparatively very low. Out of total respondents, 47 percent people have never received any awareness by any organisation during or before any disaster which is shocking. Almost 15.5 percent samples have received assistance from national

government and 25 percent from state government while 1.8 percent received information from National Disaster Management Authority (Figure 12). Approximately, 33.2 percent respondents felt that there exists a communication gap between government officials at top and bottom level (Figure 13). This might be the cause why policies lack proper ground implementation. When asked how disasters can be managed effectively, majority (30.6 percent) insisted on prioritisation of risk reduction rather than response followed by (29.9 percent) strengthening emergency services and 22.5 percent said that scientific planned adaptation is required (Figure 14). Figure 15 shows that more awareness about Sendai Framework and National Disaster Management Plan needs to be done to better and effectively manage disasters at community level.

4. Suggestions

Health systems cover all the health agencies in a country and these are interconnected and organised for better functioning. Consistent efforts are made to improve the quality and functioning of these life-saving organisations by their respective governments (WHO 2007).

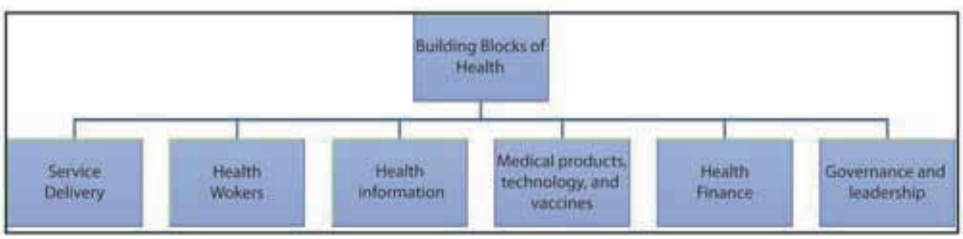

Figure 16: Building Blocks of Health

Source: WHO

Human resources and health infrastructure form the most important component of public health. Having sufficient number of people with the right combination of skills and appropriate use at different levels of health care is important to ensure effective medical care for the people. Infrastructure is an important indicator for understanding the health care delivery provisions and welfare mechanism in a country. As per National Health Profile, 2019 the highest number of doctors are in the state of Maharashtra

(1,73,384) followed by Tamil Nadu (1,33,918) and Karnataka (1,20,261). Maximum number of beds in government/public hospitals are in the state of Maharashtra (51,446), Karnataka (42,656) and Tamil Nadu (38,326). According to the latest data from the Organization for Economic Cooperation and Development (OECD), India has 0.5 beds per 1,000 people compared to 0.4 in 2009, but it is one of the lowest among all the countries surveyed by the OECD. China has 4.3 hospital beds per 1,000 people while the United States has 2.8 as per the same survey of OECD. However, the most number of confirmed coronavirus cases have also been observed in the states of Maharashtra, Karnataka and Andhra Pradesh (MoHFW, 15 Nov, 2020).

The most effective way to prevent COVID-19 infections and save lives is breaking the chains of transmission which can only happen if testing rate is increased. Vaccination is considered as an effective tool in saving lives. This would require a standard healthcare system in place comprising of adequate infrastructure, trained doctors, nurses and other essential service providers. The World Health Assembly designated 2020 as the International Year of the Nurse and the Midwife. These people are fighting the frontline war against the virus and acting as a shield for the general public.

4.1 Improving Health Diagnostics and Infrastructure

As health is a state subject, Union government's role could, at best, be advisory and coordinating in nature (Economic Times, 14 April, 2019). Public Health (Prevention, Control and Management of Epidemics, Bio-terrorism and Disasters) Bill 2017, proposing to repeal the Epidemic law of 1897, if passed by Parliament should have been more apt and justifiable during the ongoing epidemic.

The NDMA, along with the National Disaster Response Force (NDRF), did India's first full-scale biological management emergency mock drill at Patna airport in the summer of 2018 to spread awareness among the masses about biological disasters but it was a one-time story. No follow up happened after that. National Health Profile-2019 data has shown that total number of government hospital beds available in India are 7,35,917. This means that per capita hospital beds in India is 0.55 per 1,000 population (K. Ghosh et al., 2020, Ray et al., 2020). As per a report by the Centre for Diseases, Dynamics, Economics and Policy, Washington, India has huge shortage of 6,00,000 doctors and 2 million nurses.

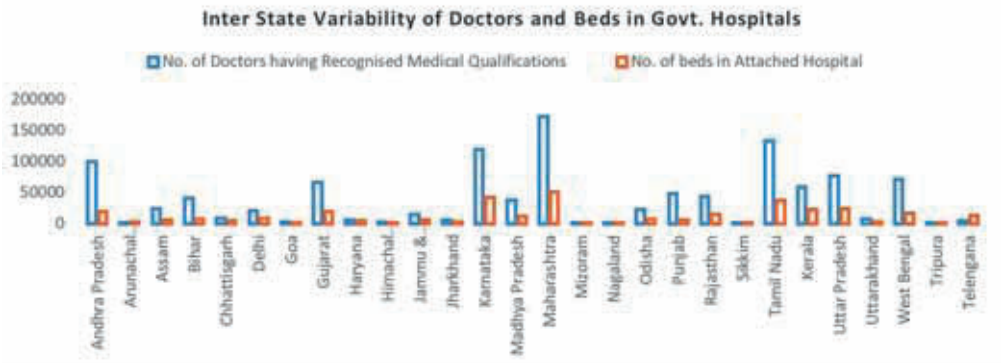

Figure 17: Inter State Variability of Doctors and Beds in Government Hospitals

Source: Data from National Health Profile, 2019 and CDDEP, 2020

Since government hospitals charge a nominal fee as compared to private ones, majority of the population prefers these hospitals to avail the benefits of Public Distribution System. National Health Profile showed that most of the states need to expand their health infrastructure to meet global targets. Number of beds were not sufficient and thus to tackle this issue, dedicated COVID infrastructure was established by the government.

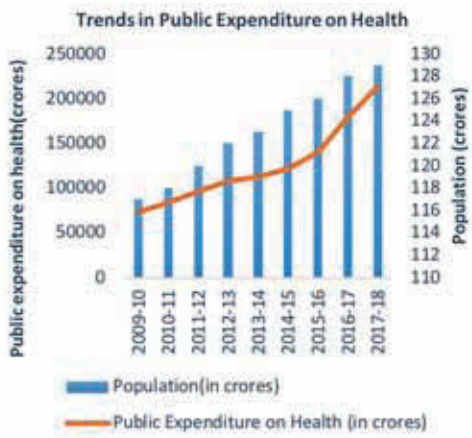

Figure 18: Expenditure on Health

Source: Data from National Health Profile, 2019

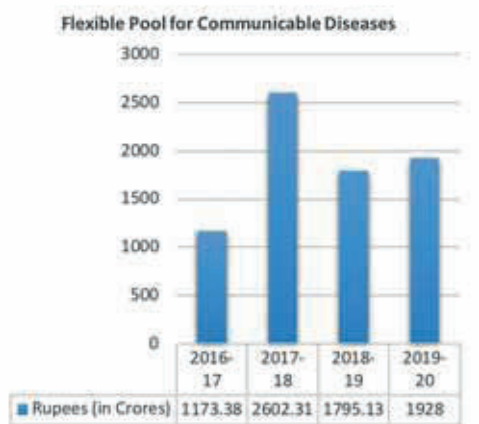

Figure 19: Funds for Communicable Diseases

Source: Data from National Health Profile, 2019

The country has more than 1.3 billion people. Population numbers have been increasing but investment in health has not been up to the mark (Figure 18). This clearly shows that governments were not responsible while planning for health. Flexible pool of funds for communicable diseases was highest in 2017-2018 when compared for time period between 2016 to 2020 (Figure 19).

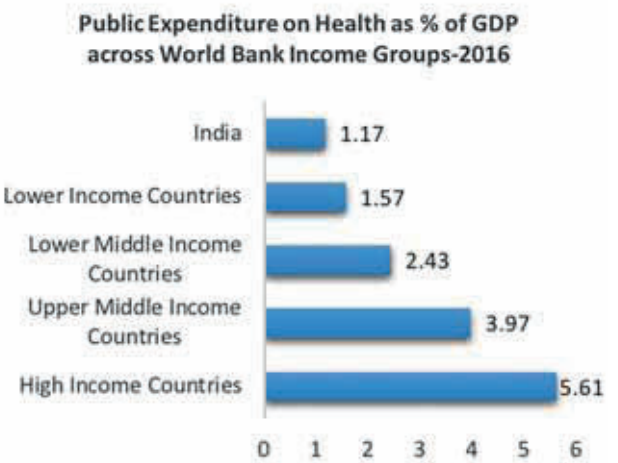

Figure 20: Comparison of Funds Allocated by Countries on Health.

Source : Data from National Health Profile, 2019

India has been categorized as a Lower Middle Income Country by World Bank but its expenditure on health is almost half of its other counterparts in the same category. National Health Profile-2019 shows that India spent 1.17 percent of its GDP on health as compared to other Lower Middle Income Countries who spent 2.43 percent (Figure 20). President of Public Health Foundation of India, Prof. K Srinath Reddy put forward that COVID-19 cases in India might peak in mid-September only if all suggested precautions are followed by people combined with government actions. His suggestions included social distancing and wearing masks which were to be followed strictly by the public. He also talked about government actions and measures regarding boosting of health infrastructure in the country which could act as the main tool in combating the deadly virus.

4.2 Adaptive Development

Adaptive development alleviates climate change risks without compromising the well-being of people and their ecosystems. This uses incentives, institutional help and information-based policies to address the various components of climate risks (Agarwal and Lemos, 2015). Adaptive development relies on bridging gaps in climate adaptation to reduce the risk of sudden shocks or disruptions that occur slowly. This becomes very important for a country like India where considerable number of people fall below poverty line. 25.7 percent people in rural areas and 13.7 percent in urban areas are estimated to be poor (Planning Commission, 2011-12).

COVID-19 makes us realise that how important sustainable development is to mankind. The world has almost turned upside down in the year 2020. Countries will try to meet their growth targets as soon as the virus gets eliminated. This might bring pollution and emission levels to pre-COVID times. Clean air, water and oceans with countless free movement of birds and animals are not expected to exist in the post-COVID world. Arguments for declining consumption also do not hold ground seeing continued poverty. Adaptive development can be an answer in dealing with these chronic socio-economic problems. Agarwal and Lemos offer solutions that are compatible with adaptive development, such as safety nets for migrant workers, protection of agricultural land, promotion of crop diversification, subsidies for sustainable use of water and land, etc. Although they are also promoted in the context of climate adaptation, adaptive management must generally integrate them into development options. Raghu Murtugudde, a professor at the University of Maryland is of the view that "Adaptive development would naturally sustain the ability of both the government and the society to respond rapidly and effectively to shocks such as COVID-19."

Adaptive development is in sync with Sustainable Development which the world is aiming at. Growth and development would be achieved without causing much damage to natural resources. For a country like India with variable climatic features, achieving economic development is a basic necessity for the survival of its citizens. Adaptive development would help in livelihood options with dignity.

4.3 Human Rights Context

The World Health Organisation has stressed upon the importance of respecting human rights while managing the COVID-19 crisis. India has approximately 139 million migrant

population (Census of India, 2011). Migration of workers were highest than ever recorded till date in India (Economic Survey, 2016-17). It found out that each year, an average of 9 million people migrate in avenues of better education and livelihood in our country. The planning for containment of COVID-19 cases through means of nationwide lockdown had a loophole that it did not take into consideration these migrants. People have the right to seek and receive information regarding important health measures taken by authorities under the International Covenant on Civil and Political Rights (ICCPR) of which India is a state party. A 4-hour notice before implementing countrywide lockdown could have been avoided or a more people friendly approach could have been adopted. Migrant workers had to face some difficulties. As the saying goes, "the carrot is as important as the stick"; a well analysed comprehensive planning process could have been more beneficial for "Sabka Sath Sabka Vikas", translated as "collective effort, integrative development". Upholding human rights during a crisis increases the trust of people in their government and a better cooperation can be achieved from them.

5. Conclusion

Every new threat brings up a new challenge. COVID-19 is one of such threats. It has highlighted that healthcare system is the backbone of an economy and countries should take Sendai Framework suggestions more seriously.The pandemic has taught us that communicable diseases follow no boundary and the threat has increased multi-fold with globalisation and increased trade. Only way to minimise the losses are by strengthening the health facilities of a country. Biological disasters are as serious as natural ones. Science and technology are accelerants of progress. The government invoked the Epidemic Diseases Act, 1897 initially to deal with the situation arising out of COVID-19. This act has no mention of word "epidemic disease" and how to deal with it whereas COVID-19 was labelled as a pandemic by WHO. This makes us to retrospect that the country needs to plan holistically for such future events with a more humanist approach. The Epidemic Diseases (Amendment) Bill, 2020 was a positive step to deal with some problematic situations. The government's step of universal health coverage in recent times is appreciated but more efforts are required to make it more inclusive and efficient. Moreover, the benefits should reach the poor residing in every part of the country. One room house for the informal sector can be thought of as it will be beneficial for the poor as well as the country.

We have seen how there are inequalities among states in terms of hospitals, beds and doctors. No Indian state meets WHO criteria of one doctor for 1000 people. Budget is prepared by the government. While planning for it, these points should be kept in consideration. Focussing on health and its management should be the first priority on government's planning as health is a prerequisite for sustainable development of the country.

Educating people about what and what-nots to follow during a disaster is also important. Help of ICT tools can be taken like Aarogya Setu app which was launched by the government and it became quite popular among the masses. But, ICT tools would be most helpful when people possess a smartphone or have internet connectivity. At this point, government can take help of local government officials and these need to be implemented in ground sincerely.

India's response to COVID-19 has been pre-emptive, pro-active and graded as per Union health Ministry. But, a more inclusive approach is need of the hour. Testing has increased substantially since last year. Vaccination drive has started in the country and from 1st May, 2021 individuals aged 18 years can be vaccinated. More and more people are following COVID appropriate behaviour which is need of the hour.

We summarise by quoting Mahatma Gandhi "It is health that is real wealth and not pieces of gold and silver." The government's topmost priority should be the health of its citizens. Rest everything will follow. Primary survey was conducted with people who were thought to have some basic facilities like a computer and internet connection which might be a limitation of the study.

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Geohazards and Challenges in Karst Terrains

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Abstract

Carbonate rocks are most susceptible to karstification. The corrosive action of water is responsible for the formation of various types of landscapes. Intense solutioning results in doline formation, paving the way for genesis of cave passages and underground streams in karst terrains. Generally karstification is intense wherever points are weak,namely, at junctions of joints, fractures, interstices and bedding planes. Interconnected network of secondary pore systems in karstic areas create innumerable geohazards and challenges in various developmental activities including construction of dwelling units. The main issues are collapses, environmental degradations, leakages and discharges in distal places, which need to be properly identified and taken care sufficiently. Accordingly, careful evaluation of geohazards is essential prior to initiating any development projects in karstic areas. In this regard, various investigations that are required have been outlined. Furthermore, systematic researches for various issues in karst terrains have also been suggested to ensure a balance between development in one hand and to address properly issues of geohazards, geotourism and environment in karst terrains on the other hand.

Keywords: *Geohazards, Geotourism, Environment, Challenges, Karst terrain*

1. Introduction

The name karst (krs or kras, a Salvic word meaning 'stony ground') represents geomorphic features developed in carbonate terrains close to surface due by corrosive action of moving water (Bogli, 1980; Ford, 1965; Ford and Williams, 2007; Sweeting, 1972; Singh, 1992). The geologic units prone for corrosive action of moving water include mainly

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limestone, dolomite, gypsum and halite. Such rocks occupy nearly 20% of the globe and constitute potential aquifers (Ford and Williams, 2007; Andreo et al. 2010; Dar et al. 2014).Although surface coverage of carbonate rocks in India is less, e.g., ~3% (Dar et al. 2014), they have been proven to be very productive aquifers (Singh and Dubey, 1997). Carbon dioxide-rich and/or acidic water infiltrates along joints, fractures and bedding planes and forms secondary and tertiary pore systems. The corrosive action of water is responsible for formation of surface and sub-surface solution passages and vertical and horizontal drainage system. The common surface karst landforms are represented by karren, solution basins, pavements, natural bridges and sinkholes. On the other hand, subsurface landforms include various types of caves, namely, vadose and water table caves, phreatic caves, vertical caves and cave collapse and breakdown, and cave deposits (terra-rossa, rocks falls and stream deposits of external origin). Accordingly, dissolution and karstification lead to formation of various types of landscapes. Interestingly, a few of such landscapes in karst terrains have been converted to World Geotourism centres (Hall and Day, 2011). All over the world, karst landscapes are developed not only in different latitudes but also in various altitudes in tropical and temperate zones. In this paper,the mode of development of pore systems and associated geohazards in karst terrains have been briefly outlined.

2. Nature and Distribution of Karstifiable Rocks

The most common karstifiable lithounits include biogenic, biochemical and chemical sedimentary rocks comprising limestone, dolomite, chalk, anhydrite and evaporites. However, picturesque landscapes are documented from quartzite and granite karst terrains also (White, 1960; Twidale, 1982; Dasgupta, 1993; Singh, 1995, 2005). Karst may occur at all latitudes and elevations, and covers about 20-33% of the Earth's land surface (Milanovic, 1988; Jamali et al., 2015). Distribution of carbonate rocks in India is shown (Figure 1). Innumerable surface and sub-surface karst landforms are noted in karst terrains. Some of them include karren, sinkholes and caves. Features formed due to accretionary processes are also well known in karst terrains. Such speleothems record imprints of past-monsoonal variations. In fact, recently, stalagmite from Meghalaya, North East India, helped define a geological age by the International Union of the Geological Sciences (IUGS). The karst form Earth's most diverse scenic and resource-

rich terrains and repository for underground resources, like minerals, oil, natural gas, groundwater reservoirs (Singh and Dubey, 1997; Jeelani et al., 2018).

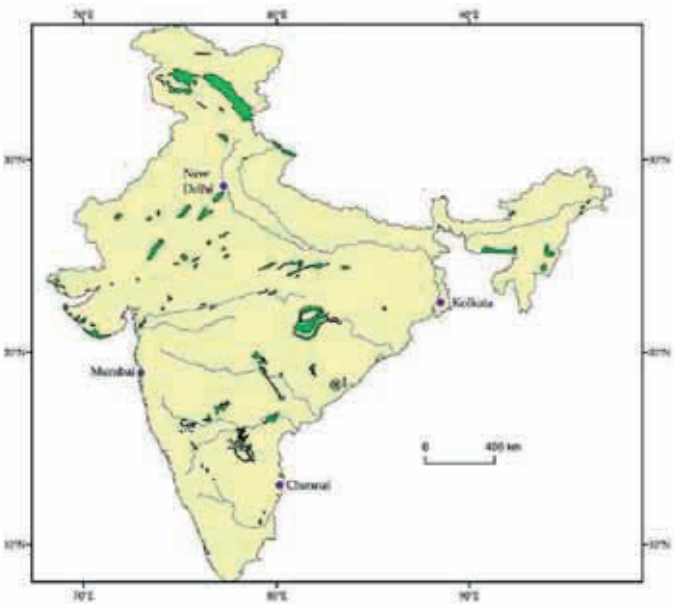

Figure 1: Map Showing Distribution of Carbonate Rocks in India (After Narayana et al.,2014)

The most common factors responsible for the development of karst are the presence of soluble rocks close or near the surface, high density of weak planes, mineralogy, variable response of constituent minerals to solutioning, topography, precipitation, green vegetation, meteorological variables and anthropogenic activity (Singh, 1992; Bonacci, 2004; Narayana et al., 2014; Jeelani et al., 2018). These agents work variously in conjunction with each other in different magnitude. In Meghalaya, North East India, the density of cave system appears to be the highest, and several factors are responsible for their formation, namely, high grade of limestone, high precipitation, elevation and a humid climate (Brooks and Smart, 1995). In each region, some factors play a dominant role relative to others.

3. Genesis of Pore Systems

As such, carbonate rocks possess insignificant primary porosity. However, dissolution of constituent minerals of carbonate rocks initially creates small-scale porosity in them. The continued corrosive action of the water leads to genesis of various types of karst landforms on variable scales both on the surface and subsurface levels (Figure 2 to 9). Furthermore, pronounced solutioning by water along joints, cracks, bedding planes is responsible for genesis of depressions. Such features play key role in development of caverns and sub-terranean drainage in karstic areas. Solutioning is pronounced around weak planes and sets and systems of diaclases (Figure 4 to 7). Apart from network of fracture systems and other factors, differential dissolution of constituent minerals play significant role in variable karstification in rocks like granite and quartzite (Figure 8 and 9). Degree of karstification, depth and interconnectivity of secondary and tertiary pore systems are responsible for geohazards in karst terrains.

Figure 2: Development of (secondary) tubular porosity along the runnels in sloping limeston outcrop. (Note: Initiation of tiny pores throughout the surface of outcrop).

Figure 3: Network of grikes and solution cavities in limestone.

Figure 4: Development of grikes along joint planes in stromalolitic limestone.

Figure 5: Development of vertical caves along the solution widened joints in flaggy limestone.

Figure 6: Well-developed sinkholes, pot holes and grikes in the river bed. Note solution enlarged joints leading to development of vertical caves in horizontal bedded limestones.

Figure 7: Grand statuary of karst in horizontally satisfied limestone showing compartmented karst (After Singh, 1992)

Figure 8: Highly karstified sandstone with pronounced solutioning on surfaces

Figure 9: Preferential solutioning leading to development of cave.

4. Karst Aquifers

Karstified limestones form potential aquifers. Nature of flow in karst aquifers has been documented by various researchers (Ford, 1965; Sweeting, 1972; Legrand and Stringfield, 1973; Bogli, 1980; Adyalkar, 1984; Singh, 1985; Singh and Dubey, 1997; Ford and Williams, 2007; Andreo et al. 2010; Ghasemizadeh et al. 2012; Scheidler et al. 2021). Common flow systems are diffused and conduit types. In the diffuse type, generally joints, fractures, fissures, bedding planes and other interconnected pores simulate flow system, with fairly well-defined water table due to interconnectivity. In the other case, flow is turbulent type, which is simulated by integrated conduit system formed due to preferential corrosive actions along joints, bedding planes and at the intersections of two to three sets of joints. Solutional pathways change from a few cm to >1 m. Karst aquifers occur under semi-confined to confined and unconfined conditions. In shale terrain, semi-confined to confined conditions are reported due to interstratified limestone beds and uneven karstification (Figure 10; Singh and Dubey, 1997).

Interbedded limestone bodies are highly karstified due to pronounced solutioning leading to profound development of secondary pore systems, which act as reservoirs of groundwater. In such interstratified limestone beds groundwater occurs under confined conditions (Singh and Dubey, 1997). In certain cases, tauto-flowing wells have also been reported (Singh and Dubey, 1997). Significantly, in India, amount of water pumped out from karst aquifers equals not only to total amount of water required for ~35 million people dwelling in 106 districts of country, but also for livestock, irrigation and various industries (Dar et al. 2014).

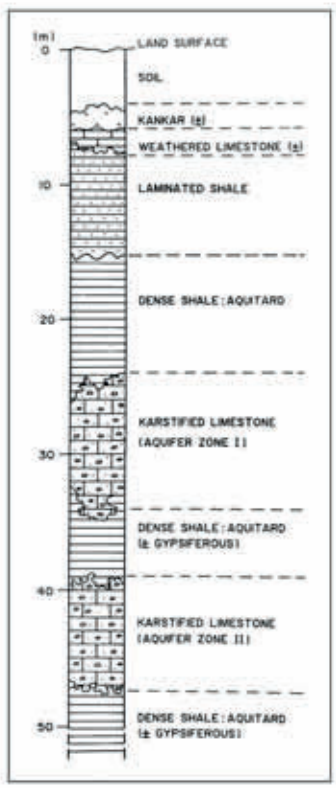

Figure 10. Lithology of a borehole showing interbedded, highly karstified limestone unit with pronounced solutioning leading to development of secondary pore systems and aquifer zones (After Singh and Dubey, 1997)

5. Discussion

5.1 Geotechnical Aspects

Due to interconnected network of secondary and tertiary pore systems, karst terrains pose diversified geohazards and challenges in development of any project. Among others, the notable issues are leakages and discharges in distal places, warranting proper redressal (Singh, 2007). Systematic and meticulous geotechnical assessments of karst terrains are thus essential prior to initiating any project. These studies should include probing of depth continuity, behaviour and occurrences of all types of porosities and their networks through sub-surface drilling in closed intervals, morphometric analysis, geophysical changes and geohydrological assessment. Closing all types of pores involving pervasive pressure grouting by drilling closely-spaced bore holes is a keyword to prevent distal leakages and discharges and structural degradations. Choice of depth and spacing of drilling and grouting is generally guided by the depth, bahaviour and intensity of karstification. Indeed the reason for failure of Hales Gar Dam in Tennessee (USA) is attributed to inadequate treatment of cavities in the carbonate rocks in the basement. Accordingly, for safety of envisaged projects, geotechnical evaluation during prefeasibility, feasibility and detailed feasibility time should be seriously carried out and properly taken care.

5.2 Geohazards in Karst Terrains

The uniqueness of karst terrains is well known in several ways with mysterious surprises throughout their lengths and breadths. Regional, local and lateral changes are unpredictably profound. Similarly, depth variabilities are also equally uncertain. On surface, manifestations of karstification may be minimal, whereas in depth it may be intense (Singh, 1989). These variabilities and uncertainties compound problems. In certain sedimentary sequences, interbedded limestone units have also been found to be intensely karstified at depths (Figure 10; Singh and Dubey, 1997). Identification of such water-bearing zones is equally important for proper assessment of geohazards. Also, cultural heritage monuments are adversely affected by geohazards (Ilies et al. 2020). Accordingly, there are several challenges to overcome geohazards in karst terrains. These challenges include (i) Creating geological and structural maps of karstified areas; (ii) Ascertaining agents, depth and intensity of development of karst; (iii) Mechanism

and intensity of formation of pores and their interconnectivity; (iv) Identification of zones of recharge and discharge and delineation of catchments and real source areas; (v) Creation of aquifer map, including geohydrological and geophysical studies; and (vi) Addressing environmental concerns in karst area.

5.3 Researches in Karst Terrains

Based on the studies likes field traverses, karst landscapes, mode of genesis of pore systems, agents of karstification and geohydrological parameters, the following aspects should be kept in mind with respect to geohazards, challenges and remedial measures in karst terrains. (i) Comprehensive geotechnical evaluation of karst terrains are essential prior to initiation of any projects in them. (ii) Natural hazards in karst areas include floods, landslides, sinkholes and subsidence phenomena. (iii) Subsidence of underground caves may manifest in the form of experiencing earthquakes. Strong motion accelerographs and triaxial broad band seismometers can help in locating such collapse of subsurface voids/caves. (iv) Hydrologic hazards in karst terrains need more attention. (v) Paleo-karst and active karst history of the Karst terrain should be properly assessed. (vi) Land degradation, and partial or total destruction of the karst landscape, up to desertification, are among the most serious hazards that karst terrains have to face. These aspects should be properly monitored regularly. (vii) Systematic monitoring of surface and groundwater quality is essential as the risk of pollution is high in Karst areas. (viii) The extraction of limestones through quarrying activity inevitably has dramatic impact on the karst landforms, which are point of attractions for Geotourism. Efforts should be directed to preserve karst landscapes to promote tourism in such areas. (ix) Karst areas need policy and plan for management of sewage and effluent due to its high vulnerability of polluting subsurface and surface water bodies. (x) Risk and vulnerability studies in karst terrains need special training and capacity building.

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Financing Recovery: A Case of Kerala Floods 2018

Akanchha Singh

Abstract

Financial constraints are a reality when it comes to managing disasters. In absence of sufficient endogenous wealth to finance recovery the State has resorted to creating conditions to attract foreign investments in affected region. As global capital markets are closely intertwined, various States aspiring for aid are judged in terms of their 'comparative hospitality' to external capital and overall investment climate; this triggers a race to the bottom. Aspiring States, driven by the lowest common denominator, undertake massive deregulation, lowering of trade barriers, granting tax holidays and subsidies to international investor. The liberalisation of market and State led deregulation eliminates domestic rivals to the extent of having monopolistic control. Post disaster, states have little bargaining power viz. a viz. the foreign investor, whose aim is to profiteer. They exercise control over the destination, type and nature of use that foreign capital would be put to.

1. Introduction

Disaster Financing is important for all stages of disaster: preparedness, mitigation, response and recovery. Act provides special mitigation plans and funds at District, State and National level. Of late, with increasing frequency and magnitude of disasters, various channels have emerged to finance recovery. It is important to understand the sources of finance, their pros and cons to plan for a robust recovery in advance.

2. Methodology

The study uses Critical Realism paradigm of social science research. It is pertinent as it views reality as a 'multilayered and multicausal (Oliver, 2012:75. Critical realism provides a lens to understand the political construction of events and environment

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which goes on to uncover seemingly apolitical, benevolent exercises like disaster recovery. This paradigm contends that both extensive (statistical) and intensive (interpretive) data should be collected in a study in order to construct a complete picture of social reality (Fletcher, 2017:185). As a result, the study uses mixed method research. Apart from quantitative data analysis, qualitative method is suited to this study as the topic of research is relatively new, knowledge in the field is limited to begin with and secondary data is very scarcely available and often difficult to access. Using multiple sources of data and methods of analysis helps to triangulate the results. The study uses case study approach to look at issue of recovery financing. While case study research has its advantages the results cannot be generalized. The uniqueness of every disaster episode should be appreciated. Expert interviews have also been conducted to enrich understanding.

3. Results and Discussion

3.1 Constitutional and Statutory Provisions

Before the enactment of the Disaster Management Act, the Finance Commission played a central role in providing guidelines for fund allocation for disaster management. The Second Finance Commission brought about the concept of 'margin money' scheme to be kept aside for extreme events. It also laid down provisions for central assistance in case of disasters. Subsequently, the Ninth Finance Commission introduced the concept of the Calamity Fund Relief. The Tenth Finance Commission, additionally, laid down a National Fund for Calamity Relief which was later subsumed under the National Calamity Contingency Fund.

The Disaster Management Act claimed to make a categorical departure from response and relief centric focus to one which augments preparedness and mitigation activities. The Act provided for the setting up of two funds: National Disaster Management Fund and the National Disaster Mitigation Fund. Such funds are to be created at State and District level as well. District level funds have still not been created. The State governments cite the reason that districts are not equipped with the administrative and operational capacity to manage such funds.

The Disaster Management Act, 2005 lays down that the funds would be financed by the Parliament through appropriation. It is also authorized to receive contributions

from individuals as well as institutions. Interestingly, no model mechanism for state/ district disaster financing has been outlined. The implicit assumption is that States will make their respective provisions for meeting the fund requirement.

The Disaster Management Act, 2005 mandates the creation of the National Disaster Response Fund (NDRF). Further, the Act envisaged public contributions to the NDRF, however, in response to an RTI the Home Ministry revealed that it is yet to open a bank account under the NDRF to solicit public contributions. It is to be noted that the National Disaster Response Fund, having been conceived by an Act of Parliament, is subject to audit by Comptroller and Auditor General of India and disclosure directives under the RTI Act 2005.

Prior to the NDRF, the Prime Minister's National Relief Fund (PMNRF) was created in 1948 and has been operational ever since. PMNRF had no budgetary contributions and only solicited funds from general public. The PMO therefore insists that the fund does not fall under RTI and is audited by an independent auditor. Notably, much like the recent PM CARES fund, there exist operational ambiguities about the PMNRF.

National Disaster Response Fund which has been mandated to receive funds from individuals and institutions alike is a better alternative as it is more transparent and has statutory sanction.

Section 46 (1) of the Disaster Management Act, 2005 provides for the setting up of the National Disaster Response Fund to meet any contingency like disaster. Accordingly, the Central government credits a given amount to the fund every year. Under the same section, the next sub clause 46 (1) (b) allows any individual or institution to donate funds for the purpose of disaster management. To reiterate, no mechanism has been put in place so far to enable the same.

Expert interviews revealed that the Home Ministry is increasingly eyeing public donations citing the "shortage of funds". In the pre-GST era, the expert opines, a lot of fund was received in form of cesses. Implementation of GST has necessitated budget spending for disasters. On the issue of disaster financing, there is a lot of tussle between Ministry of Home Affairs and the Ministry of Finance as both are seen passing the buck in response to RTI appeals made during the course of writing this thesis.

Under the Disaster Management Act, Centre has been entrusted with co-ordination during disasters but major responsibility of managing disasters rests with the State. The PRS analysed Ministry of Home Affair's budget expenditure highlighting that in the year

2017-18, 80 per cent of the Ministry's expenditure went to police and only 6 percent on Disaster Management. Finance Ministry's notice on Demands of Grants for the year 2018-19 showed INR 10,000 crore as budgeted expenditure for State Disaster Response Fund (SDRF) and INR 2,500 crore for National Disaster Response Fund (NDRF).

The SDRF is therefore the primary means available to states for financing disaster relief and losses. For general category states, Centre contributes 75 per cent to SDRF; in case of special category states, it contributes 90 per cent. The total budgeted expenditure for disaster management for the year 2018-19 was INR 12,500 crore. The inadequacy of the quantum set aside for disaster management becomes clear when we compare it to INR 20,000 crore worth damage in Kerala floods alone.

However, there exists a caveat in the operational guidelines of National Disaster Response Fund. The two statutorily conceived funds NDRF and SDRF are intended to be used for providing immediate relief. Long term rehabilitation needs have to be met with separate budgetary heads and external assistance. But in practice it is observed that states underestimate the probability of adverse events occurring

3.2 Kerala Floods 2018: Recovery Financing

The Kerala Floods opened a new debate about fiscal federalism. Katju and Roy highlight that the imposition of Goods and Services Tax has led to greater centralising tendency wherein the states are limited in their authority to raise their own revenue for meeting catastrophic expenditures. It is to be noted that public health, agriculture, land, roads and bridges are all state subjects. The Kerala State government decided to levy a cess to finance disaster recovery. Under Article 279 A, the GST council is entrusted with the responsibility for approving state tax in the wake of disasters. The GST reform had promised to increase the state revenue, however, Kerala at the time of floods reported significant reduction in revenue. The GST council initially raised reservations about Kerala raising its own revenue, as such a cess would potentially threaten the uniformity of tax rates throughout the country. While Kerala solicited putting cess at 10 per cent, the GST council allowed it to levy 1 per cent cess for two years. If states are not allowed to raise their own fiscal resources, the Centre should step in with additional funds to prevent excess state borrowings.

Besides cess, Kerala resorted to an unorthodox measure, i.e. issuance of rupee denominated masala bonds overseas. Consequently the Kerala Infrastructure

Investment Fund Board issued Masala Bonds worth INR 2150 crore in 2019. It was argued that the use of such instruments is in contravention to Article 293 (1) of the Constitution of India which prohibits the state governments to borrow from abroad. The constitution requires that only central government can be responsible for foreign country's foreign exposure. However, it is the Reserve Bank of India that monitors the country's foreign exchange exposure and has allowed the usage of such bonds subject to stipulations. The Union government argued with the legal maxim that 'what cannot be done directly, cannot be done indirectly'. The centre has raised concerns that in future other states may resort to such routes of disaster financing citing this precedent.

It is also to be noted that the Central government declined foreign aid offered from UAE and other middle-eastern countries which are popular destinations for migrants from the affected state. While opposing foreign aid, the government argued that there has been an informal consensus since the Indian Ocean Tsunami to not accept foreign aid in the wake of natural disasters. In 2004, the then Prime Minister of India had said, "We feel that we can cope with the situation on our own and we will take their help if needed." Jacob (2018) has interpreted this statement to mean that it does not necessarily mean that the country has closed its doors to foreign aid forever. The 2004 decision has to be contextualized on case by case basis. Interestingly, since 2004, various policy documents of the government have highlighted that it is not principally averse to accepting foreign aid. According to the National Disaster Management Plan, "if the national government of another country voluntarily offers assistance as a goodwill gesture in solidarity with disaster victims, the Central government may accept such an offer."

In a similar way both the National Policy on Disaster Management 2009 and the Disaster Management Act of 2005 are predisposed to forging positive external linkages for disaster recovery. Apart from policy precedent, Jacob (2018) lists National pride as the second most significant deterrent to accepting foreign aid. However by citing instances of India offering aid to USA (Hurricane Katrina 2005) and China (Sichuan earthquake 2008) he critically dismantles the theory of 'national pride' by showing that the so called better off countries have also routinely accepted emergency foreign aid from friendly nations.

The Disaster Management Act 2005 mandated the creation of National Disaster Response Fund and the National Disaster Mitigation Fund. Similarly, it also mandates

the creation of State Disaster Response Fund and District Disaster Response Fund separately. The mitigation fund has still not been conceived. Funds at district level are created in very few districts.

3.3 Sources to Finance Recovery in Kerala

The State of Kerala estimated its recovery needs at INR 31000 crore over a period of five years. The State government states that 35 per cent of the estimated cost will be contributed by the beneficiaries. It envisages recovery to be a "collective exercise with shared responsibilities." It has solicited the contribution of private partners, NGOs, philanthropic organisations and common citizens. The government categorically states in its rehabilitation policy document that it is primarily the responsibility of the government (State and Local Self Government), to take the responsibility of rebuilding post-disaster.

Even so, the State government acknowledges that it is beyond its fiscal capacity to build back all damaged assets. As regards housing reconstruction and livelihood restoration the government concedes to providing the basic minimum stimulus to resume life. It explicitly states that it cannot provide for full replacement cost for damaged assets. The government having estimated the damage at 31,000 crore aims to raise finance through public and private means.

The channels of raising finance listed by the government are:

1. Central Assistance
2. Increase Tax Revenue
3. Private Contributions
4. Market Borrowings by State Government
5. Efficiency Savings
6. External Assistance (Overseas Development Assistance)

Of these, the primary significance is attributed to assistance provided by the central and state governments. Besides, unconventional and rather innovative channels of financing are also gaining relevance. The role of State, insurance companies, private contributions and crowd funding has been elaborated here.

3.4 Central Government Assistance

Under the Disaster Management Act, the National Disaster Response Fund has been created. Interestingly, the National Disaster Response Fund is only available for relief measures and not for recovery and reconstruction. Therefore the State government cannot lay claim to NDRF as a matter of right for reconstruction measures. However central relief allocations are tweaked to support rehabilitation efforts by the states.

The Kerala government solicited INR 4700 crore under NDRF by submitting a memorandum to the central government by claiming the 2018 floods to be the worst in a century. After receiving the memorandum, the Central government sent an Inter-Ministerial Central Team (IMCT) to assess the damage on ground. ICMT submitted its report to the National Executive Committee (NEC), headed by the Union Home Secretary. The Union Home Minister heads a High Level Committee where, in consultation with the NEC, final approval regarding quantum of assistance is made. In case of Kerala, the actual assistance given to the State government by the Union was INR 3048 crore.

Besides, the State also solicited additional funds under Centrally Sponsored Schemes, for example MGNREGA, PM Awas Yojana (PMAY).

Other sources of financing are Chief Minister's Relief Fund which accepts private contributions. The fund aimed at mobilizing INR 3000 crore. The state government also considered requesting grants from the central government (INR 6000 crore) under Article 275 (Grant from Union to certain States). Kerala government also launched a Nava Kerala Lottery to fund recovery needs (INR 80 crore): The Government of Kerala has floated a lottery for recovery needs and expects to mobilise about INR 80 crore through this source. Kerala also proposed to the Union government to grant the state 4% of total funds (i.e. 15000 crore) received under Corporate Social Responsibility (CSR). The government actively used crowd funding through social media and other digital platforms to rope in philanthropic contributions from the state diaspora. Besides, it also invited NGOs to support its effort in rebuilding housing and livelihood. The State government was pro-active in forming the Inter-Agency-Group (IAG) at the state and district level to coordinate their activities.

The government also considered augmenting the tax base to enhance revenue. It suggested doing so by expanding the tax base, introducing new taxes, improving overall tax efficiency and increasing the tax rate. Kerala's tax to GDP ratio is 9 per cent compared to the national average of 16.8 per cent. Augmentation of tax revenue would

give the government a better fiscal space to finance recovery and reconstruction needs. The state government is considering various business units in the state which did not fall under the commercial tax net of the State. Further, the State government is also considering levying a new tax on vacant houses in the State with a higher tax slab for bigger houses. This step would also help in bringing 1.2 million houses into the rental market. The government envisages that this step would make Kerala and attractive destination for IT industry.

Moreover, the State also considered imposition of carbon tax on building material and motor vehicle.

Close to INR 12000 crore is pending in tax litigation in courts, the government is aiming at salvaging this amount. It also aims at improving efficiency in tax collection, introducing cess etc. For the purpose of introducing cess, the Kerala government cites Article 279 A (4)(f) which provides for increasing rates of taxes under Goods and Services Tax (GST) for a short period in wake of a natural calamity subject to the approval of GST council. The Kerala government also proposed imposition of a calamity cess on intra state trade (over and above GST rates) to the tune of 10 per cent. When the GST council took up the matter, it reduced the cess to 1 per cent for a period not exceeding 2 years.

Finally the government also considered market borrowings as an option. While the option to borrow via market instruments was available, both nationally and internationally, the government realised that this can, at best, be an option in the short term, as loan has to be returned with interest soon enough.

The government was also keen on issuing reconstruction bonds which can be purchased by the state's diaspora living abroad. Interestingly, this option has been used by various national governments in the aftermath of disasters.

Finally there is the option of borrowing from Banks.

In the domestic realm the State government has the option of borrowing from National Bank for Agriculture and Rural Development (NABARD), Housing and Urban Development Corporation (HUDCO). However, it is a common compliant from various states that domestic banks charge a higher interest rate. Disaster affected states are therefore driven to negotiate with the World Bank and Asian Development Bank to finance recovery and reconstruction needs.

The State governments, in order to raise funds through market borrowings, need the approval of Central government. This is also necessary as market borrowings would

exacerbate the fiscal deficit to GSDP ratio beyond the mandate of Fiscal Responsibility and Budget Management Act, 2003.

Under Article 293 (3) of the Indian Constitution, the State government requested the Union to allow it to borrow to the tune of 4.5 per cent of GSDP. This would yield INR 10000 crore for recovery and reconstruction.

3.5 Economy in Government's Expenditure

The government aims to bring in economy and efficiency in its expenditure. The savings can be used to finance reconstruction needs. By re-prioritizing budget allocations, cutting down on funds for State schemes, the government hopes to achieve its target.

Kerala government is also eyeing Overseas Development Assistance (ODA) which would reduce the burden of market borrowings on the State.

3.6 Finance Commission Recommendations

The Disaster Management Act 2005, provided for the creation of National Disaster Response Fund and the State Disaster Response Fund. The 15th Finance Commission chaired by N.K. Singh submitted its report with recommendations for the financial year 2020-21.

Table 1: Grant for Disaster Risk Management (Rs. in Crore)

Sl. No.	Corpus	Mitigation	Percentage to Total	Response	Percentage toTotal	Total
1	State	2478	6	9912	24	12396
2	National	5797	14	23186	56	28997
3	Total	8275	20	33098	80	41393

Source: Report for the year 2020-21, 15th Finance Commission; PRS Legislative Research

Table 2: Sub Components of Response under 15th Finance Commission (Rs. in Crore)

Sl.No.	Category	Response and Relief	Recovery and Reconstruction	Capacity Building	Total Response
1	State	4956 (12%)	3717 (9%)	1239 (3%)	9933 (24%)
2	National	11593 (28%)	8695 (21%)	2998 (7%)	23186 (56%)
3	Total	16549 (40%)	12412 (30%)	4237 (10%)	33119 (80%)

Source: Report for the year 2020-21, 15th Finance Commission; PRS Legislative Research

Amongst its various recommendations, the Commission suggested the setting up of National and State level Mitigation Funds. The Commission held that the existing pattern of cost sharing: 75:25 for general category states, 90:10 for North Eastern and Himalayan States should be retained. For the term 2020-21, State Disaster Risk Management Funds have been allocated INR 28,983 crore, out of which union share is to the tune of INR 22,184 crore. The National Disaster Risk Management Fund has been allocated INR 12, 390 crore.

3.7 Other Innovative Channels for Financing Disaster Recovery

1. Role of Insurance Sector

While the total quantum of economic loss was in 2018 floods was more than 20000 crore, only about five percent could be covered under insurance claims. The lack of penetration of insurance sector, even in the relatively better off states, puts enormous burden on the State treasury.

It was reported that insurance companies in Kerala had eased their claim settlement process with teams dedicated for the purpose. Most claims were received for vehicles and property such as residences, shops. As far as vehicular damage is concerned, a comprehensive motor insurance policy covers all damage due to natural calamity. However, water entering the engines is covered only when an 'engine protection' add on is specified in the insurance policy. Post-disaster, vehicular insurance companies incorporated engine protection add on in their package.

2. Salary Challenge

Through Government order GO(P)144/2018/Finance dated 11/9/2018, the state government requested all the government employees to donate one months salary in ten installments to Chief Minister's Disaster Relief Fund (flood relief). The government aimed at raising a revenue income of INR 3800 crore .

3. Involvement of the Online Market in Financing Recovery

In the immediate aftermath of the deluge, the state government launched a crowdfunding initiative, with help from KPMG, for rebuilding. However, the initiative was unable to elicit a substantive response from the public at large. The lack lustre response compelled the government to introspect subsequently deliberate on an elaborate expert consultancy.

4. Conclusion

Disasters are the new normal. The challenge, however, is to live with it ,and no despite it. Once immediate relief has been provided for, the challenge is long term recovery.

The ideal goal is to 'build back better', naturally, this is a financially intensive exercise. While state support is imperative, it is far from substantive. United Nations Organisations and International Financial Institutions repeatedly emphasise on the need to increase penetration of insurance market. While broader insurance coverage can be a desirable goal, it is far from being an end in itself. There will always be a segment of survivors, however small, which will be left out of the insurance net. Market based borrowing is also a popular alternative. However, this instrument has to be used very carefully, in that it creates long term dependence, as the loan has to be repaid later. Thus we need a mix of institutions and channels to finance recovery.

The role of government is central to regulating and steering the recovery exercise. The Disaster Management Act, 2005 puts the responsibility of managing disasters with the states while the overall coordination is with the central government. However, given the scale of responsibility, states are overwhelmed in absence of adequate financial, administrative power and lack of trained human resource. For a successful recovery, governments, corporates, institutions, civil society actors, non- government organisations and individuals, all have to come together and put their best foot forward to 'build back better'.

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Enlightenment: The COVID-19 Pandemic

Domadala Pramod

Abstract

All efforts are for body and soul. All scientific theories and technologies, government policies, infrastructures, and spiritual activities are meant to protect the soul, body, and hunger. If we can protect the lives of all living entities in any eventuality, the country is said to be a developed country.

Every incident exposes the system and gives the experience to learn for better operation with minimum fatalities. The sudden outbreak of deadly microscopic Coronavirus had opened the eyes of all walks of people in the world and put all the countries in danger of human losses as well as the financial crisis. The pandemic COVID-19 has taught valuable lessons and exposed many grave areas - Loss of family members, loss of jobs, the closing of industries, offices, and schools, tireless work of emergency service providers, and what could be the severity of spreading of COVID-19 and health care systems after post lockdown.

Apart from this pandemic disease, other critical areas for Disastrous Management due to the regular occurring natural calamities are droughts, cyclones, and industrial explosions, etc. pose challenges and need improvement in the areas such as emergency services, agriculture sectors, shelters, sanitation, cleanliness, public parks and playgrounds, beautification of cities, old premises, cremation grounds, market places, slaughterhouses, etc. These essential services need to be investigated with quality assurance for the welfare of the people in terms of health, investments, revenue, and the creation of jobs. These experiential challenges are critically analyzed in detail and presented in this paper for the policymakers to take appropriate steps to avoid any future epidemic diseases and disastrous situations like COVID-19.

Keywords: *COVID-19, Emergency services, Amenities for living entities, Swachh Bharat, Rejuvenation of Earth and Agriculture sector, etc.*

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1. Introduction

The unanticipated Coronavirus has shattered all of us globally. It is has a poignant reminder that human life is fragile. It created panic among people like who is infected, who is uninfected, and who gets infected and how long will it continue, and will there be any vaccine created? Can the country afford to continue the lockdown? Lockdown may reduce the rate of fatalities but this might rise due to hunger. For some, survival is the only agenda at the moment. These are the flickering and confusing thoughts in the minds of people.

This pandemic has been monumental in many ways: the global response to fight, complete lockdowns, emphasis on health facilities, the world coming to a standstill, economy down, no jobs, and uncertainty everywhere, families spending much more time together, work from home concepts, following basic Hindu traditions-cleanliness, social distances, and isolation; vegetarian diet, nature is healing itself, such reactions once considered impossible for any authority to take up, whereas now this crisis has made all of these possible.

A crisis usually happens at a short notice and triggers the feeling of fear and threat which causes a sequence of unexpected events. The regular natural calamities, droughts, floods, and cyclones; fire, environment pollution, water scarcity, and the regular epidemic diseases, industrial explosions, killing of animals and slaughter centers, etc. are consequences of the ruthless activities of humans in the name of civilization and industrialization of a country not complying harmony with nature.

Every event is a learning process. Nevertheless, there are many more things that can be better for the future so that in an eventuality of a global crisis, we as a whole could be seen and taken as a challenge, and citizens as singly are better prepared. All efforts are for the soul (Pramod, 2019). All scientific studies, technological developments, and government policies are meant for body and soul. The health and education sectors play a major role in developing a nation that is highly dependent on Government policies, agriculture, industries, and local employment, etc.

The experience of COVID-19 has taught us that we should be well mentally prepared and well equipped to face such situations. There are a large number of areas that need to be given immediate attention to better health care systems and agriculture products so that farmers will get benefitted financially and get motivated to work intensively. Some of the prominent: government agriculture lands, hospitals, shelters, public parks

and playgrounds, cremation grounds, beautification of cities, Swachh Bharat Abhiyan, rejuvenation for the earth, market places, slaughter centers, and ancient Hindu traditions, etc are analyzed systematically and presented in this paper, hoping one day they get implemented so the citizens, as well as animals, will be in a secured place in case of any eventuality.

These are my meticulous observations, but not to criticize or harm any individual or organization. Policymakers should consider the following points for proper implementation in creating a healthy and hygienic society for living entities - humans and animals.

2. Analysis

2.1 Announcements

A sudden announcement without considerable time to prepare for the crises created a sense of panic. Further announcements of a similar situation should be considered with giving ample time for the citizens to be prepared without creating a panic for staff members and workers.

2.2 Elected Members

All the elected members local MPs, MLAs, local body chairmen, and councilors, etc., others should be asked to stay at their constitutions to oversee the proper implementation of decisions taken by the state and central governments. It must be their responsibility to see that all facilities are being provided and no citizen should be suffered during the crisis.

2.3 Emergency Services

The emergency service providers always rise to the occasion. In this crisis, health workers, doctors, police authorities, sanitation workers have worked and continue to work tirelessly day and night to heal and protect citizens. In this hard time, they have sacrificed their sleep, time, and staying away from their families just to keep them and everyone safe from the virus.

2.4 Citizens

All this hard work would go in vain if citizens themselves don't comply and support. Though a large extent of the population has been duly complying, there has been a rise in selectively targeted attacks on health workers and authorities. Every citizen should understand the fact no matter how hard every authority works, if citizens don't comply then all the efforts go in vain. People should learn and acknowledge the hardships faced by emergency service providers and show gratitude towards them. That should be the basic nature of each every citizen in this crisis. It is the collective effort that matters for a lockdown that has its full effect.

2.5 Hospitals

Strong health care systems play a key role that can support the high loads in case of crisis. This pandemic COVID-19 has exposed countries like the USA, Italy, and Spain which are considered to be the best health care facilities in the world that save the lives of many people. As per WHO, 2020, (Madhav, 2013, and Himani Chandana, 2019) recommendations that a country should have one doctor for every 1000 people. Currently, India has one doctor for every 1445 people. Though these numbers might convey that India's condition is not that bad. But seeing its huge population the availability and affordability of health facilities in cities and rural areas, the country certainly needs more hospitals, specialized doctors, and paramedical staff to cope during any crisis.

India currently allocates a meager 1.28% of its total GDP (WHO 2020, Madhav, 2013, and Himani Chandana 2019) to the health care sector. In comparison, the USA currently spends around 17% of its huge GDP on Healthcare. India allocates a very low budget for healthcare, which clearly shows the priorities. This needs to be changed immediately.

If we remember nearly two decades back, people were preferring only Government hospitals because of qualified staff and better facilities at a meager cost. Now, the main concern in the Government hospitals is the lack of basic amenities, such as cleanliness, sanitation, restrooms, and low quality of equipment and quality of service which are contradictory to the private hospitals. Insurance is another factor to visit the panel hospitals that care for them with proper attention. Patients rush to urban areas for the best private hospitals for their good hospitality, facilities hygienic environment, and availability of highly qualified doctors.

Cleanliness, disinfection, hygiene are the main concern in Government hospitals. Many of the hospital wards are in a very dire situation. Some don't even have proper toilet facilities. This is a major concern and needs to be addressed first.

During any health issues, the government depends on its aided hospitals as private-run hospitals may not entertain patients because of cost-effectiveness, the severity of cases and long unnecessary government procedures and formalities, and political interference. Sometimes it is difficult in getting authentic national data from local private hospitals and nursing homes due to the poor maintenance of records in local areas. India needs to improve the medical facilities in government hospitals by procuring types of equipment, hygienic facilities, and recruiting the doctors and paramedical staff in controlling COVID-19 like epidemic diseases, otherwise, it would be a disastrous situation in controlling the huge population.

2.6 Medical Achievements During COVID-19

The doctors, paramedical staff members have done a commendable job around the clock treating and providing medical treatments to Covid patients. They have rendered their service to patients as a noble profession irrespective of additional duties and neglecting their family problems. Their untiring services are highly acknowledged by the whole nation as a "Gesture of Gratitude" through ringing bells and clapping for five minutes on 22nd March 2020 for the call given by the Indian Prime Minister.

The early imposition of lockdown to fight against the deadly Coronavirus had saved several people from infecting virus and less number of fatality cases than that of western countries.

The Prime Minister of India, Sri Narender Modi, during his national telecast on 12th May 2020, said "When the lockdown was imposed, not a single PPE was manufactured in India and a very few quantities of N-95 masks were being manufactured. The crisis has allowed learning a lesson to produce needy surgical items. Indian companies had accepted it as a challenge and now manufacturing 2 Lakh PPE kits and N-95 masks per day within a period of 40 days during this lockdown .

The Serum Institute of India (SII) and Bharat Biotech are two manufacturers that have undertaken the task of Coronavirus vaccine and successfully produced Covaxin and Covishield vaccines. Nearly eight crores of Indians have been successfully given

vaccine and Lakhs of doses are being exported to other countries. Indian medical capabilities have been appreciated worldwide.

This phenomenal accomplishment during this crisis has given us more confidence and encouragement to be self-reliant. It is a time to be vocal for local products and help these local products to become global" (Mini Tejaswi, 2019 and News 18 India, 2019).

Indian doctors and medical companies do possess technical skills in manufacturing high international standard equipment, provided Government policies are free and fair.

2.7 Police

It was a very tough task for police authorities to control people in the lockdown period to maintain the social distance and to convince the deadly contagious diseases and their remedies to stop spreading. People should also note their importance and help themselves in such an awkward situation. The members of society and rural people should be trained to face such calamities. The community people in rural areas should protect their village by themselves in the shifting system.

2.8 Agriculture - Storage Places

The agriculture sector is the backbone of the Indian economy and provides food grains, vegetables, and fruits, etc. for millions of people. Indian agriculture is a huge and extensive sector involving a large number of stakeholders. Farmers purely depend on agriculture income. With a lockdown situation prevailing throughout the country, storing, transporting, selling and export of crops have been hit. This has led to farmers not being able to sell their goods and sustain losses. And on the other hand, the scarcity of vegetables in the cities has led to an increase in prices. This unequal distribution has affected the farmers the most. Due to control in the movement of people, there has been a scarcity of daily wage laborers who were hired for farm work causing difficulty to both parties.

There are many factors like improper rains, cost of daily labors, fertilizers, and seeds, bore wells, storage facilities, export, and transport facilities, that ensure proper returns to a farmer. To safeguard the crop, proper storage facilities should be made available to all villages in rural areas, and at some places, cold storage centers are provided so that farmers can participate well in rainy seasons as well as in these lockdown situations so that their crops don't get affected. This would avoid the farmers to go to cities. The

Government or private parties should make sure that no crop goes wasted. If it is done perfectly, this will have a very good impact on the economy and everyone.

2.9 Educational Institutions

Academic activities are essential; and classes, examinations need to be conducted under any circumstances by implementing any mode of teaching and examination pattern. One must ensure it should not be a zero year. After all, students are the future of a country, their curriculum shouldn't be hampered. Without letting the development of the last two decades go in vain, the shift to online classes has been quick. Though its effectiveness still needs to be analyzed.

The method of online classes through Microsoft team, Google Meet, and Zoom, etc for teaching, examinations, assignments, oral or written tests, and telephonic and individual interviews are well established. Educational institutions should find an effective way to teach and conduct examinations in such a way as not to misuse technology. If not fully online, at least some regular face-to-face interaction classes and practicals for science courses may be considered next semester. The curriculum should have the option of a quick shift of classes from online to offline. Conducting examinations online from homes will be a difficult task to avoid cheating. Hence, the method of evaluation needs a restructure too. All institutions should have an alternate online portal for every work so that things can survive without getting completely shut.

The proper seating plans, dividing into more number of sections, avoiding mass lunch or making in two shifts, reducing the period of examination to adhere social distance concept. Schools are the best social media to pass information to parents and the community, through students.

To avoid commuting in such lockdown situations and to complete minimum basic work, 10 to 15% of staff may be recruited to reside in residential quarters, otherwise, institutions should make alternative arrangements within the campus.

2.10 Offices, Companies and Industries

To run the offices, companies and manufacturing units must recruit at least 10 to 15% of staff members; they would stay in the residential quarters. Other members may be asked to work from home online. The campus staff members should not be allowed to go outside except one person who is in charge may be asked to procure essential items. It must be the responsibility of management to implement during any crisis. This would

not hamper completely the office work and manufacturing tools so that at least work would be continual.

2.11 Shelters for Street People

India is a developing country with a 135 crores population, most of them are below the poverty line, mainly farmers and laborers, that too migrating daily labors from one state to another for the sake of employment. People living in slum areas and staying on roads in peak summer and winter are called street people. Some say it is their life we cannot help them. But during such crisis pandemic diseases, natural calamities, are nowhere to go. It will be a chaotic and pathetic situation for them. To avoid and save the lives of street people, the government or private parties may go for construction of at least one shelter at every 5 to 6 km distance with basic amenities in cities, and at least one or two in the district, taluka, and village levels on nominal rental and renewal basis for every two years. This compassion for such people will be great a boon for them.

Such type of temporary rental accommodation will facilitate them in many ways - i) they get shelter and basic amenities (electricity, water, toilets, etc), ii) they will be hygienic as they go as maidservants and labors to houses and offices, iii) children will be safe, especially girls, iv) we can provide education to them, and v) they will have unity among themselves.

Such type of rental accommodation will avoid the clumsy environment on pedestrians or two sides of roads in the main cities. One needs to understand that the above-mentioned facilities should even arise in a perfect country where every citizen has his shelter and the state is doing a great job looking after every one of its citizens. The main fight is against poverty. The Government must make policies to eliminate pathetic conditions to bring them up to the basic level that would help them to get some shelter houses. If this is done, then they don't even have to think about the homeless when they aren't any. It is a long battle and it is to be won. If it is successful, then India will be free from poverty.

The government authorities must make policies to construct shelters and be given to private authorities on a lease basis so that it generates business, employment and leads to revenue-generating centers.

2.12 Public Parks and Libraries

People need recreation in the open air. The multi-storeyed buildings, residential complexes, densely populated houses have abolished the concept of parks and libraries in the cities and district level also. There is no proper place or public parks for people to spend some leisure time in the open air, for physical exercise, yoga, and even to play outside. This is the major concern for family members and children. The lack of facilities would compel children to play on the main roads. That leads to complications with neighbors and also prone to accidents.

These parks may also be essential in emergencies like natural calamities, earthquakes, and in any eventuality, the public may be asked to shift and labor class people may be shifted for a few days. The parks may also be used for school children. The local Government authorities may go for the creation of parks and libraries, then they may be handed over to private authorities or welfare associations for maintenance on a lease basis by charging a nominal amount from users. That would generate a healthy and knowledgeable society and also generate employment and revenue for the government.

2.13 Play Grounds

Playgrounds are as important as schools. The school educates the mind whereas the playground energizes the body. An intelligent mind with a distorted body is useless and the converse is also true. Thus, the way mind and body exist together, the school and playgrounds are necessary to be together, they both are equally important for the physical development of children. It improves their flexibility and balancing skills, the function of the heart and lungs, the children become stronger. Playgrounds are safe places for children to play and learn freely, rather than practicing on the streets. It provides a platform or places for all ages of players, students and employees to come regularly and participate in sports and games such as running race, jumping, football, cricket, bad maintain, etc.

Play grounds create a healthy environment and certainly improves the health conditions, otherwise, the people become lazy, dull, inactive, and becoming obese and fixed to four walls of flats, spending most of the time before television sets or now on mobile sets in the pretext of online classes. Thus more unhealthy and inactive people also cause a threat to the country and one day the country may consist of unhealthy citizens. And this will force authorities to have more and more health care systems in the country.

In the present scenario of the real estate business, because of the high cost of land, we rarely find any playgrounds or parks, or recreation centers for children and adults. However at the interest of the citizens, concerning health issues and motivate and develop the students to become more number sports personalities in the country, each village, taluka levels, and district levels, playground be earmarked for residents, and multi-complex sports centers be constructed in every district and apart from that, every two or three neighboring districts in a state should have at least one sports college. This generates competition among students starting from rural areas to national levels. Thus public and private sectors should come together for business in constructing sports centers and sports colleges. India's richest sports body BCCI may come forward to provide playgrounds and sports centers in all the states in India.

2.14 Market Places

The market places are another nuisance in our country. They are highly uncleaned, unhygienic, and densely packed shops with huge crowds. They are neither properly planned and nor well maintained. The commercial activities should not be performed in residential areas, which may be economically beneficial to some individual parties but highly inconvenient to others such as children, ladies, and senior citizens. The individual houses may not be allowed to convert into business centers and shops. In almost all the places in India, the roadside buildings were initially granted permission for house construction but they are slowly converted into commercial activities by modifying front building portion structures into shops and offices. This can be easily seen in all most all the major cities in India.

The department of town planning and municipality/state government authorities must implement strict rulers and impose heavy fines. That should not lead them to pay property taxes of category II of commercial activities.

Another awkward business is liquor, wine, and bars shops – restaurants in residential areas and in the vicinity of educational institutions. What type of moral values do we expect from the teacher in teaching students? Three factors - good parents, good schools, neat and hygienic societies are equally important to make a healthy and educated child, which leads to being good citizens of country, otherwise uneducated and unhealthy population cause induce effects to others and it would be a burden to the country.

2.15 Sanitation and Public Toilets

India being a huge country, cleanliness and sanitation have always been a major concern. That concern adds up the problem of a lack of toilet facilities. The toilets in Bus and Railway stations; and government hospitals are in very awful and unhygienic conditions. This shows the negligence of municipality and government authorities. This situation is different in five-star hotels and developed countries. The present ruling party was quick on realizing this and they have made building toilets and proper sanitation their primary work, through the program "Swachh Bharat Abhiyan". This was so massive, it led to a cleanliness revolution all over the country. Even though the condition had improved a lot, still there is a long road to go. Lack of public toilets especially in urban areas is a major concern. The density of toilets on the main roads needs to be increased and the existing ones need to be maintained well. At all petrol pumps and supermarkets public toilets be made available, the signboards showing the directions with distance may be erected on the roadside. A fine of Rs. 500/- (or any amount as per the committee decision) be imposed if anyone is found urinating at public places. In developed countries, we do not see anyone urinating on the roadsides. Why cannot we impose strict rules and regulations in society similar to the imposition of masks in the COVID-19 period?

2.16 Spitting

Spitting has always been a great concern for the authorities. People in India have a very bad habit of spitting everywhere without noticing the location. It is a big nuisance especially in government buildings, on roads, and at every corner, spitting spots are generally noticed. The COVID-19 has made people aware of the dangerous spitting; it has been a great concern, the spitting has a virus that spreads through droplets. This change needs to come in from within the people themselves. The government should impose a fine and put them in jail for a certain period on spitting and make sure it is implemented well. The government should make use of this pandemic crisis to make the population aware of not spitting everywhere.

While I was deputed in Bhutan (1995-1998) from government of India, it was noticed that littering at public places was prohibited and if found, a fine of Rs. 100/- was imposed. We do not find spitting anywhere in the developed countries, but these are common practices in our country, India. The time has come to cultivate good and

healthy habits in the minds of people through strict rules, otherwise, the places may become hub for insects and germs which spread any diseases or viruses, which are harmful to the people.

2.17 Swachh Bharat

We are fortunate to have an honorable Prime Minster Sri Narender Modi, who had a great vision and touched the Indian critical issues that no one had imagined them that he would speak from Red Fort. They are Swachh Bharat and public toilets issues. The Swachh Bharat concept may be strictly implemented at all places. It should not be only on paper. The municipality authorities must take responsibility for collecting the garbage of all the places and be dumped at proper distant places and may be reused in consultation with the departments of Waste Management. The house and shop owners should also be made responsible to maintain the area neat and clean.

Some of the proposals are drafted, one can implement them

a) The collection of garbage must be the duty of the municipality and private parties. It is carried out strictly by the private authorities in some places in Telangana state. However, it needs to be further improved to make hygienic places.
b) The Municipality should also employ their staff members.
c) The tender may be floated for the private parties in the area wise to remove the garbage and maintain the area hygienically.
d) It will be good business and generates a lot of jobs for class IV employees.
e) They should collect garbage from every house and can also collect garbage collecting charges on monthly basis.
f) House & shop owners, residential complexes must be fined as per the norms if any garbage is found around two meters distance of building or complex.
g) If any unwanted materials or junk or waste materials are found the local municipality be responsible.
h) The public may approach the office or court if any type of garbage is noticed beyond two meters of the house and complex.
i) The owners of unconstructed plots in residential areas must be warned to construct the houses or at least boundary, if not, the plots may be maintained neat and clean and they should also pay the cleaning charges for their respective plots.

j) Implementation of such strict policies would certainly improve the area and people will enjoy clean and fresh air and free from infectious diseases.

2.18 Agricultural Lands and Food Crisis

Neither anyone wants to work in fields nor is interested to do agriculture business, but everyone wants uncontaminated agricultural products and hygienic food. In most places, it is noticed that farmers are averting agriculture due to many reasons. Some of them are: i) non-profitable business, ii) not getting at least the initial investment, iii) farmers are committing suicides, iv) shortage of laborers, v) high cost of fertilizers and seeds, vi) water crisis, vii) shifting to cities for employment and better facilities, viii) nuclear families, ix) dependent on children at old age, staying with them wherever they are employed, x) selling the lands for real estate people and shifting to cities, and xi) any other reason.

If the private agriculturalists fail to perform cultivation, it may arise another huge crisis of food shortage. If raw materials are not produced, whole industries and manufacturing companies have to be closed down or they may have to import raw material and food grains.

If this is not taken seriously, one day the situation may arise that private owners may convert the land into residential plots for the construction of houses or sell their lands for real estate builders for making housing or commercial complexes; as the land rates are very high and it is a lucrative business to sell the land rather than doing agriculture. It is already prevailing in most of the places. By and large, all roadside lands are sold at a high rate for commercial activities.

Keeping in view of this vision, the government must and should possess, some fixed land for agriculture purposes only. At least 10% or minimum 1000 acres of village land must be allocated as government land for purely agricultural purpose with a note, it should not be sold for any private parties, and not used for any type of constructions such as offices or storage, industries or any type of religious structures temples, mosque, and churches, etc. If any crisis arises in near future, the government may recruit the laborers as permanent staff members for the cultivation of lands for producing food grains and vegetables, etc.

2.19 Maintenance of Old Houses and Old Shops

A cultured family is known for their behavior, purity, and orderliness of one's own house. The impression of a colony or city depends on well-designed houses or complexes and on proper planning cleanliness of roads. The neatness has to be the moral accountability of residents and local municipality authorities.

The old houses as well as unused shops, and sick industries cause ugliness to the city as well as a nuisance to neighbors. If they are not maintained properly, the houses, the empty plots are treated as dump yards and garbage centers, the houses may turn to ghost places. If such houses and shops exist in the cities and rural areas, the local or neighbor people should bring them to the notice of the municipality or local authorities as causing inconvenience to the residents. The owners should be reminded to repair their structures or if there are any disputes in their properties, it should be shorted out and they should be turned to the livable condition, otherwise, the owners are liable to pay a heavy penalty at Rs. 5000/- per month or any amount of fine as per the decision of government authorities.

2.20 Painting - Bank Loans

Cleanliness determines beauty. The environmentally clean and hygienic cities give the choice for domestic and foreign investors to start new business ventures. To beautify the city and areas, the houses, shops, and complexes be painted at least once in seven to eight years. The date should be written on the compound wall of the building and municipality authorities may be asked to verify the dates regularly. If their premises or complexes are not whitewashed, they should be liable to pay a fine of Rs. 5000/- per year or any amount of fine as per the decision of government authorities.

The banks may be requested to provide loans for whitewashing or painting (not for the renovation) for houses or flats and the complexes at a maximum amount of Rs. 50000/- (fifty thousand) at a nominal interest rate. Thus by and large the needy people may avail loans that beautify the houses and cities. The prime advantage is that, the house, complex, or factory would be free from insects and diseases, and lead to a healthy and hygienic environment for residents.

2.21 Cremation Grounds

Birth and Death are continuous processes in life. A person who takes birth also takes death. The birth of a child attracts few relatives and guests whereas the death of a person attracts more visitors. When birthday parties are arranged so elegantly, why can not the cremation grounds be arranged properly ?

It is noticed, in the number of districts and rural areas proper cremation centers are not available. Even if they exist, they are like deserted land, badly managed and lack of basic amenities like water, wood, electricity and sitting places, toilets, and bathrooms. These are pathetic conditions.

Local Municipal authorities must construct proper cremation grounds with modern facilities such as electricity and firewood, with basic facilities. They can be handed over to the private parties on a lease basis for five years. The procedure of the allotment is done through the open tenders. It is observed in some places, by and large, every day five to six dead bodies are brought for cremation. This would generate revenue for the government and also it would be a small business for the leasing party which gives employment for about 8 to 10 members – in charge, caretakers, wood and electric suppliers, a shop for cremation items, priests, etc. Rural areas can have one whereas urban areas can have 5 or 6 cremation grounds at different places in the outskirts.

These centers will also beautify the city and enable them to perform regular rituals of deceased persons in open areas for the gathering of many people, whom they cannot be entertained in small houses and flats. Thus proper cremation grounds are essentially required to depart a soul with great satisfaction who spent the whole life with family members and rendered his/her services as well as knowledge to children and society, otherwise, such a soul is burnt in a dirty or garbage place where Vedic rituals have no sanctity.

2.22 Beatification of City

Cleanliness determines beauty. The beautification of cities, natural and artificial sites; hygienic environments play a major role in attracting tourists and investors to start new business ventures. India has incredible and innumerable natural sightseeing places, waterfalls, temples, and monuments that are culturally very rich. It is a unique place for foreign tourists. Every year they eagerly visit India to know and adopt the culture. If the cities and villages are made as attraction centers, with a neat and clean environment,

and with high-quality Indian food and proper hospitality, then India would be a natural tourist center in the world.

The side roads i.e. both sides of main roads, pedestrian places, need to be maintained properly for advertisement purposes. Such long stretch areas in piecewise (5 to 10 km distance) can be given to rent on lease basis for a period of 5 to 6 years to private parties for commercial advertisements with proper scintillating lights, neat posters of Indian culture and traditions, well-known scientists, freedom fighter, arts, and photographs and to maintain the area neat and clean.

That would certainly generate revenue for the state, and the area gets cleaned, the city will be automatically beautified and turn to be tourist attraction centers. These things are well decorated and well managed in Gulf and Western countries. Why cannot we do it in India? This practice should come from schools and colleges. It should be mandatory to the students to participate in Campus Beautification Committees (CBC) which would improve their knowledge and change their behaviour. This was followed in Sherubtse College, Kanglung, Bhutan.

2.23 Slaughter Houses

It is believed that this COVID-19 is originated from the Wet market, Wuhan, China. The Wet market is a slaughter place where all types of animal meat such as bats, snakes, covets, goats, and hen, etc are sold for human consumption. They are stored in racks and in unhygienic rooms, where there is a high possibility of germs, insects, and bacteria. The infections are spread out from animal to animal and then it became Zoonotic virus animal to humans. These diseases are mostly originated from slaughter centers and unhygienic places from different parts of the world.

The history reminds us that all epidemic diseases such as (mentioned few here) Ebola virus, Zika virus, Chikungunya, Plague, H1N1, Swine Flu, and the present Coronavirus were caused due to the merciless activities of killing animals for consumption of animal meat, beef, pork and chicken, etc. (Mathew Brown, 2020). These rampant viruses have claimed millions of deaths of innocent people in pandemic disease.

These deadly diseases remind us

a) Cannot humans survive without the consumption of meat?
b) Cannot we monitor these slaughter centers periodically?
c) What type of meat they are selling to innocent people?

Once they are butchered, it is difficult to find out the type of disease or infection the animals had, whether they were healthy or sick animals. There is an urgent need to monitor these slaughter centers and it should be under the vigilance of government authorities. All these rampant effects such as leakage of gas from industries, electric short circuits, leakage of water from storage units and spreading epidemic diseases, etc are due to the negligence or corruptive nature of employees, shortage of technical skills, or installing faulty equipments.

If things are not properly implemented, find the unhygienic filthy environment and unhealthy people in the respective constitutions of elected members (MPs. MLAs, and Councilors, etc.), their allocated funds for the developments of their respective places must be frozen.

2.24 Bio-diversity, Zoo Parks and Goshals

The Hindu traditions believe that care towards to animals and nature lead to a blissful human life and the world would be in peace. Protecting animals mean looking after dumb children in our house. The conservation of a variety of animals and the number of species of plants, fungi, microorganisms give the concept of bio-diversity and zoo parks. They play a crucial role in the development of a nation such as the protection of water resources, soil formation and protection for crops, nutrient storage, climate stability, medicinal plants, recovery from unpredictable events, research and educational programs, etc. (Shah Anup, 2014). To have a proper and balanced ecosystem, bio-diversity, and zoo parks, goshals (cow shelters) are essential for all living bodies. Cow protection is considered to be a divine service that can achieve extraordinary strength in producing cow milk products. The literature says most of the diseases can be cured by consuming cow products and using them in Yagans which remove infections from the environment.

If proper habitant centers are not provided to animals, they cause innumerable loss and nuisance to human society. The animals, cows, monkeys, and stray dogs move freely in residential areas and main highway roads, create a lot of hazardous to the people and accidents do take place with fast moving vehicles on the main roads.

It is the duty and responsibility of highly intellectual human society to show proper shelter and feed proper food to them. These animals and creatures are part and parcel of the ecosystem. India is an agricultural-based country, it's necessary to make at least

one proper bio-diversity park for every two or three districts and animal parks for every 10 to 15 km distance in rural areas. These parks may be given to local private authorities on a lease basis for every five years. The concerned in-charges should feed them properly, and local people and visitors may also be intimated through notices or announcements through loudspeakers to provide eatables. These simple feeding methods to animals develop proper moral and ethical values and culture, sympathy, affection, and attachments towards animals. Thus the blessings of animals would be innumerable benefits to the people as well as to the nation, which directly leads to proper balancing of the ecosystem.

2.25 Rejuvenation for the Earth

The ruthless activities of killing animals, the detonation of mountains, deforestation of trees and plants for inhabitants and industrialization, construction of multi-storeyed buildings, drilling mines for minerals, bore wells for water, oil wells for petrol, throwing garbage and industrial wastages into the rivers, nuclear wastages and testing nuclear weapons in oceans, polluting the environment, water crises and densely populated cities, etc. are causing major threats to the ecology of the planet Earth.

Any mechanical engine needs a break at a regular interval of time to attain initial normal conditions. Similarly, the earth also needs a break for a healing period for a few days. It is being continuously tortured for many centuries. If the break or healing period is not given it retaliates in any form to release energy for stabilization. To avoid unethical activities, regular epidemic diseases such as the present outbreak of COVID-19, and the positive results due to lockdown indicate that "Need for the Earth Healing Period or Resting Time for at least two weeks in a year, preferably during the peak summer season in the 3rd and 4th week of May (from 15th to 30th May) every year".

This period is termed as Rohini Karte (Prokerala, 2019), Nava Tapa (Hindi), Njattuvela (Malayalam). The Sun transits through Rohini Nakshatra (one of the 27 constellations), during this passage, Sun occupies each of the Nakshatras for approximately 13.5 days. Rohini Karte falls during two weeks period 3rd and 4th week of May every year. This summer period shall always be very hot and humid. It is said during this period even roads and stones get cracked due to the extreme temperature of nearly 45^{o}C and the radiation of heatwaves. During these extreme climatic conditions, all educational

institutions are closed for summer vacation and people are generally availing leaves to remain in the houses.

This period may be considered for the Healing period for the earth. It is necessary for the planet Earth to be stabilized for its resources as well as to remove all the unwanted pollutants from the environment. Thus this healing period of two weeks is used as a complete lockdown for rejuvenation for the planet Earth and nature to serve the people for one year. To compensate for the two weeks, it is proposed that "Every First or Second Saturday" may be considered as a working day for all government offices, private companies, and industries. This type of yearly EHP or lockdown may not be a major loss for manufacturing units and the economy of the country but it yields a lot of positive consequences to the citizens in the long run. These are analyzed in detail and presented in another paper titled "Rejuvenation for the Earth"(Pramod & Prateek, 2020).

2.26 Ancient Hindu Culture

India is considered to be the source of spirituality in the world. Hindus are strong followers of traditions and culture which are based on Vedic Scriptures. They are framed accurately for the welfare of all living sources on this planet. The manifestation is every living entity is unique and parts and parcel of the Supreme Lord, have equal rights to exist, and they are independent but they are interdependent for survival. People respect and worship all, as they see the soul and super soul in every living entity.

They adhere to several rituals and customs which are directly or indirectly related to the benefit of the people and the development of satwic (mode of goodness) societies in the country. The customs and procedures mentioned in the Vedic scriptures are unique in the world, concerning the health and prosperity of humans. They produce a hygienic, clean environment, and curb infections and bacteria if any, at the place of working. Such as namaste, cleanliness, vegetarian diet, keeping holy tulsi (basil) plants, using cow dung and cow urine, prayers and healing mantras, yoga, yagnas, and cremation grounds, etc.

For the past many decades these are given the least importance or neglected due to many reasons, but pandemic COVID-19 had exposed and enlightened the people in the world to follow the ancient Indian tradition and culture. These are analyzed in detail in another paper titled "Hindu Traditions and Customs to curb Infections". (Pramod, 2020)

3. Conclusion

All our efforts are to protect and safeguard all living entities. One must work with nature, if any action or activity goes against, it follows and one day it takes retaliation as per the law of karma. The meticulous analysis shows that these are essentials and vital for the welfare of humans – hospitals, parks. playgrounds and sports centers, and cleanliness, sanitation centers, agricultural lands, hygienic hospitals, market places, slaughter centers, maintenance of old houses and complexes, rejuvenation of earth, bio-diversity, and animal parks have directly pertained to health issues of citizens and the ecosystem of planet earth. These sectors appeared to be insignificant, but if they are unplanned, unsolved, and if they are degraded further in the society, one day they might explore similar to pandemic Coronavirus.

The impact of COVID-19 is so vulnerable that people have no choice, except to face and adhere to the new challenges in life which would be free animal and free environmental effects and work in harmony with nature. The lockdown has compelled them to realize the Hindu traditions and practices such as cleanliness, isolation in and outside houses, social habits, whereas fast-food diets with animal products, ruthless killing of animals were to account for this epidemic diseases, which are treated as prohibited traditions and customs in Indian Vedic scriptures.12 The cultural and hygienic values need to be understood and cultivate in daily life in a modern way without distorting their main objectives. The planet earth also needs regular rejuvenation once a year so that earth gets healed and other living entities birds, animals, and reptiles would be in harmony with the ecosystem and with people.

The above issues are the topic of discussion in the minds of many citizens and are said to be unsolved issues. They need to be undertaken and be improved. They can be developed as public and private projects. The fulfilling of the above basic projects in a modern style not only generate employment but beautify the areas and cities; and produce revenue and attract investors to set up business in rural and urban areas. They are protectors, safeguard places, employment generate centers, and the most prime factor is, citizens will always be healthy and free from diseases.

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Current Strategies of Risk Mitigation for Disaster Surveillance of India

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Abstract

This study aimed that the risk mitigation for disaster in India, and damage the socio-economic condition, loss of the natural resources, death of the living bodies remain high. Clearly, the continuous process of risk mitigation for disaster in India, very intricate due to the several factors, for example socio-economic condition, climate change, rise of sea levels etc,. These different factors dominance the frequency and intensity of flood, earthquakes, tsunami, landslides, wildfires, drought, cyclones, different epidemics diseases, needs of the different scheme for proper implementation, lack of traditional structural measures and finally end-to-end risk mitigation of disaster and prior protection of the environment and ecosystem. The article identifies current strategies of risk mitigation for disaster by India different disaster and risk mitigations agencies in present scenario. The article recommendation may be guide the policymaker and the stakeholders in formulating the sustainable risk mitigation for disaster surveillance of India. A good attempt was taken by the govt. of India to recognize, promote more potential through online training, different awareness programme organized by early warning system, National Institute of Disaster Management (NIDM) Govt. of India.

1. Introduction

Any catastrophe has caused loss of life and misery all over the world. Now, the main interest of the government is the flexibility of sustainable communities, but most of the endangered communities particularly in developing countries are the incondite sections of the community, specially poor people, who have not sufficient capacity to join the effectively in the elasticity efforts (Kanji and Agrawal, 2020). Several good researches were focused on the geographical, social, physical, economic, political and

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finally infrastructure quality enhancement as per social media analysis, print media analysis, mathematical modeling and finally physical observations (Giri and Vats, 2019). Recent observed for disasters like as health aspect (pandemic disasters), cyclone, earthquakes, landslides, tsunamis and volcanic activity, avalanches and floods, extreme temperatures, drought, wildfires, cyclones, storms, disease epidemics, insect or animal plagues, etc. (Fraser, 2021; Shahbazi et al., 2020). The anthropogenic activity of disasters namely, hazardous materials, nuclear disaster either power plant or blast, radiological activity, chemical-biological weapons, cyber-attacks, transport accidental, etc. (Gill and Malamud, 2017).

Modern application on basis of disasters mitigation in kind application of GIS as ability predicted of vulnerability zone require aspect on the basis of hazards perceptive. Observation to potentially support as disaster risk management is coming into increased scrutiny (Alexander, 2008). Its take actions needs as different steps of the disasters management aspect on, minimize future losses, preparedness and crisis management, disaster often focused on saving lives, and crisis management aiming at re-establishing services supporting human activities (Jaman et al., 2021). Previous literature as extensively discussed on the technical and scientific observation, scientific challenge as required to maximize in term of beneficial space to mitigation of disaster risk management. The exclusively observed as extent space-based earth, grants actually meet the disaster risk management decision framework (Jaman et al., 2021).

Social media as a significant tools for mitigation role of the media in natural disaster as unarguable. The media supporting acts as a transmitter of valuable information throughout the disaster mitigation of life cycle. This is more effective argued that the relevant functions of the media variability such as radio, TV as well as e-communication, newspaper awareness, and more supporting as Facebook, WhatsApp's to make supporting its effects as well as remedies. As long term mitigation, the media leads to disaster information which could provide repeatedly on disaster coverage (films and demonstration as virtually, documentaries, news and special programs), which ultimately helps the community raise disaster awareness rather than future events (Rodriguez 1997).

Immediate response team is not only the common recognized term, but also its plays a vital role in life-saving management in risk mitigation for emergency disaster management response. The main objectives of this study are current strategies of risk mitigation for disaster surveillance of India.

2. Global Mitigation of Disaster

Natural or manmade disaster occurred suddenly, happening over the month or it may run even the years and affects the large region and it finally damages the natural environment in the world. Different good planning and mitigation measures can also help the reduction of the risk mitigation for disaster (Jones et al., 2014). Mitigation across perspective to prevent as reduce the risk of life, property, social and economic activities and natural hazards (Shahbazi et al., 2020). Major aspect on mitigation primary decides awareness, education, preparedness, prediction and warning systems, which can leads to the disruptive impacts of a natural disaster on communities (Jaman et al., 2021). Mitigation measure parameters applied such as adopting of zoning, land-use practices, and building subjection. However, to minimization for actual damage from hazards and identify vulnerability zone by GIS system (Alexander, 2008). As landslide- and flood-prone areas towards planning needs at zoning ordinances and constructed to require element for post disaster mitigation. Moving towards up holding of mitigation practices searching for community commitments, limitations and barriers, and innovative solutions, e.g., Flood plain support area to the community as open space, wildlife and recreation attractions, or mountaineering and physically good ness trials (Shahbazi et al., 2020). With awareness and educational has to be leads in cooperating of disaster knowledge and research for social media mitigation practices. Mitigation initiative of all above corresponding need to engaged the key points that addition in growing, adopting, implementation, and elongation of mitigation, public officials, insurance as well as finance, civil groups who are able to architects planners also engineer; supporting specialist like as marketing, educator and researchers (Izumi et al., 2019). As communication and coordination researcher, practitioners and policy incorporating to enhances likelihood of implementing effective mitigation programs.

Table 1: Current Perspective Disaster Management

Disasters	Description	Management & Reducing Aspect
Bushfires, Australia 2020 ("The Australian Bushfire Mitigation Strategy," 2018)	Australian bushfire season, Black Summer, as period of unusually intense bushfires in many parts of Australia.	Completely close of insulation system in an IP66. Control by order of secure communication and automatic control. Advanced sensors with safety functionality are designed to monitor and manage high-disability earth faults. No form of recovery is a fire or bushfire mitigation solution. Recovers must be used in single shot mode on a fire risk day.
Flash Floods, Indonesia-2020	Flash floods, occurred in the Indonesian capital of Jakarta and its metropolitan area. Couse overnight rain overflow Ciliwung and Cisadane rivers, which dumped nearly 400 millimetres (15 in) of rainwater	Keep safety of people and displaced hundreds in a district on the Indonesian island of Sulawesi, and Search and rescue officials were still looking for missing people after the floods struck the North Luwu district of South Sulawesi province, said RadityaJati, a spokesman for the national disaster mitigation agency. Jati said search and rescue operations were hampered by thick mud covering roads and houses, and rain was continuing to fall.
COVID-19, China and all over the world, 2019-2020 (Yu et al., 2020)	COVID-19 as a pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (stork-covi-2) and ongoing pandemic, first identified in December 2019 in the city of Wuhan, China. The World Health Organization declared the outbreak a public health emergency of international concern.	Current situation social distancing masking, and vaccination, government police in primary stage-I lock down, then unlocking process.
Volcano Eruption, Philippines-2020	Taal Volcano in Batangas by Eruption, January 12, 2020, a phreatomagmatic eruption from its main crater that spewed ashes across Calabarzon, Metro Manila, and some parts of Central Luzon and Ilocos Region. Resulting in the suspension of school classes, work schedules, and flights in the area, Philippine Institute of Volcanology and Seismology (PHIVOLCS).	The only effective method of risk mitigation before such an eruption is to remove from areas likely to be affected by pyroclastic flow. 5 - Laharas (volcanic mud and debris flow) is a common large volcanic hazard for people and property. The Lahars likewise move very fast and acquire great destructive power.

Cyclone Amphan, Bangladesh-India-2020	Super Cyclonic Storm Amphan, powerful, catastrophic tropical cyclone, massive damage in Eastern India, also Bangladesh in May 2020. Amphan originated from a low-pressure area persisting a couple hundred miles (300 km) east of Colombo, Sri Lanka, on 13 May 2020. Tracking northeastward, the disturbance organized over exceptionally warm sea surface temperatures; the Joint Typhoon Warning Center (JTWC) upgraded the Amphan underwent rapid intensification and became an extremely severe cyclonic storm within 12 hours.	Place people and social media involve as climate change exacerbated extreme weather events in India and its neighboring countries, there was an urgent subjected to look at the plight of millions of people, mostly the poor, and find ways to build resilience.
Forest Fires, Uttarakhand-2020	On 23 May, a 51 hectare forest in Srinagar in Pauri Garhwal district was affected, now 51 hectares of forest has been submerged across several districts of Uttarakhand, killing two civilians and injuring another.	Advanced sensors and protection functionality designed to monitor and operate high-impedance earth faults. Government alive a relief-struggle for the firefighters controlling the growing forest fires in the state.
Assam Floods, India-2020	Assam floods, affected on Brahmaputra River in the Indian north-eastern state of Assam with including the COVID-19 pandemic, Couse by heavy rainfall, affected 30,000 and destroyed crops across 5 districts. It was approximately over five million people, claimed 123 lives, with an additional 26 died due to landslides, 5474 villages were damaged and more than one hundred and fifty thousand people took refuge in relief camps.	Thus, a proper assessment of the damage was not possible and a provisional estimate was provided by the affected districts and divisions. After the floodwaters receded. Recovery and protection by Assam State Disaster Management Authority (ASDMA). Social medial lead a major role.

3. Major Contains of Disaster in India

Natural disaster for major contains in India, many of them basis of the climate of India, make in losses of life and properties. Some natural disaster as droughts, flash floods, cyclones, avalanches, landslides brought by torrential rains, and snowstorms made in major threats. In dangers of disaster classified their profound environmental effect and human loss and frequency in sense of financial loss (Chakraborty and Joshi, 2016). Frequent summer dust storms, which usually happing from north to south, make

in properties damage in north India and deposit large dust and dirt from arid regions. The essential responsibility of disaster management towards mitigates or recovery, which state make its concerns. However, spread in the central Government could require approximate on relief, rescue and preparedness. The National Crisis Management Committee (NCMC) at central level of convey about disaster with extremely effort. The nodal ministry are justified and supporting certainty to recovery associate with NCMC ("Deep Depression in Bay of Bengal," n.d.).

Last decades of India, the government responsibility about natural disaster has elongated in terms of effectiveness, leads to well-organized at administrative level, privileges of Relief Manuals with public-private partnerships. In the federal of India, the responsible for shaping the government's response for natural calamity in primarily concern on the state government (Brenkert and Malone, 2005; Gupta and Sah, 2008; "Kedarnath disaster: facts and plausible causes.," n.d.). However, the central government as their resources, physical and financial support, provides the necessary assistance and support to reduce relief efforts in the event of a major natural disaster. The level of response at the central government level determines the existing policy of financing relief and considering existing factors: (i) Gravity of a disaster (ii) The amount of relief activities required, (ii) the need for central assistance to increase financial resources during the allocation to the State Government. Since its enactment in 2005, India's Disaster Management Act are described as a paradigm shift in disaster management, disaster prevention and risk reduction, and a move away from a new relief government. The conversational framework this Act obliges the National Disaster Management Authority and the State Disaster Management Authority to act as agencies subjected as disaster preparedness and risk decreases at the respective levels ("Disaster Management Act, 2005," 2020). Combined with three specified organizations should address the full magnitude of the disaster management cycle. The disaster management cycle as described in India's National Disaster Management Policy are exhibited in Figure 1.

Figure 1: Disaster Management Cycles

4. Social Media as Risk Potential Tools

As social media is a great tool for disaster mitigation, it can help in the news or awareness circulated now a days. It ranges from hotspot news massaging to applicability of social networking sites, these virtual provider could be connected to their mutual friends, or affected families. This application as the purpose of communication is to encourage and promote new for emerging sources of information online, and visitors about the achieving experience among respective concern, i.e., "post", "tag" "digg" or "blog" (NW et al., 2010; Sandra, 2015).

Recent trends in social media not only effectiveness of communication perspective, but also it concerns about application that could benefit (Giri and Vats, 2019). Further application on basis of media tools that has been remarkable benefitted like an Aarogya Setu app, is a mobile application tools, and developed by the Government of India, which connected health status and concern to peoples at COVID-19 pandemic disaster.

Although, 21 most popular of social media in 2019, where are more applicable as disaster recovery like as Facebook (2.23 billion MAUs), Youtube (1.9 billion MAUs), WhatsApp (1.5 billion MAUs), and Messenger (1.3 billion MAUs). Pervious applied traditional medial such as TV, radio and newspaper but more focus on the social media as an additional mode of communication, when information sharing is important such as disaster mitigation (Jamali et al., 2019). Furthermore, surveillance under disasters (e.g., cyclones, volcanic eruptions/earthquakes), where does not reach any communication like the internet, their communication conduct through mic campaigning and radio broadcasts.

4.1 Strategies of Resilience to Natural Disaster

Different strategies using different availability of management tools and improvement plan was decided basis of risk types. Disaster are associated with hazards, possible conditions of vulnerability and insufficient capacity, when disaster coincides with a vulnerability aspect (Jayakody et al., 2018). Thus according to common connotation defined as: Hazard (H) × Vulnerability (V). Risk assessment is an uncompromising process arising from risky areas, which assesses existing vulnerabilities that can harm people, property, services, livelihoods and the environment that are exposed to them together. Aspect on strategies of disaster resilience aspredict, and forecast of all hazards faced by the community such as: floods, cyclones, earthquakes, tornadoes, high winds and fires, to emphasis on the long term which could reduce risk as future aspect, instead of returning the community to a pre-disaster situation (Oldham and Astbury, 2018). The multifaceted goal of sustainability is to create more living communities, protect open spaces, increase economic vitality, promote social values and provide for future generations (Read “Facing Hazards and Disasters, n.d.). Previously act as screening process of disaster such as risk certainty, which able to following progress as sort out in Figure 2. Corresponding develop of building strategies and recovery process, assessing hazards problems and adhoc evaluation of the problem. As mitigation progress applies as an alternative protocols, setting goals and objective for failure perspective, which should implementation.

Figure 2: Conceptual Framework for Disaster M`itigation

Relevant Concepts	Description
Hazards	Physical events, a major loss of human activity, which can result in loss of property and damage over a period of time and within a specified period of time, social and economic disruption or efficacy of the environment
Disaster	Severe disruption of society's activities resulting in massive human, material or environmental degradation beyond the ability of the affected society to cope with its own resources
Risk	The probability of harmful consequence or expected losses (deaths, injuries, property, livelihoods, economic activity disruption or environmental damaged) resulting from interaction between natural and human induced hazards and vulnerable condition
Vulnerability	It is a measure of the tendency (natural phenomena) to carry the consequences of danger to an object, field, person, group, community, country or other entity. This limits the community to a disaster.
Specific Risk	Expected degree of damage due to a specific natural phenomenon
Elements at Risk	All objects, persons, animals, activities, and processes may be adversely affected by hazardous events, directly or indirectly, in a particular region.

Figure 3: Relevant Idea for Disaster Potentiality

5. Conclusion

This paper aims to explore the potential of disaster management with global policy, and social media effectiveness whether of adhoc disasters like floods, earthquakes, tsunami, landslides, wildfires, drought, cyclones, different epidemics diseases, needs of the different scheme for proper implementation. This article is mini review towards disaster mitigation strategies. In addition, the role of communication during mitigation, response, and recovery stages is also reported in the above sections. Needs separate to vulnerable zone possible selection which mays leads to, effectiveness ability. Explore the operational needs of disaster management agencies to liaise with other agencies and communities during the mitigation, response and recovery phase basis of India.

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A Review of Cyclone Track Forecasting Techniques

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Abstract

Over the past few decades, the tropical cyclone forecasting capacities and accuracies have improved considerably with the advancement in numerical weather prediction (NWP). With the improvement in monitoring technology, data collection and modeling techniques there are significant increased lead time forecasts. In this review work, an attempt has been made to understand various techniques used to produce forecast such as averaging across occurrences, statistical forecasting techniques, dynamical and numerical forecasting techniques, statistical-dynamical techniques, hybrid forecasting techniques, other forecasting techniques.

Keywords: *Tropical cyclone; Cyclone track forecasting techniques; Numerical Weather Prediction (NWP); India Meteorological Department (IMD)*

1. Introduction

Prediction of tropical cyclone is a complex process which includes prediction of several parameters such as location, wind speed, intensity, probable storm surges and accompanying rainfall etc. (Holland, 2009). Tropical cyclone forecasting techniques takes into consideration the behavior of previously encountered similar cyclone and/ or the recent-past behavior of the current cyclone. The similarity between cyclones may be attributed to the similar behavioral pattern, place of origin or time of origin. To forecast the track of the current cyclone, certain forces or factors are considered, also called predictors, with an assumption that these predictors would influence the previous and present cyclone in similar manner similarly. The cyclone track forecasting techniques that are implemented can be broadly categorized into various classes as represented figure 1.

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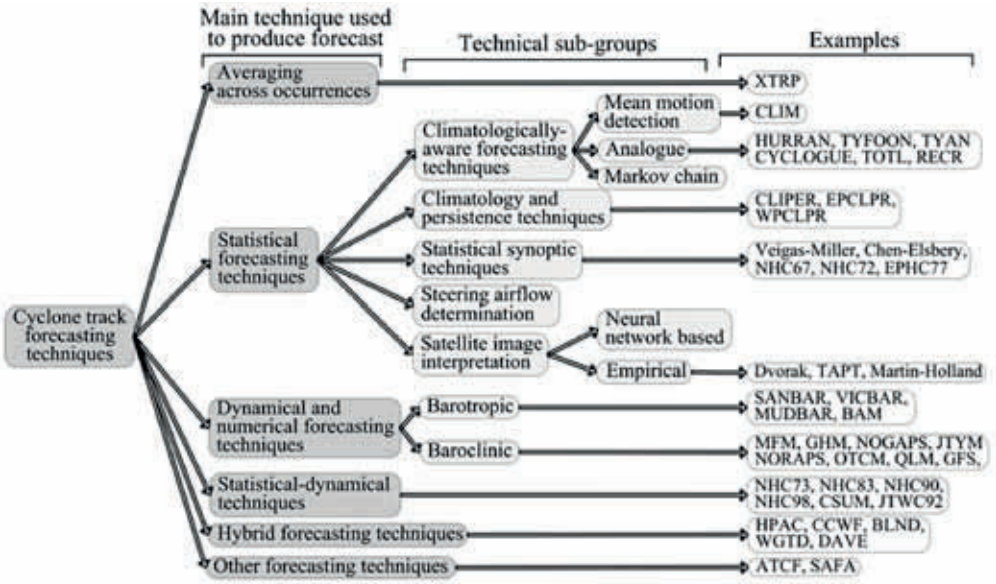

Figure 1: Details of various cyclone track forecasting techniques used (Roy and Kovordanyi 2012).

The Indian Seas have historically been the deadliest basin with several cyclones responsible for more than 1 lakh of causalities. The 1970 Bhola cyclone killed about 3 lakhs people, perhaps, the maximum number as per the recorded history. In the Bay of Bengal, number of devasting cycloning storms originated which made landfall in the eastern coast of India such as Cyclone Amphan 2020, extreme severe cyclonic storm Fani 2019, Cyclonic Storm Roanu 2016, extremely severe cyclonic storm Hudhud 2014 etc. Similarly number of devastating cycloning storms made landfall on the West coast of India originating in the Arabian Sea such as Cyclone Nisarga 2020, Very Severe Cyclonic Storm Ockhi 2017, Cyclonic Storm Phyan 2007 etc. The annual frequency of cyclone in India is represented in Figure 2.

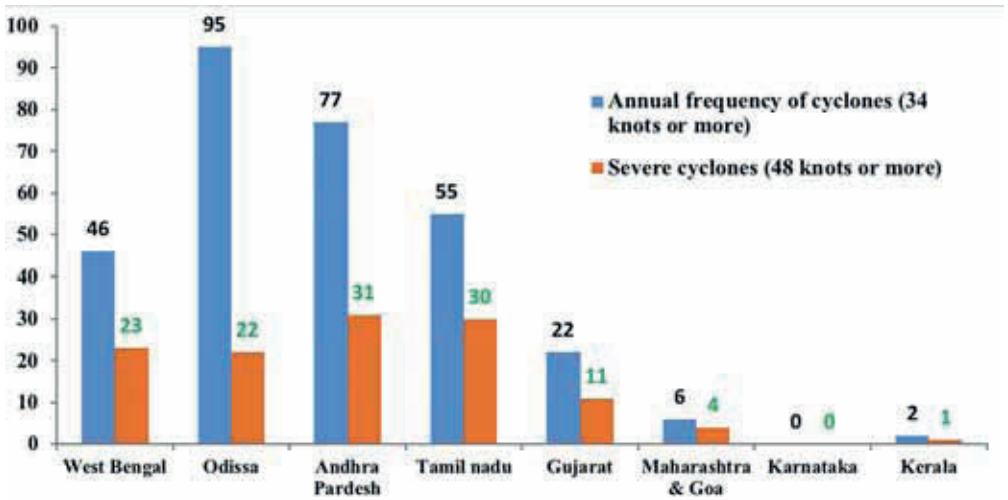

Figure 2: Annual Frequency of Cyclone

(Source: https://mausam.imd.gov.in/)

1.1 Averaging Across Cyclones

Averaging across cyclones are the simplest cyclone track forecasting techniques (Holland, 2009). In this technique, current and recent-past movement of cyclone are extrapolate and average to generate forecast the details of future cyclone and are also called as extrapolation techniques (Roy and Kovordanyi 2012). Only two factors i.e., direction and previous positions of the current cyclone governs the future movement of cyclone, the accuracy of the forecast depends on precise selection of time-tagged positions (including recent-past position) of the current cyclone. Even though this technique provide satisfactory extrapolation for short-term forecast i.e., 12 to 24 hours ahead, but they are not adequate and preferable for making long-term forecasting (Jeffries et al., 1993; Roy and Kovordanyi 2012).

1.2 Statistical Forecasting Techniques

These techniques are mostly based on regression analysis and can be used for producing both short-term (24 hours) and long-term (72 hours) cyclone forecasting (Miller and Chase, 1966). Some of major types of statistical forecasting techniques are statistical synoptic techniques, climatologically-aware forecasting techniques, steering airflow

determination, climatology and persistence forecasting techniques and statistical-dynamical techniques (Jeffries et al., 1993; Neumann, 1979; Roy and Kovordanyi 2012). Details of present or previous storm, numerical simulations or synoptic analysis can be used to obtain the predictor data set used for cyclone track forecasting. In comparison to dynamical and numerical forecasting techniques, statistical techniques require fairly low computational resources. In addition, any number of combinations of variable can be considered in the observed data (Neumann, 1985; Lee and Liu, 2004; Roy and Kovordanyi 2012). This technique reflects the average behavior of storms and the prediction of the model varies greatly when the present synoptic situation departs greatly from the normal climatology (Keenan, 1985). Additionally, this quality of data influences the output of the prediction of these techniques making it quite unreliable in data-sparse regions (Jeffries et al., 1993).

1.3 Dynamical and Numerical Cyclone Forecasting Techniques

Dynamical cyclone forecasting are carried out in two different processes i.e., using equations to forecast the track of the tropical cyclone vortex and determining the suitable pressure level using wind prognoses at different air pressure levels from global or regional models (Jeffries et al., 1993). This technique doesn't depend on climatological data of the basin since the different environmental factors that influence the cyclone are incorporated in the model enabling this technique to execute reliable forecasting even in data scarce environment. To run these modeling multi-kernel computers are required as these models cannot be run on desktop PCs (Lee and Liu, 2004, Neumann, 1985).

1.4 Statistical-dynamical Techniques

In this technique, predictors are determined to use statistical screening of past storms followed by combining with forecasts produced by a dynamical technique resulting in a final forecast (Neumann, 1979). In statistical-dynamical techniques, the output obtained from both from statistical and dynamical techniques are integrated. Statistical-dynamical technique is also known as NHC73 and is used by the NHC.

1.5 Hybrid Forecasting Techniques

As the name suggests, in hybrid forecasting techniques the output generated from two or more different techniques are combined statistically. In this technique, all the strength of the combining techniques will be inherited by the hybrid model and will be able to handle a broader set of predictors. However, in addition to strength, weakness of each constituent technique will get aggregated (Jeffries et al., 1993; Chu, 1999).

1.6 Other Cyclone Forecasting Techniques

In addition to the above mentioned techniques of cyclone forecasting, several other techniques are employed to tract and forecast cyclone movement but cannot be classified under above classification. Some examples includes intelligent decision support framework developed by Pedro et al. (2005), Systematic Approach and Forecast Aid (SAFA), Automated Tropical Cyclone Forecasting System (ATCF), Analysis and Forecast Integration System (TAFIS) (Roy and Kovordanyi 2012).

1.7 Tropical Cyclone Forecasting by IMD

IMD is the Nodal agency for cyclone forecasting in India. During forecasting of tropical cyclone, genesis, location, probable path, wind speed, duration are predicted along with heavy rain, storm surge, gale wind, coastal inundation and other associated adverse weather condition. IMD follows a specific systematic procedure to implement all the aspects of early warning of cyclone. Scientifically based conceptual models, meteorological datasets, dynamical & statistical models, advance technology, skill and expertise are employed to carry out analysis, prediction and decision-making process of tropical cyclone. The detail schematic diagram of early warning system used by IMD is represented in figure 3. Conventional observational network, Doppler Weather Radars and satellites, buoy & ship observations, climatological, statistical and Numerical Weather Prediction (NWP) are used for the above purpose. IMD is constantly working to upgrade all its early warning component and technology to increase its efficiency and effective management of tropical cyclone. In this regard, IMD has commenced introducing the state-of-the art Doppler Weather Radar (DWRs) along the coastline in replacement of existing cyclone detection radars (CDRs) as part of their modernisation programme (Rathore et al., 2017).

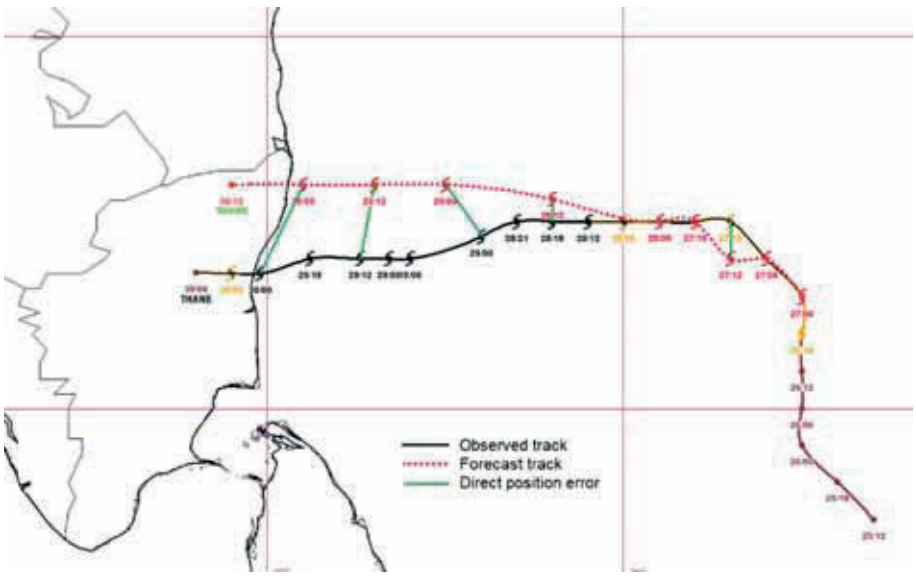

Figure 3: An example of forecast track based on 0000 UTC of 27 December 2011, observed track of very severe cyclonic storm, Thane (25–30 December 2011) and the direct position error at different forecast verification time.

(Source: https://mausam.imd.gov.in/)

For forecasting the intensity of tropical cyclone, both satellite method and radar technique are used. In radar technique, radial velocity measurements are collected via direct wind observations. In addition, data collected from Buoy, Ships, Scatterometry wind from satellite etc can be used to calculate the Maximum sustained surface wind apart from Dvorak technique. A statistical–dynamical model is implemented for real time forecasting of 12 h to 72 h intensity, where IMD GFS model are used for derivation of model parameters (Kotal et al. 2014; Rathore et al., 2017).

As per the requirement of the ship, cyclone wind radii are generated in each quadrant (NW, NE, SE and SW) for wind reaching 34 knots (kts), 50 (kts) and 64 (kts). With recent advancement in technology and techniques such as Special Sensor Microwave Imager (SSMI), ocean satellite, multi satellite surface winds, Doppler Weather Radar (DWR) etc., the monitor and prediction of IMD have been more accurate and efficient (Mohapatra and Sharma 2015; IMD 2013; Rathore et al., 2017). Figure 4 show an example of wind radii forecast of tropical cyclone Phailin issued by IMD.

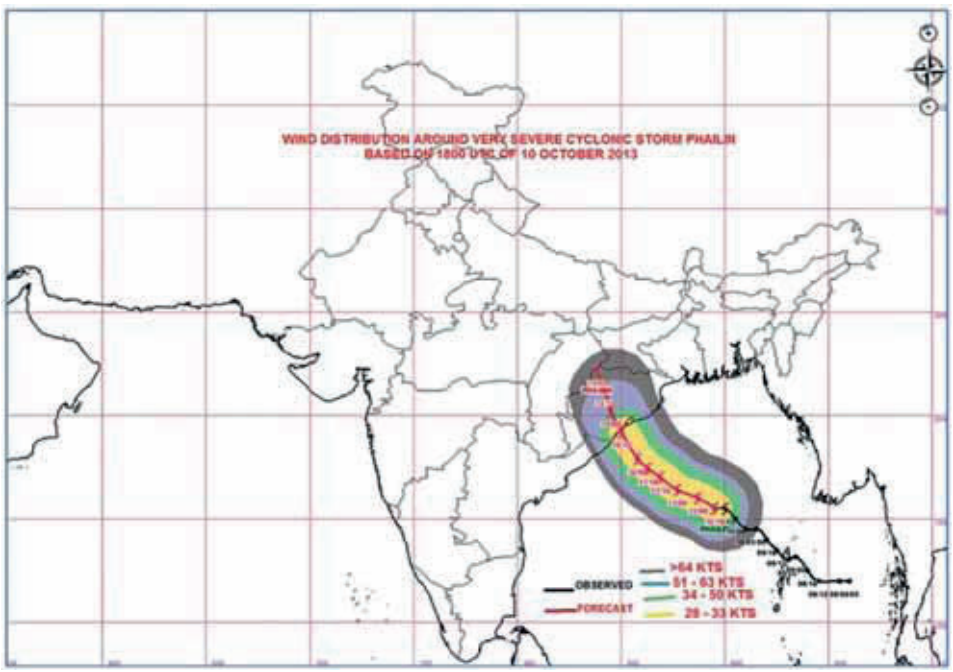

Fig. 4 An example of wind radii forecast

Generally, there are 3 types of adverse weather i.e., heavy rain, gale wind and storm surge that are associated with tropical cyclone during its landfall. Heavy rainfall forecasting is provided based on climatological, synoptic, Radar, satellite, and NWP techniques where, forecast issued contain details such as time, intensity, location and duration of heavy rainfall. Forecast of gale wind contain vital informations such as area of occurrence, duration, commencement time and magnitude of gale wind. The prediction is carried out using climatological, synoptic, radar, satellite, NWP and dynamical statistical techniques. (Source: https://mausam.imd.gov.in/)

Storm surge is the rise of sea due to the cyclone and depends upon radius of maximum wind, rainfall, river run off, pressure drop at centre, interaction with sea waves, point of landfall, bathymetry, astronomical tide, coastal geometry, etc. The forecast of storm surge includes information such as time, location and duration magnitude of storm surge. The technique used for storm surge prediction includes IMD Nomogram, IIT

Delhi Storm surge model and Indian National Centre for Ocean Information Services (INCOIS), Hyderabad Storm surge and coastal inundation model (Ghosh 1977; Dube et al. 2009; Rao et al. 2012).

1.8 Nowcasting

The forecasting and prediction techniques and instrumentation are constantly improving. Some of recent introduction includes dense automatic weather station (AWS) network, good network of Doppler Weather Radars, Kalpana and INSAT satellites observations, advancement in analysis tools, availability of nowcast models, computational and communication capabilities etc. for nowcasting of convective weather major stations/cities falling under the coverage of DWR and with the expansion of DWR networks, more number of cities will be brought under nowcasting.

2. Conclusion

With the advancement in science and technology, sophisticated numerical models are implemented for prediction and forecast of tropical cyclone. Though there have been significant achievement in recent time but still much work needs to be done in understanding force influencing cyclone position, direction etc. The exact importance of various conditions necessary for formation of cyclone is not clear.

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