ICTs and Disaster Management: An Analysis of Cyclone Preparedness and Response in Odisha, India

A Thesis Submitted to University of Hyderabad

In Partial Fulfilment of the Requirements for the Degree of

Doctor of Philosophy in Communication

By

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DECLARATION

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In addition, the student has the following publication and conference presentations:

A) Publication:

1. Kanjilal, M. K., Jena. A., & Yadav. R. A., (2021). Media and marginalized communities during the COVID-19 pandemic in India. *Media Asia,* 49 (1), 70-75. https://doi.org/10.1080/01296612.2021.1980674

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To,

My beloved previous Ph.D. Supervisor

Late Dr. Pilli Kennedy

&

All the disaster victims/survivors of India and the world

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List of Abbreviations

ACWC	Area Cyclone Warning Centre
ADRR	Asian Disaster Risk Reduction
AMG	Apada Mitra Group
ARRnet	Aceh Radio Reconstruction networks
AT	Activity Theory
BDO	Block Development Officer
BEOC	Block Emergency Operation Centre
CBDMP	Community Based Disaster Management Plan
CBO	Community Based Organisations
CCP	Community Contingency Plan
CD	Civil Defence
CHAT	Cultural-Historical Activity Theory
CM	Chief Minister
CR	Community Radio
CRS	Congressional Research Service
CRSs	Community Radio Stations
CSC	Common Service Centre
CSMMC	Cyclone Shelter Management and Maintenance Committee
CSOs	Civil Society Organisations
DDMA	District Disaster Management Authority
DEOC	District Emergency Operation Centre
DMA	Disaster Management Act
DMR	Digital Mobile Radio
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DST	Department of Science and Technology
ESCS	Extremely Severe Cyclonic Storm
EWDS	Early Warning Dissemination System
FGDs	Focus Group Discussions
FSMMC	Flood Shelter Management and Maintenance Committee
GIS	Geographic Information System

GP	Gram Panchayat
GPA	Ground Plane Antenna
GPS	Global Positioning System
GSU	Grama Unnayan Samiti
GVS	Gram Vikas Samiti
HCI	Human Computer Interaction
HFA	Hyogo Framework for Action
HHI	Harvard Humanitarian Initiatives
IAG	Inter-Agency Group
ICTs	Information and Communication Technologies
IDDRR	International Decades for Disaster Risk Reduction
IMD	Indian Meteorological Department
INCOIS	Indian National Centre for Ocean Information Services
INSAT	Indian National Satellite
ISRO	Indian Space Research Organisation
ITU-D	International Telecommunication Union-Development
JDNA	Joint Details Need Assessment
MCS	Multipurpose Cyclone Shelter
MDGs	Millennium Development Goals
MDO	Mandal Development Officer
MHA	Ministry of Home Affairs
MMS	Mass Messaging Service
MoES	Ministry of Earth Sciences
NCCF	National Calamity Contingency Fund
NCESS	National Centre for Earth Science Studies
NCMRWF	National Centre for Medium-Range Weather Forecasting
NCS	National Centre for Seismology
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NEC	National Executive Committees
NGOs	Non-Governmental Organisations
NIOT	National Institute of Ocean Technology

NRSA	National Remote Sensing Agencies
ODRAF	Odisha Disaster Rapid Action Force
PDS	Public Distribution System
PS	Panchayat Samiti
RIMES	Regional Integrated Multi-hazard Early Warning System
RS	Remote Sensing
RSMC	Regional Specialised Meteorological Centre
SDMA	State Disaster Management Authority
SDRF	State Disaster Response Force
SEC	State Executive Committees
SEOC	State Emergency Operation Centre
SMER	Social Media for Emergency Response
SMS	Short Messaging Services
SRC	Special Relief Commissioner
SRO	Special Relief Organization
SWAN	State Wide Area Network
TRAI	Telecommunication Regulation Authority of India
UAV	Unmanned Ariel Vehicle
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
UNPF	United Nations Population Fund
V&TC	Volunteer and Technical Communities
VDMA	Village Disaster Management Authority
VDMC	Village Disaster Management Committee
VIC	Village Information Centre
VSCS	Very Severe Cyclonic Storm
WMO	World Meteorological Organisation
WWW	World Wide Web

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Abstract

This study presents an investigation of mediated communication, especially digital, in responding to emergencies. The selected cases examine the role of different Information and Communication Technology (ICT) tools and applications in the context of disasters. This research takes a case study-based ethnographic approach. Through detailed case studies of two cyclones – Titli and Fani, the research analyses the role of ICTs in cyclone preparedness and response in Odisha state.

The study adopts the framework of disaster communication to explore the current debates and discourses around disaster management in India. It reviews the challenges faced by the government to position and operationalise the ICTs infrastructure in disaster-prone areas during the preparedness and response phases. The thesis documents the socio-political and infrastructural transformations that occurred in Odisha after the 1999 super cyclone. The research applies the Cultural-Historical Activity Theory (CHAT) to understand the modes of subject-to-object and tool-mediated relationships that emerged because of cyclones Titli and Fani. The thesis also endeavours to examine the role of community radio in networking, information exchange, and addressing the communication needs of vulnerable communities during the different phases of disaster management.

A significant insight derived from this study is that role of digital tools/platforms is embedded within a complex social system and takes shape in accordance with the transformation of socio-political structures. The thesis further argues that digital tools reinforce collaboration between state actors and disaster response agencies and help forge relationships between institutional actors and citizens during the different phases of a crisis. The study also contends that digital tools play a key role in influencing the perceptions and participation of citizens in the process of disaster management. The thesis goes on to flag that citizen engagement through crowdsourcing has emerged as an important platform for sharing spontaneous and real-time data and has led to digital humanitarians making crucial contributions to the field of disaster management and emergency response.

Chapter-1

Introduction: ICTs in Disaster Management

1.1. Introduction

All countries worldwide deal with one or more emergencies every day, including natural, human-caused, environmental crises, armed conflicts, food shortages, and/or pandemic. The devastating cyclones (known by various names, hurricanes/typhoons/tsunamis)[1], earthquakes, floods, wars, and senseless acts of terrorism have been causing irreparable losses to humanity and socio-economic instability in society. Any disaster can freeze the normal activities of human life and interrupt essential services which are key to the lives of human beings, such as health care, electricity, water, sewage and garbage removal, transportation, and communication. While unpacking the nature of disaster, the United Nations International Strategy for Disaster Risk Reduction (UNISDR) defines a disaster as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, May, 2009, p. 24). It is associated with disruption of the normal pattern of human life, causalities, economic instability, and the loss of materials and biodiversity. Since the beginning of the 20th century, the estimated total economic losses due to natural disasters have exceeded seven trillion USD dollars and taken eight million human lives (Watwani, 2016). The recent COVID-19 (Coronavirus) in 2019 has become the worst humanitarian disaster and economic catastrophe in recent memory; every nation is still battling to return to normalcy in socio-political and economic aspects.

[1] https://www.weatherbug.com/news/Hurricanes,-Typhoons,-Cyclones-Where-In-The-World

According to the Big Bang theory, the natural structure of the universe and life on earth developed through a cosmic-scale disaster. Evolution history has shown that humans arrived at this stage after overcoming several risks and disasters. Disasters have always co-existed with civilisations. Many gigantic creatures, including dinosaurs, the mammoth, the Siberian tiger, and a few more, inhabited the world before the arrival of humanity and are thought to have perished due to a variety of causes – natural calamities being one of them (Pal, 2017). Many archaeological findings suggest that our ancient civilisation was subjected to many of the same environmental disasters that we are experiencing today, such as floods, cyclones, tsunamis, droughts, famine, hazardous fauna, inhospitality, earthquakes, pandemic, and so on. As a result, from prehistoric times to the present, human civilisation has been shaped by countless catastrophes.

Looking at the natural structure of the earth, it is believed that Asia is the most disaster-prone region of the world and more vulnerable to natural disasters. According to ADRC (Asian Disaster Reduction Centre) (Databook, 2006), Asia was home to 38% of all disasters between 1975 and 2006 and accounted for a total of 57% of causalities during the last 31 years. India has traditionally been vulnerable to natural calamities or other forms of disaster due to its unique geo-climatic conditions. The natural structure of India and its subcontinent exposes it to different climatic and topographic conditions. The Indian subcontinent is one of the most disaster-prone regions in the world. The current seismic zone map of India identified that 59% of the landmass is prone to earthquakes, almost 68% of the total geographical area is vulnerable to droughts and the country is exposed to nearly 10% of the world's tropical storms (Yojana, Jan 2017). Since the early nineteenth century, India has been subjected to a slew spate of natural and human-caused disasters that have wreaked havoc, killed thousands and destroyed vast amounts of property. Amongst all the disasters, the most catastrophic include the Indian Ocean Tsunami (2004), the Gujarat

earthquake (2001), Odisha super cyclone (1999), the Latur earthquake (1993), The Great Famine (1876-1878), Coringa Cyclone 1839, The Bengal Famine 1770, and 1943. (NDMA, 2011).

However, from the beginning itself, people have made great efforts in order to deal with and safeguard lives from natural disasters, human-caused disasters, or any other kind of emergencies, by creating preparatory measures and emergency response procedures. Before the invention of new technologies, people used to anticipate risks and hazards by looking at various things like how nature and living things moved and how the seasons changed. They would then tell others about the risks so they could take precautions before a disaster happened. With the advancement of modern technology, such as satellite communication and radar technology, it has become easier to detect and monitor climatic conditions, and to predict the potential for risks and hazards in advance. Further, Information and Communication Technologies (ICTs) and social media platforms channelise crucial information between and among disaster response officials and citizens during the phases of mitigation, preparedness, response and rehabilitation. Hence, managing disasters has become increasingly reliant on technology – when technology fails, the amount of loss is much worse.

Information and communication technologies, popularly known as ICTs, and their various tools and applications like the Internet, GIS, GPS, remote sensing, satellite-based communication and artificial intelligence greatly aid in planning and execution of disaster risk mitigation activities. These technologies have been extensively used in designing early warning systems, quickening the process of readiness, response, and mitigation during post-disaster activities. GIS-based systems, geotagging, and other technologies enable planners to identify mitigation strategies and enhance the accuracy of evaluations of risks and hazards. Media and ICTs are playing an increasing role in communication during all phases of disaster. Now a days, citizens can get to know more

and more in detail about the possibilities of disasters irrespective of the location from which they hail. Social media has become an important platform for sharing information, uploading crisis-related data, preparing crisis maps and mobilising communities during a crisis. Thus, crisis events are becoming increasingly mediated through digital technologies.

In India, the Union Government came up with a comprehensive National Disaster Management Framework in 2005. It covers every major sector: institutional mechanisms at all official levels; disaster mitigation/prevention through long-term and sustainable processes; enhancing early warning systems, preparedness and emergency response measures; and strengthening social capital. The Ministry of Home Affairs is now taking the lead to strengthen the country's disaster management and mitigation efforts by utilising various advanced technologies and tools in disaster-prone regions as well as within disaster response institutions (Govt. of India, 2011). The Government of India and the United Nations Development Programme (UNDP) are working together to carry forward the Disaster Risk Management (DRM) plan in 169 of India's most dangerous districts in 17 states.

The Odisha state is regarded as one of the most vulnerable states in India. Hence it is called as the disaster capital of India (Das, 2016). Floods, cyclones, droughts, heatwaves, and many epidemic diseases occur on a regular basis throughout the state, resulting in the loss of lives and property. In 1999, a Super Cyclone (Category-4 as per Simpson Scale)[2] erupted in coastal region of Odisha, which killed 10,000 humans and millions of livestock and caused huge amount of property damage. After the devastation and mass casualties, the state government came up with an integrated disaster risk reduction plan. It deployed advanced information technologies into the

[2]https://www.weather.gov/mfl/saffirsimpson#:~:text=The%20Saffir%2DSimpson%20Hurricane%20Wind,loss%20of%20life%20and%20damage.

disaster management system in order to cope with and respond to any form of disaster. After massive failure during the Super Cyclone, Odisha has constructed an integrated communication network in the state, which set an example for others on how to manage disasters or any form of emergency. ICTs-enabled solutions now help in communicating risk warnings, weather alerts, crisis maps and important information among disaster management officials as well as vulnerable sections of the state.

Due to the diverse geographical regions as well as the multicultural and multi-linguistic nature of the populace, the government, both state and central, confronts a great number of difficulties when it comes to information and communication dissemination, coordination and administration. Hence a lot of resources have been spent trying to fill the voids emerging in emergency communication. ICT applications and tools significantly impact emergency response systems because "information technology tends to favour collaboration over command, cooperation over control" (Alexander, 2014, p. VI). A significant amount of activities are happing around the country in order to strengthen disaster management capacity in general and increase access to information and communication technologies in particular that need to be studied closely end.

1.2. Defining the Problem

There is a significant amount of literature produced by academia across all disciplines, including social sciences, computer science, and engineering technology, emphasising what role ICTs play in the field of disaster management. A major segments of research related to ICTs in disaster emphasises the functionality of technologies in the management system, and how ICTs may provide opportunities for enhancing emergency response capabilities. The studies also highlight a list of the common problems that need to be addressed before designing a robust crisis

response mechanism in a particular context. The existing field of literature mostly deals with three major approaches: cyberoptimism, cyberscepticism, and cyberpragmatism (Asmolov, 2016). The scholars of cyberoptimism believe that ICTs have the ability to improve disaster management capabilities and save more citizens' lives. In contrast, cyberscepticism scholars question the reliability and reach of ICTs to all. The scholars of cyberpragmatism try to make a balance between the two approaches and, pointing out the nature of ICTs in a disaster or emergency context, argue that the use of ICTs in emergency services might go beyond queries related challenges and opportunities. While focusing on the importance of ICTs as something that may either improve disaster response or create new challenges, it overlooks the aspects of the disaster as a transformation of the socio-political reality. Hence, this thesis aims at exploring the transformation of socio-political structures followed by a disaster and how ICT tools and applications are positioned within the transformation process.

Also, the study explores what role ICTs play in mediating relationships between various stakeholders and government authorities, management officials and citizens in the process of transformation of socio-political structures. Examining the role of ICTs in the multiple segments of transformation in a disaster situation suggests the tools and applications of ICT shape different relations in crisis. In this study, the focus is given on what are the relationships built by tools and applications in the different contexts of disaster. Moreover, the tools and applications of ICT are differently used in the disaster context; relying on that notion, the role of ICTs is examined in the domain of the mediated activity or mediated interaction in a situation of emergency.

The aspects of 'ICT' as the object of the investigation of this research need to be simplified. Information and communication technologies (ICTs) can be considered as "electronic means of capturing, processing, storing and communicating information" (Heeks, 1999, p. 5). ICT is a set

of components used in disaster communication that relies on hardware and software and different types of communication networks that enable interaction between two entities. The hardware is basically physical elements such as a computer, laptop or portable devices, e.g., tablets or mobile phones other equipment. These devices are used for the communication of audio-visual content such as images, videos, texts, audio/sounds and maps.

Software is programmes and operating information used in computers. It comprises web-based tools, mobile-based applications and computer programmes. Again web-based tools consist of stand-alone websites or organisational websites, social media platforms, personal blogs, crowdsourcing and search engines. Mobile application refers to a specific software designed to run on a mobile device. Some applications are designed for a specific purpose, such as geolocation features, situation-based information and visual content generation capabilities. Emergency management officials or organisations mostly utilise the computer-based programmes for unique emergency management purposes. Some of the applications are linked to open-access websites and mobile apps available to the citizens. However, since ICTs is a broad concept, the researcher frequently used two terms throughout the thesis, 'tools' and 'applications', in order to specify the components used for emergency management. Furthermore, these tools and applications refer to all the things such as software, hardware, platforms, and resources (online or offline) that can be associated with computers, mobile devices, and other digital devices and include text and audio-visual content.

However, the most important function of ICTs here in the thesis is about their capacity to communicate with other hardware devices depending on diverse range of software in a specific context. It can be differently perceived as communication through digital technologies and web of networks depending on WWW (World Wide Web), mobile communication, crowdsourcing,

satellite-based communication, and other modes. Finally, the most important aspects of communication tend to be the sharing of valuable information by emergency officials and access to emergency-related queries or messages by a large number of citizens.

1.3. Disaster Management: Dynamics and Discourses

Disaster is one of the key impediments to the socio-economic progress of a country. In the last few years, geographical disasters have significantly increased due to various reasons such as global warming, urbanisation, population growth, industrialisation and other scientific or atomic experiments. Disasters not only affect human lives and the various social, political and economic conditions of the society, but also the flora and fauna. Hence, various species are extinct from the earth, and many included in endangered categories. Several studies have suggested that globally, disasters occur equally in all parts of the world, but developing countries and poor people are more affected by disasters (Cuny, 1983).

A disaster is not confined to socio-political and geographical boundaries. They neither have a discriminatory nature over race, caste, creed, religion, and ethnicity, nor are restricted to developed and developing countries. When it strikes, all are affected equally. According to World Meteorological Organisation (WMO), the number of disasters over the last 50 years has increased fivefold (WMO, 2021). Every year, weather, climate and hydrological or water related disaster causes the loss of millions in terms of economy, human lives, property, biodiversity and other lives on earth. Epidemics and pandemics have often caused significant losses of the world's population. The Bubonic plague (Black plague) pandemic in Europe in the 14th century and the COVID-19 pandemic spread worldwide in the 21st century have resulted in a sizeable reduction in the world's population. Several disasters in the twenty-first century have caused havoc and devastation across the globe, including the South-Asian earthquake and tsunami of December, 2004 (230,000 human

lives were lost), the Kashmir earthquake of October, 2005 (80,000 killed), the Great Sichuan earthquake of China in May 2008 (68,000 killed), and the most recent, the Haiti earthquake of January, 2010. (Death toll exceeds 200,000). Hence, combating the catastrophic nature of disasters turns out to be a global discourse.

The word 'disaster' is derived from the Middle French word *'desastre'* and from Old Italian *'Disastro'* which in turn comes from the Greek pejorative prefix *δυσ*-, (*dus*-) "bad"+ *αστήρ* (*aster*), "star"= 'Badstar'. The root term '*Disaster2' ("bad star"* in Greek and Latin) arises from astrological themes, which in ancient times used to denote to the destruction or deconstruction of a star (United Nations and World Bank, 2010). Disaster is categorised into two types relying on occurrences, whether 'natural' or 'man-made'. Natural disasters are caused by nature, such as floods, hit waves, tidal waves, earthquakes, cyclones etc. When human actions are directly involved in a disaster is called 'man-made', such as biological/chemical threats, anthropogenic hazards, mishaps (during transportation), civil disorder and acts of terrorism. This thesis will use the gender-neutral term 'human-caused' where possible in place of 'man-made'.

Much archaeological evidence shows that, in the prehistoric times (before recorded history), humans have used different countermeasures to deal with and respond to risk and hazards. As per the Old Testament, the story of 'Noah's ark' is an act of warning, preparedness and individual action to save from disaster. Also existing records indicate this risk management practice has continued since 3200 BC (Coppola, 2011). However, organised and collaborative attempts at disaster recovery didn't occur until much later in modern history.

According to UNISDR, disaster management refers to the "organisation, planning and application of measures preparing for, responding to and recovering from disasters" (United Nations International Strategies for Disaster Risk Reduction, "Disaster Management"). Disaster

management does not absolutely prevent or eliminate risks; rather, it emphasises on developing and executing preparation and other strategies to lessen the impact of disasters and 'build-back-better'. The mismanagement of plans and systems could lead to increased human casualties, property damage, and material losses. The UNISDR suggests disaster management involves different steps such as prevention, mitigation, preparation, response, recovery, and rehabilitation.

The overall idea behind disaster management includes reducing harm to life, property and environment by monitoring the situation and systematic planning before, during, and after the disaster. International Federation of Red Cross & Red Crescent Societies defined "disaster management as the organisation and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular, preparedness, response, and recovery in order to lessen the impact of disasters" (IFRC & RCS, "Introduction,"). The professional and academic disciplines that address this 'management' of disaster are considered as 'emergency management' (Bullock et al., 2017). These two terms 'disaster management' and 'emergency management' are used, sometimes interchangeably, especially when it comes to biological and technological hazards and health emergency (UNDDR, 2022).

Disaster management approaches in the global context are more or less the same. Still, looking beyond the conventional mode, community-led integrated risk management approaches are given a new dimension in modern times. Many of the present concepts have their origins in the success stories of previous civilisations. In the contemporary form, the emergence of global standards and systematic efforts are categorised into various steps, such as preparedness, mitigation, and response to a wide range of risks and disasters. A lot of efforts have been made to foster a culture of preparedness and resilience across the globe in all countries. The government plays a significant role in preventing and responding to disasters. Moreover, along with the

government, a lot of philanthropic organisations and community-based groups are coming forward to help disaster victims and vulnerable citizens deal with risks and hazards. Many developed countries have begun to create integrated risk management systems. The system includes risk monitoring, early warning detection systems, physical infrastructure (shelter houses), civil personnel, social capital, and volunteers at the grassroots level. Furthermore, national and international organisations have carved out various legal frameworks to guide and sustain this system through the passage of laws, the formation of armed and defence personnel within government structures, the allocation of monetary assistance, and the building of social capital.

The United Nations General Assembly declared the 1990s as the 'International Decade for Natural Disaster Reduction' (IDNDR) on December 11, 1987. The declaration aimed to promote international coordination efforts in order to lessen material and economic losses and social unrest caused by climate-induced or natural disasters, especially in developing countries. The declaration strongly emphasises strengthening each United Nations member state's capacity to avoid or prevent the negative effects of climate-induced disasters and to establish uniform rules and regulations for deploying the latest scientific technology and instrument to lessen the impact of disasters. Two years later, on December 22, 1989, in IDNDR a resolution 44/236 passed in UN General Assembly to promote 'international cooperation' in the field of natural disaster risk reduction. The council also urged that the General Assembly should take the initiative to develop a suitable framework for international cooperation to achieve the objectives and goals of IDNDR (IDNRD, 1999).

In May 23 to 27, 1994, World Conference on Natural Disaster Risk Reduction was held at the Yokohama of Tokyo in Japan. All the UN members were assembled at the conference to assess the progress of IDNDR, and adopted new guidelines they called Yokohoma Strategy and Plan of

Action for Safer World. Several key points were discussed at the conference pointing towards the rising natural disasters and rising vulnerabilities worldwide. The major highlights of the conference were:

1. Disaster prevention, mitigation, preparedness, and relief are four elements that contribute to and gain from the implementation of sustainable development policies.
2. Disaster prevention, mitigation and preparedness are better than disaster response in achieving the goals and objectives of the decade.
3. The information, knowledge and some of the technology necessary to reduce the effects of natural disasters can be available in many cases at low cost and should be applied.
4. Community involvement and their active participation should be encouraged in order to gain greater insight into the individual and collective perception of development and risk, and to have a clear understanding of the cultural and organisational characteristics of each society as well as of its behaviour and interactions with the physical and natural environment. ("Yokohama Messages," para. 2)…

Apart from these major points, various sub-points were also discussed, such as the protection of citizens' lives; capacity building in developing countries, especially in small and island nations; developing national capacities and capabilities as well as disaster prevention legislation for disaster prevention, mitigation, and preparedness, including mobilisation of non-government organisations and participation of local communities; human and institutional capacity building; using technology for sharing, collection, and dissemination of relevant information; and mobilising available resources (para. 7)…

In 2005, another World Conference on Disaster Risk Reduction called 'Hyogo Framework for Action' (HFA) was held in Kobe, Hyogo, Japan. It produced the blueprint for global disaster risk reduction aiming to reduce global disaster losses by the end of 2015, in terms of the lives, social, economic and environmental assets of citizens and countries. In the HFA emphasis was given to the five key elements such as:

1. Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels. ("Priorities for Action," para. 7)

The adoption and implementation of HFA was a watershed moment in accelerating national and local disaster risk reduction activities and bolstering international collaboration via the establishment of country-specific strategies, plans, guidelines and policies. The HFA was instrumental in establishing institutions, regulations, and laws for disaster risk reduction. Also, it suggested all levels of stakeholders should improve their capacity for risk assessment and identification, disaster preparation, response, and early warning capabilities[3].

The third World International Conference on disaster risk reduction, the Sendai Framework, was held in Sendai city, Miyagi, Japan, on March 18, 2015. The Sendai Framework

[3]https://www.preventionweb.net/sendai-framework/Hyogo-Framework-for-Action, access on October 10, 2020

is the first agreement initiated after the 2015 Millennium Development Goals (MDGs). It outlines seven targets and four priority areas to prevent and reduce existing risks and hazards. These are as follows:

1. Understanding disaster risk.
2. Strengthening disaster risk governance to manage disaster risk.
3. Investing in disaster reduction for resilience.
4. Enhancing disaster preparedness for effective response, and to 'Build Back Better' in recovery, rehabilitation and reconstruction. ("Priorities for Action," para. 1)

In the modern day, comprehensive disaster management system stands on four important elements such as mitigation, preparedness, response and recovery. Globally, including in India, the same techniques and steps are followed while dealing with emergencies or disasters (Osti, 2011).

1.4. Disaster Management in India: An Overview

Disaster management in India, has evolved from an "activity-based reactive setup to the proactive institutionalised structure; from single faculty domain to a multi-stakeholder setup; and from a relief based approach to multi-dimensional pro-active holistic approach for reducing risk" (NDMA, 2011 p. 55). The institutional structure for disaster management in India may be traced back to the British era, after a series of disasters occurred in the different parts of the country, including famines in 1900, 1905, 1907, and 1943 and the Bihar-Nepal earthquake of 1937. Since then, however, disaster management in India has changed significantly in terms of structure, system, policy, and guidelines following the changes in international trends. In British India (before Independence), a special department in government administration was set up to look after emergencies, and it functioned to deliver relief materials and post-disaster assistance. The

departmental activities encompassed designing relief codes and implementing food for work programmes. The British relief code was continued in the post-independence era, and the disaster relief activities were carried out by the relief commissioner of each state under the purview of the Central Relief Commissioner. The departmental responsibilities were limited to distributing relief materials and financial aid to disaster-affected areas. During the 1990s, following the IDNDR, the Government of India set up a permanent and institutionalised disaster management cell under the Ministry of Agriculture. Following the Super Cyclone of 1999, the Bhuj earthquake in 2001 and a few other disasters, a high-level committee was constituted under the chairmanship of Mr. J. C Pant, Secretary, Ministry of Agriculture, to analyse the major causes and give a sustainable, integrated and holistic solution to deal with disaster risks. This can be marked as a paradigm shift in India's disaster management from a relief-centric approach to a holistic approach. In 2002 with notification from the Cabinet Secretary, the disaster management cell shifted to the Ministry of Home Affairs (MHA).

The institutional structure for disaster management in India is in flux. Although there are advances in the system over time, the prior one co-exists with the new one. The tsunami of 2004, series of floods, and earthquakes in the Jammu and Kashmir region have once again raised questions about the structure and ability of disaster management in India. The country realised it is high time to design a long-term and development-oriented approach to address rising hazards and risk of disaster. In December 2005, the Government of India passed the Disaster Management Act-2005 (DMA-2005), which and it applied to all states. The Act envisaged creating an individual body; hence on December 23, 2005, National Disaster Management Authority was established at the centre, and following the same pattern and structure, every state has got a State Disaster Management Authority. Currently, the Government of India has a hierarchical structure for

Disaster Management that functions at four levels: centre, state, district and local (community level)[4]. Before the DMA-2005, disaster management was based on relief-centric and post-disaster interventional approaches. However, the new Act showed a roadmap to thinking beyond post-disaster activity. It covers a wide range of subjects, such as institutional elements, disaster prevention strategies and response, and human development. The Act envisages vulnerability reduction of all types of risk or hazards (both natural and human-caused) – the construction of a safer and more secure nation through collective action and strengthening of national resources and community participation (NDMA, 2011).

The Act was passed for the effective management of disasters as well as associated factors. It offers an institutional mechanism for planning disaster management and keeping tabs on its implications. The Act also guarantees that the various government departments will take action to avoid and minimise the risk of disasters and respond quickly to emergencies. Early warning, risk alert, data forecasting, monitoring risks, disseminating updated data, and keeping an eye on crisis situations are crucial elements in the DM Act. Under the Ministry of Home Affairs, a structural body has been working, which includes all the state governments, district administrations, and local Panchayat Raj governments. Various organisational bodies such as the National Disaster Management Authority (NDMA), National Executive Committee (NEC), State Disaster Management Authority (SDMA), State Executive Committee (SEC), District Disaster Management Authority (DDMA), and various armed forces such as the National Disaster Response Force (NDRF), State Disaster Response Force (SDRF), and Civil Defence (CD), Fire Services, etc., are also part of the ministry. The armed forces are deployed during emergencies for

[4]https://ndma.gov.in/about-us/introduction#:~:text=On%2023%20December%202005%2C%20the,and%20implement%20a%20holistic%20and Access on October 13, 2022

rescue operations, rehabilitation, response, etc., based on the need. The National Policy on Disaster Management was drafted by the National Disaster Management Authority and passed in legislation on October 22, 2009, under the Ministry of Home Affairs, Government of India, with the goal of creating a safe and disaster-resilient India by developing a comprehensive, proactive, multi-disaster oriented, and hi-tech technology-driven strategy. In response to the Sendai Framework for Disaster Risk Reduction 2015-2030, the Government of India revived the existing disaster management plan and came up with a new plan called Disaster Management Framework-2019. This framework emphasises that sustainable development needs to be disaster resilient and adaptive to the impacts of climate change.

1.5. ICTs and Disaster Management

In the present context of disaster management, ICTs are widely used in the different phases, i.e., preparedness, response, mitigation, risk reduction, recovery and mitigation and by all the intervening institutions and organisations - international institutions, government, stakeholders, rescue authorities, local organisations, and the community itself (Zaman & Biswas, 2014; UNESCAP, 2016; Benkhelifa, et al., 2014; MoHA; APCICT, 2007). ICT applications like satellite communication, Geographical Information System (GIS), Global Positioning System (GPS), Remote Sensing (RS), telecommunication, Internet, satellite radio, mobile phones, etc., are widely used for various purposes such as early warning, weather forecasting, hazard mapping, communication, etc.

The advancement of technologies, particularly digital ones, including satellite communication links, the internet, GIS, GPS, and remote sensing, contributes significantly to disaster risk reduction. ICT technologies and applications make it easier to create information repositories using the internet and warehouse techniques – information components are classified

and saved for future use. The existing forms of databases, stored in digital formats, guide government officials or response agencies in designing policy frameworks for mitigation guidelines for every level. The GIS-driven database/information is critical for identifying vulnerabilities and developing a risk mitigation strategy.

When a disaster strikes, it affects a large portion of society, and 'management' is one of the most complex tasks, which involves multiple actors under time and resource constraints and often hostile conditions (Benkhelifa, et al., 2014). The existing forms of communication systems are overloaded with information from the disaster sites and outside the disaster location. Hence, effective coordination within the organisation needs a scalable environment that would provide flexible information access, easy communication, and real-time collaboration for decision-making. In such circumstances, concerned organisations typically employ open-source software for information management, relief operations, and the registration of victims' databases. And digital services, like SMS, email, hashtags (in Twitter), and standalone websites, send important information to a large section of society.

In all the processes of disaster management, such as mitigation, preparation, and management, ICTs make it easier to send early warning information with the support of telecommunication, satellites, telemetry, and meteorology (Wattegama, 2007). Before a disaster strikes, early warning and risk alerts and other relevant information are disseminated through the tools and applications of ICT to disaster-prone areas. ICTs play a crucial role during the 'build-back-better' process, and facilitate a channel to communicate with all the concerned agencies and with the displaced communities.

During any crisis, people seek more information from whatever sources are available within the rapidly changing situation (Shklovski, et al., 2008). In the face of continuous

information shortages, the impacted local community utilises ICTs to harness local expertise, organise around local issues, and thereby save themselves. It is considered that ICTs appropriately work in post-disaster or crisis. In the post-disaster scenario, they help to mobilise the communities during the entire process of recovery and facilitate experiential knowledge for preparedness. However, locally relevant information is one of the vital requirements for some of the major disasters. In the networked world, ICTs act as a vector to disseminate locally relevant information and locally-generated content within a fraction of a second among the larger public, which motivates them to engage in emergency management activities.

Several sociological studies indicate that in any disaster or crisis, communities play a critical role in generating locally available resources, transferring information, and initiating rescue and evacuation before the arrival of intervening authorities. The proliferation of Web 2.0 and social media platforms supports an online platform that enables individuals to cross geographic barriers and engage in online citizen-led disaster management activities. Online citizen-led disaster management is becoming more prevalent in a variety of fields, including creating disaster maps, community mobilisation, crowdsourcing, and linking of disaster victims to aid agencies (Shklovski, et al.,, 2008). They also underlined the fact that mobile devices are an emerging tool in the area of emergency response. Citizens in emergency zones can communicate via SMS, images, audio-visual content, and the sharing of geotagged images and videos.

The advancement of ICTs facilitates emergency response officials with numerous latest tools to support collaboration with multiple stakeholders and inquiries related to the field. It also helps in advance collaboration between two parties, including officials at various levels and with citizens. The functions of ICTs are not limited to early warning information dissemination, instant message delivery, information processing, and the transfer of knowledge to the masses. Rather it

transcends its limits towards “data mining and advanced decision support systems, data visualisation techniques, data and system integration framework, next-generation collaborative technologies, Web 2.0 approaches, and grid technologies” (Asimakopoulou, 2010, p. xviii).

The nature of disaster remains the same, and it hits once or twice a year in India, but every time a new story, a new region, new causalities, and a new shock. In India, the development of GIS (Geographical Information System), RS (Remote Sensing) and satellite communication makes it easier to map vulnerable areas and conduct hazard mapping, risk management and ground observation. Furthermore, these technologies play major roles in big data management, mitigation, catalysing preparedness, early warning, building data warehouses, etc. (GoI, 2011; UNISDR, 2014). Besides that, ICTs play an important role in coordinating decision-making among intervening stakeholders during the various stages of a disaster. In India, the National Disaster Management Authority (NDMA) is collaboratively working with all state disaster management authorities (SDMA), the Indian Meteorological Department (IMD), the Indian Space Research Organisation (ISRO), and the Indian Remote Sensing Centre (IRSC) to ensure any kind of disasters causes minimum loss.

The Government of India, the United Nations, and the International Disaster Risk Reduction Framework identify ‘capacity building’ or ‘institution building’ as an essential element in order to promote the approaches of relief work, disaster risk reduction, and development work (Yadav & barve, 2014). With the collaboration of ISRO/DoS (Department of Science), the Ministry of Human Resource Development (MHRD) has launched a satellite ‘EDUSAT’ exclusively for serving educational needs and facilitating universal, equal, free and open access to digital technologies and platforms for students, regardless of any location they belong. The MHRD also proposed EDUSAT to have ICT-based learning capabilities for elementary education, literacy,

vocational training, and teacher training in agriculture, health, community development, and disaster resilience (NDMA, 2008). In India, a large population access information through television and radio in vernacular languages. Information related to daily weather updates and risk alerts is broadcast over multiple public and private television and radio channels. In the present context, the mobile phone is widely used for SMS, voice calls, internet, GPS data, and sending photos and video during an emergency. For instant and quick information, several mobile applications have also been designed for cyclone or weather updates, such as 'MyWorld Weather', 'Disaster Alert', 'Weather and Radar India', 'The Weather Channel' 'Hurricane Cyclone' and many more (Google Playstore, 2018). Satellite mobile phones are conveniently used by disaster management officials, response agencies, armed forces, and other government officials for coordinating rescue operations and setting up telemedicine links when all the mobile connectivity remains functional.

According to the International Telecommunication Union Development sector (ITU-D), (2017), telecommunication and web technologies have the potential to deliver useful information related to early warning, efficient management, and provide a quick connection to people with the rest of the world. At the grassroots or village level, the density of ICTs is minimal compared to urban or metro cities. The government of India has set up various common service centres (CSC) under the scheme of the national e-governance programme. These service centres are connected with the district, state, and national disaster management departments. Additionally, under the purview of the Department of Science and Technology (DST), Kiosk Centre, State Wide Area Network (SWAN), and Village Information Centre (VIC) are widely working at the ground level to provide primary information and empower communities through digital technologies (NDMA, 2008).

Furthermore, various civil society organisations have emerged across the country to cope with the risk of disaster through increasing stakeholders' participation, media coverage, financial aid, scientific research and education, community resilience and environmental engineering for long-term disaster risk reduction. Several community radios in disaster-prone areas, particularly in areas with limited ICT infrastructure and the use of ICTs, provide critical information to marginalised communities (such as seaside or fishing communities) about disasters and climate-related emergencies. Community radio enables community participation in planning and decision-making for disaster risk reduction and helps include vulnerable communities in the disaster management spectrum.

With the growing pace of change, ICTs are being used in a diverse range of aspects of emergency management. In several disasters, such as the pandemic, earthquakes, and some forms of humanitarian crises, the early prediction or precaution may not be possible using ICTs, but when it comes to tropical cyclones, tsunamis, or floods, ICTs are doing a significant job in terms of early warning, SMS alerts, data forecasting, hazard mapping, weather forecasting etc. During the last five years, India has recorded success stories in disaster management, such as during the Phailin and Hudhud cyclones in 2013 and 2014, and Chennai floods in 2015.

India, has a long standing history of the tropical cyclones. The Indian subcontinent is one of the worst affected regions of the world when we look at cyclones. The country has a huge coastline of 7516 km (5400 km with the mainland, 132 km with Lakshadweep and 1900 km in Andaman and Nicobar Islands). There are 13 coastal states/UTs (Union Territories), including 84 coastal districts affected by cyclones. In eastern coastal region, five coastal states, i.e. Andhra Pradesh, Odisha, Tamil Nadu, and West Bengal, and one union territory as, Pondicherry, and in the western coastal region, Gujarat state, 40% of the population resides within 100 kilometres of

the shore. The Government of India's database from 1980-2000 shows that, on average, 370 million people in India are affected by cyclones every year. The database of 1891-2000 shows that nearly 308 cyclones, including 103 severe cyclones, have occurred in India. (Govt. of India, NDMA, 2008). World Bank has reported that an average of two per cent of GDP is lost due to disaster in India.

Various scientific institutions are operating for cyclone warning and hazard mapping; the National Remote Sensing Agency (NRSC) under the body of ISRO; the Indian Meteorological Department (IMD) delivers all weather forecasting data to the state meteorological department and direct to the people via SMS and phone calls; Indian Nation Centre for Ocean Information Service (INCOIS) at Hyderabad delivers early warning of Ocean movement to India and 28 other countries (Govt. of India, NDMA, 2012). Doordarshan and All India Radio telecast/broadcast cyclone warning information in real-time. Cyclone information is sent in four phases, pre-cyclone, cyclone alert, cyclone warning, and post-landfall. There are 252 Area Cyclone Warning Centres (ACWC) that have been set up under the IMD in 10 coastal states and one union territory, which generate special warning information and transmit them every hour in the local language.

1.6. Conceptual Framework of the Study

1.6.1. Disaster Communication

In the disaster management process, communication remained a crucial element even before the discovery of radio waves worldwide. In the late 18th century, vast arrays of technologies were invented worldwide for instant and fast communication. The majority of applications were created in tandem with the French Revolution and the Napoleonic War, and used for military purpose. The development of optical telegraphy systems in the 1880s was a watershed moment in

the form of the fastest communication systems. It allowed information to be transmitted faster than the quickest means of transportation. The importance of this ability must not be studied in a vacuum. This system is marked as the first recorded use of error control, flow control (sending quicker or slower) and message priority. Since then, these three elements have remained fundamental to all disasters and emergency communications. From the telegraph to Web 2.0, new information technologies have brought many improvements in the field of disaster communication.

During an impending disaster, communication with citizens becomes especially critical. Disaster communication includes multiple elements such as alerts and warnings, command and control over rescue and evacuation, deployment of adequate resources, mobilised social capital and sensitised vulnerable communities. In every structure of government, from the top-to-bottom, horizontally, and bottom-to-top, 'communication' is one of the critical requirements to make coordination and the overall process of managing and reducing the risk of disaster. Access to information and communication from legitimate sources is key in the preparedness, response, recovery, rehabilitation, and reconstruction processes. An effective mode of communication establishes links between affected people and their families, response agencies, support systems, and other parts of society (Nayak, 2017).

Communication is identified as one of the universal components of 'emergency management and homeland security' (Coppola, 2011). Simon et al., (2015, p. 609) assert "communication is one of the fundamental tools of emergency management. It becomes crucial when there are dozens of agencies and organisations responding to a disaster." ICTs in disaster contexts give rise to improvised activities and speed up the communication needs of involved

agencies. They also helps reach the last mile of communities through various tools and applications of ICTs.

This thesis examines the role of ICT tools and applications in various phases of emergency management for generating collaboration between emergency management officials, volunteer organisations and citizens. Through case studies of different disasters that occurred earlier, the study highlights the role ICT tools and applications play in mediating relationships between citizens and disasters within a particular context.

1.6.2. Mediation of Activity

In the field of media and communication studies, the notion of mediation is associated with the early day's concepts of transmission, rituals, and mediational models. In contemporary debates, scholars across the crisis and emergency management fields have argued that emergencies are becoming largely mediated by digital technologies. This research analyses how different ICT tools mediate the relationships between humans and emergencies or crises. It investigates the role played by ICTs as mediators in the context of disaster management.

1.6.3. Community Resilience

Theorists working on 'community resilience' argue that communication is the central component of building community resilience (Houston, et al., 2015). In the community resilience approach, communication and information are fundamental to the adaptive capacities that make communities resilient (Norris, et al., 2008). The adaptive capacities comprise attributes of narratives, accountable media, skills and infrastructure, and reliable information sources. By examining the media infrastructure at the hyper-local level, where the ICTs are not yet functional, the study highlights the capacity of community radio to generate local resources for building

community resilience. Through a case study of the role of community radio for disaster management, this thesis looks at how hyper-local communication improves community cohesion in response to risk and disaster.

1.7. Outline of the Thesis

This thesis analyses the role of ICTs in responding to disasters. The selected cases examine the role of different digital tools and applications in the context of cyclone management. The introductory chapter gives an overview of the various debates and discourses related to disaster management around the world and in India, and the place digital technology occupies in the contemporary approaches to emergency response. In addition to outlining the conceptual framework of the thesis, this chapter provides a brief overview of the subsequent chapters.

The second chapter outlines the methodology and discusses the research objectives and questions of this study. It then describes the methods used to address the research questions and for data collection, including in-depth interviews, focus group discussions, textual analysis, organisational ethnography, participant observation, and informal interactions. The chapter goes on to present the details of the field work conducted and the sites covered during the case studies. Then it outlines the data analysis techniques, i.e., the coding employed for the research. Lastly, the chapter offers a brief description of the two cyclones, i.e. Titli and Fani, which are analysed for this research.

Chapter 3 details the socio-political and infrastructural transformations that have happened in Odisha concerning disaster risk mitigation. The chapter draws on the disasters and socio-political transformation scholarship to analyse the implications of the changes in infrastructure and

policies implemented by the state in response to emergencies. The chapter systematically explains how after the Odisha super cyclone of 1999, government interventions, institutional engagement, and community practices have undergone a series of structural changes. It then talks about political transformation and the initiation of the decentralised governance system at the centre and the state level for disaster management. The various roles and responsibilities for disaster management within and outside the government organisation are also reviewed. The chapter discusses how OSDMA (Odisha Disaster Management Authority), following the DM Act -2005 of the government of India, transferred various powers to the community members to engage them in designing community-based disaster management plans. The final section of the chapter discusses the infrastructural interventions, particularly in disaster-prone areas, to predict disaster risks in advance, communicate risk alerts, provide shelter for vulnerable people and build synergies between response officials and disaster victims.

In chapter 4, the researcher presents the literature related to the Cultural-Historical Activity Theory (CHAT) for understanding and defining the mediation of activities through subject-to-object relationships. It describes the tool-mediated activities undertaken during cyclone Titli and Fani using different tools such as the WWW, mobile phones, and social media platforms for content delivery and building symmetric relationships between government actors, non-associated actors volunteers and citizens. The chapter examines different functions of the Indian Meteorological Department, National Disaster Management Authority and OSDMA websites and analyses their processes to generate, upload, share, and channelise risk alerts, weather forecasts and climate-related database with multiple stakeholders and citizens. The chapter specifically considers that mobile phones emerged as an important tool for content generation, dissemination of information, resource mobilisation, and data storage. It goes on to talk about the services of

mobile phones such as SMS, WhatsApp, voice-over calls and social media platforms that became relevant during cyclone Titli and Fani for government officials and citizens to communicate during different phases . This chapter, relying on the activity theory, explores how actors or citizens play multiple roles as intermediaries, arbitrators, mediators, negotiators and aggregators in risk communication and crisis response. It also discusses how Apada Mitra Group and government-associated actors take the lead role in mobilising, rescuing, and evacuating vulnerable people from disaster risk zones. This chapter also describes how leaders or educated members from the community reduce information deficiency among illiterate people and in unreachable areas.

Chapter 5 analyses the role of community radio stations during the very severe cyclonic storm 'Yaas'. The community radio stations facilitated information exchange, addressed communication needs of the impacted communities, and forged community connect during the different phases of the disaster. The chapter closely examines how two community radio stations, Radio Namaskar of Puri and Radio Bulbul of Bhadrak have delivered early warning information, sensitised marginal communities and promoted community collectiveness across disaster-prone areas. It goes on to discusse the engagement of community radio stations with vulnerable communities, especially women, and fishing communities in order to foster community-based disaster risk reduction activities and build disaster-resilience capacities at the grassroots levels.

In chapter 6, as the conclusion, the researcher highlights the important aspects from all the chapters and compiles the learnings to get deeper insights about the several themes of this research. It gives an overview of the different approaches used to reflect on the role of ICTs in disaster communication, crisis response, mediation of activities, and community resilience. The final chapter synthesises all the key observations and comments from the chapters. It discusses how ICT

tools and applications motivate citizens to participate online and offline in response to a disaster. It argues that the participation of citizens for any action during disasters or crisis response corresponds to the idea of crowdsourcing. This could help in the generation of risk mapping, preparation of crisis maps online, classification of social media messages, and initiation of rescue and rehabilitation strategies. The conclusion chapter also brings to the forefront how digital technologies spur large-scale database management and automated system mechanisms for managing risks and disasters. It concludes by arguing that the dramatic shift from offline action of citizen's engagement to crowdsourcing techniques resonates with the concept of digital humanitarians, which is an emerging domain in the ambit of disaster management practice as well as literature.

Chapter-2

Methodology: Analysing ICTs in Disaster Management

2.1. Introduction

This study is an endeavour to closely present an investigation of mediated communication, especially digital, in responding to an emergency, and selected cases examining the role of different tools and applications in the context of a disaster. Media and ICTs play a crucial role in communication during disaster. These day social media channels interchange important information among government agencies and people in the emergency zones. However, disaster situations have become increasingly mediated through digital tools and technologies. After the 'Odisha Super Cyclone of 1999', the state has developed a robust communication infrastructure and community networks in order to respond to further risks and hazards. The 'Odisha State Disaster Management Authority' (OSDMA) used several information technologies for smoothing collaboration, command and cooperation with other agencies and organisations. The research topic was triggered by the observation that several tools were employed in response to the cyclone 'Phailin' in 2013 and 'Hudhud' in 2014 in Odisha. The observation suggested that the latest cases should be studied in order to understand the information and communication activities in a comprehensive manner. Since the state faces one or two severe cyclonic storms every year, the researcher selected cyclone 'Titli' 2018 and cyclone 'Fani' 2019 as potential cases for analysis and possible comparison. Besides the two selected cases, the researcher also kept following the activity around all the cyclone-induced emergency communication that occurred after Fani, such as during Amphan, Bulbul, Yaas and Jawad.

The researcher conducted extensive fieldwork to gather data related to mediated activity around the emergency situations in the state of Odisha. Initially, the researcher participated in several disaster assessment programmes at the state-level to understand the structure of disaster management and the plurality in approaches of the different actors. In the assessment programmes, the researcher closely interacted with the several institutional and volunteer actors that were closely involved in an activities around an emergency situation. The actors are basically categorised into four types: state actors (ministries, departments); state affiliated actors (disaster response officials, inter agency groups); individual organisation (non-governmental organisation, media institutions) and independent actors (citizens, community, disaster survivors).

This chapter, to begin with, outlines the research objectives and questions that guided the study and then describes the methodology adopted to investigate the role of primarily digitally-mediated initiatives in responding to emergencies. The research is based on the case studies of two individual events that happened in different time and locations. The methodology section describes the case study method adopted for the study, and the data collection tools used for the case study such as in-depth interviews, focus group discussion (FGDs), participant observation, document analysis and textual analysis. The next part of the chapter elaborates the coding and analysis. Further, the last part of the chapter presents a brief description of the two events or cases, i.e., cyclone Titli and cyclone Fani, which occurred in two distinct parts of Odisha.

2.2. Objectives and Research Questions

The increasing frequency of natural disasters and the hazardous living conditions for human beings have become a global topic of discussion. These concerns raise questions of human survival and its linkages with factors such as governance, ecology, livelihoods, social systems,

morality, legal systems and many more. Our consciousness recognises the need to think and adopt a new policy for a sustainable future. The specific geographical condition of Odisha state also called the disaster capital of India, is categorised as one of the most vulnerable regions in terms of natural disasters such as floods, droughts, heat waves, and especially cyclones. From the last quarter of 2013 to the first quarter of 2021, the state has witnessed an average of one or more severe cyclones every year, including a few super cyclones. The dimensional shift in dealing with emergencies by the state-affiliated institutions and peoples' activity with the specific situations after super cyclone opened up spaces for the researcher to conduct immersive academic research. The OSDMA was formed to strengthen disaster risk management capacity and build a resilient, responsive system across every corner. Hence, the present state of affairs integrated several units of public institutions, volunteer organisations, local actors and citizens to combat climate-related emergencies. In the current scenario, OSDMA extended its horizons to the community level to foster a community-based response system – as the community could act as first-hand responders.

This study applies different theoretical underpinnings, such as the cultural activity theory, to study the 'tools-mediated' activity around emergency response (online/offline), and several initiatives undertaken at multiple levels (top-to-bottom) by the state of Odisha for disaster management with specific reference to cyclones. The response domain was selected to understand the activity that relies primarily on digital mediation and those with other offline activity. The idea was to draw an understanding that would provide a contextual overview for articulating the relationship between citizen and state actors and between individual authority and community-based actors. In the digitally-mediated initiatives, the study focused on emergency risk management around cyclones, which is a ground-breaking movement of activism and digitally-mediated engagement of the state in disaster response.

The Odisha State Disaster Management Authority (OSDMA) was selected as one of the active institutes in emergency management initiatives, with links to the India Meteorological Department and several international independent institutions (e.g. Regional Integrated Multi-Hazard Warning Systems (RIMES) based in Thailand and the USA based Earth Networks). State-owned and local-based risk mapping initiatives focused on understanding the relationship between risk mapping institutions and state emergency response systems. The OSDMA is the prime public institution that plays a key role in enhancing disaster risk reduction strategies and building a resilient governance system across the state.

In order to initiate exploratory yet systematic study of the mediated activity for disaster management during cyclones in Odisha, the following research objectives and questions were evolved from a perusal of related literature and reports of activity during the events.

Given the above background, the study specifically proposed:

1. To outline the role of the primary ICT tools and applications available for interventions related to disaster management.
    - What are the ICTs used in disaster management and their potential roles in the process?
    - What challenges are met with positioning and use of the ICTs infrastructure in disaster-prone areas?
2. To trace the specific structure of ICTs-led disaster management interventions at the grassroots level in disaster-prone areas.
    - What systematic structure do ICTs-led grassroots level disaster management interventions follow in disaster-prone areas?

- How do ICT tools and applications become operational for crisis management during a disaster?
- What are ICTs-led location strategies adopted to engage with vulnerable communities in disaster-prone areas?

3. To study the message designing and disseminating process around the different aspects of disaster management using ICTs.
    - How do organisations generate content to meet the demands of the crisis caused by disaster?
    - How do ICTs facilitate the message dissemination process crucial for disaster management?
    - How do ICT tools and applications help in forming various networks (formal and informal) in managing the risk of disaster?
    - What is the stakeholders' decision-making process for any ICT-led disaster management interventions?
4. To understand the role of ICTs in community mobilisation during different phases of disaster management through a case study of past disasters.
    - How do community members use ICTs for disaster preparedness and risk reduction?
    - How do ICTs figure in the communication strategies formed and initiated during the pre-and post-phases of disaster?
5. To examine the effectiveness of different ICT tools and applications for coordination among various stakeholders in disaster management through the case studies of past two disasters.

- Who were the relevant stakeholders for the successful development, adoption and use of ICTs for disaster management?
- How did ICTs help different stakeholders in networking for collective action for different phases of disaster management activities?
- What factors influenced the interface and response of communities to the ICTs interventions during the two disasters?

2.3. Methods of Data Collection

The present research employed qualitative methods of data collection to accomplish the objectives of the research. The approach was to explore the role of ICTs (especially tools and applications) and interconnect them with the user in cases of emergency crises and disaster management, such as during cyclones. Emergency risk management generates a range of processes and activities within the disaster ecology where several institutions, communities and humanitarian agencies (stakeholders) closely engage in response to disaster risk. Thus, the researcher employed an ethnographic approach to gain an in-depth understanding of relationship between ICTs and their users in the context of disaster. The collection of data on the communication and mediated activities relied on **in-depth interviews, focus group discussions, textual analysis, participant observations** of the events, and **informal interactions** with the survivors in the field. Moreover, **document analysis** of reports and materials, which were gathered from various government and non-government sources, was carried out to understand the more profound view of institutional activities.

Earlier, after several cyclonic storms, the United Nations and overseas governments praised the government of Odisha for its response capacity and operative management processes during emergencies; several international newspapers recommended nation should learn emergency

response activity from the state. The entire process is not an outcome of an episodically intervention but rather an output of longitudinal engagement and a series of activities among and within the actors and citizens. Hence, this intrigue point led to the decision to take up emergency response activity in Odisha as a case study. The researcher directly met and interacted with various institutional lead actors, individual actors and citizens who are currently involved in the transformation of ICTs mediated activities in the overall process of emergency management policy in the state. The intent was also to understand the perception of groups constituted by digital platforms and socio-political elements that may influence the function of digital tools in emergency response.

The intrinsic data for this qualitative research was collected in the mode of people's responses, an account of the communication activities and contextual observation on the ground. This collection of responses were recorded as thick descriptions and reflections in the filed notes by the researcher during the fieldwork.

Following Patton (1990), the study employed qualitative research, as the emergency management activity identified complexity in nature and a diverse range of users' involvement. In this research, the case study method is used to address the questions of inquiry and as the process for data collection. As proposed by Hancock and Algozzine (2016), the case study method suggests opting in a diverse range of techniques such as; ethnographic, historical, psychological and sociological. The selected cases of emergency management characterise activities of readiness and human response which needed a close interaction within the participants. Therefore, an ethnographic case study was found suitable to understand the lived experiences of survivors/victims and the culture of resilience in the intersection of human with climatic conditions.

Hancock and Algozzine (2016) opine that "ethnographic case studies typically involve extended interaction with the group, during which the researcher is immersed in the day-to-day lives of group members" (p. 31). For this study, the researcher made direct contact with disaster survivors; spent a significant time with the communities and policymakers and visited emergency sites where different response activities were carried out. The researcher frequently visited several parts of the disaster-prone areas, where different actors were engaged in implementing disaster risk reduction activities focusing on community-led disaster management initiatives. The visited areas such as Puri, Konark, Bhubaneswar, Astaranga, Bramhagiri, Satasankha, Berhampur, Gajapati, Palasa, and Srikakulam gave the researcher a clear view for articulating the diverse range of practices and multiplicity of actions around the emergency.

According to Gobo (2008), ethnography is a type of knowledge that emerges through use of certain techniques, and it is increasingly 'polysemous in meaning'. Among the multiple approaches, ethnography consists of the three major ones; 'participant observations', 'fieldwork' and 'case study' (p. 167). This research integrated all three of these central processes into the research methodology. This research applied 'case study' as a research method, while for the data collection, 'fieldwork' was chosen, simultaneously with 'participant observation' used as one of the data collection tools. All of above the terms are briefly described in the following section of the chapter.

2.4. Case Study Method

The case study method represents research on systems bounded in time and space and confines with a specific physical and socio-cultural context (Gobo, 2008). It is considered as the examination of life histories or a partial or sum of biographies of individuals. The biography suggests not what we conventionally understand; rather, it is the 'sociobiography' of a social

setting or social role (Feagin et al. 1991). While Yin (2011) explains it is an attempt to explore and investigate the sustained process of real-life context, the central aims of case study are data gathering of a determined topic based on various sources. In the case study, personal interviews, direct observations, archival records, artefacts, or available documents are collected and recorded as related to context (Fidel, 1984). The case study can be helpful for research, especially of "an individual, group, organisation or event – rests implicitly on the existence of a micro-macro link in social behaviour" (Gerring, 2007, p.1), and is based on socio-political and interlinked phenomena (Yin, 2003). Following the path of several scholars, the case study method was found pertinent to understand the role played by the information and communication tools in emergencies and disaster management. However, the study is focused on socio-political aspects that may influence the role of digital tools in disaster response in a vulnerable state, Odisha.

In the case study method, the subjects of inquiry may be varied depending on the spatial context; the researcher may try to explore insights from an event, episode, engagement and activities by applying this research method as well (Hancock & Algozzine, 2016). The collection of data sets could be assembled from various sources and platforms, including digital archiving, websites, pdf documents, screenshots, personal interviews, ethnography, audio-visual materials, field notes, digital artefacts etc. (Yin, 2011; Brugger, 2005; Brugger, 2011; Gerring, 2007; Hanock and Alogozzine, 2016).

The data sets of ICTs mediated activity around the emergency management were collected from different units of web pages, screenshots of mobile applications, and several digital platforms. The screenshots included the front page of web pages and mobile applications representing information systems and the activity and structure of the associated platforms. A number of platforms were studied and closely analysed, and later most important platforms were

taken into consideration. Most of the screenshots were collected during the period of the occurrence of the disaster.

The data collection for activities beyond the online platforms relied on fieldwork conducted in several parts of Odisha and border villages of Andhra Pradesh (AP). The interviews were the main methods of collection of data. Apart from the interviews, relevant data were collected through, on-site informal interactions, browsing official documents, participant observation of selected events or activity systems, in-depth interviews, and focus group discussions. On-site photography (stored by various media houses and organisations) was used for additional data collection support. Field notes helped keep track of the researcher's observations and reflections during fieldwork.

2.4.1. In-depth Interviews

Following Mason (2002), semi-structured in-depth interview method was used to understand the functioning of digital and communication technologies in the mediation of activities and the factors that are inherently linked with their role in disaster management. The interview guide clubbed a series of open-ended questions and combined 'what' questions about the role of digital technologies for disaster response and 'why' questions raised to understand the contextual use of digital tools (Bauer & Gaskell, 2000). Holstein & Gubrium (1997), explains 'active interviewing' as a process of knowledge production, that delves deeper into the nature and purpose of the research focus, and that helped the researcher further explore different facets of the ICTs interventions. Following this idea, the interviewees were asked additional questions about the role of the different actors in the process of emergency response.

The idea behind the designed topic guide was to maintain a balance between flexibility and structure. The interview guide was created to address identified aspects along with certain areas to be discussed in more details. The interviews involved gathering apposite stories of users' experiences, observations, challenges and engagement of different actors in the specific situation. Subsequent questions were raised depending on the responses. The duration of most of the interviews were 40 minutes to one hour; in few cases it was more than an hour. The interviews were recorded on an electronic device (mobile phone), and stored for later; some of the crucial insights were noted by the researcher as field notes as the conversation progressed. As a next step, recorded interviews were transcribed in electronic formats (using MS office), and the transcripts were used to generate concepts and analysis for the research. The prepared interview guide informed a certain procedure which included; self-introduction; explanation of research topic and intent; clarifying consent and confidentiality; seeking permission for their voice to be recorded and used for quotations and citations.

The purpose of the interviews conducted with government officials and other non-governmental organisations was to contextualise their role and engagement in disaster response. In Odisha, the states' disaster response mechanism is more centralised (operated under the purview of OSDMA and Special Relief Commissioner). Hence, the interviews with the state government actors were carried out with the officials (based on the hierarchy and structure, from state to community level) who were a part of state emergency management systems (OSDMA). In Odisha, in the hierarchy of administrative system starting from the highest state level to ground community level, the OSDMA has appointed key officials with several roles and responsibilities. Interviews with the stratified actors shed light on how the state-affiliated actors visualise the functions of tools and applications of ICT during emergency and their perception of the activities of other actors.

The interviews with the official actors brought out ideas about the role ICTs can play in disaster management and their vision and challenges to utilise the infrastructure of digital tools.

Following Bauer and Gaskell (2000), the identification of interviewees relied on a two-phased approach. In the first phase of selection, a brainstorming desk research (based on the official database of exiting government structure and several reports of past disaster management activities) was carried out and in the second step 'snowball sampling' and recommendations by other interviewees was used. The interviews were conducted with the various government officials and non-governmental bodies as face-to-face conversations and a few of them over the phone. The case study of Titli covered various parts of Parlakhemundi, Totagumda, Gondahati, Berhampur, Gopalpur of Berhampur and Gajapati District of Odisha and Palasa, Pallisarathi, (where the cyclone Titli made landfall) of Srikakulam District of Andhra Pradesh. The Fani case covered several costal parts of Puri district such as, Satasankha, Puri, Astaranga, Satapada, Bramhagiri, Konark and Sakhigopal. To cover the view of the status from those in the city, a few interviews were conducted at Bhubaneswar.

The table below shows the number of interviews carried out during the fieldwork and the profile details of selected interviewees. Several interviews were conducted with the sectorial officers (Agriculture, Electricity, Horticulture, Line Departments, Telecommunication, Forestry, ODRAF and Fire department etc. of Govt. of Odisha) in *Joint Details Need Assessment* (JDNA) programme at state capital organised by the OSDMA. The details are mentioned in the page.

Table-1

List of In-depth Interviews

S. No	Name	Designation of the Interviewees	Date	Place
1	Mr. R. Marandi	Meteorologist- B, IMD Berhampur	18/11/2018	Berhampur, Odisha
2	T. Kalyana Chakravarthy	Mandal Parishad Development Officer	20/11/2018	Palasa, AP
3	K. Shiva	Mandal Officer	20/11/2018	Palasa,AP
4	Subrata Mohanty	District Disaster Management Officer	18/11/2018	Berhampur, Odisha
5	Sudesh Babu	Shelter Coordinator	17/09/2019	Bhubaneswar, Odisha
6	Rabi Narayan Barik	Block Development Officer, Puri	18/09/2019	Bhubaneswar, Odisha
7	Dr. Pradeep Ku Nayak	OSDMA	17/09/2018	Bhubaneswar Orissa
8	Habibur Rehman Biswas	Director, IMD State-Office	25/08/2019	Bhubaneswar
9	P. K. Beuria	Meteorologist- B, Bhubaneswar	24/08/2019	Bhubaneswar
10	Laxminarayan Nayak	State Project Officer, OSDMA	17/09/2021	Bhubaneswar
11	Sarbeswara Mohapatra	Owner of Nirmata NGO	16/11/2018	Berhampur

12	Prasanya	Suraksya NGO	23/11/2018	Parlakhemundi, Odisha
13	Sangram Tripathy	IAG Coordinator	09/09/2019	Puri, Odisha
14	Manish Jain	Consultant of Islamic Foundation	05/09/2019	Puri, Odisha
15	Manas Ranjan	Society for Women Action Development (SWAD)	12/09/2019	Sakhigopal, Odisha
16	Ashok Jena	ISERD	18/10/2019	Satapada NGO
17	Amzad and Kajal	Radio Namaskar, Young India	19/09/2019	Konark, Odisha
18	Md. Niyaz	Radio Bulbul	08/08/2021	Bhadrak
19	Laxman	Coordinator, Odisha Red Cross Society	17/10/2019	Bhubaneswar, Odisha
20	Shaktikanta Mishra,	Puri Regional News Reporter	16/11/2019	Puri, Odisha
21	Saroj	MBC News reporter,	11/10/2019	Bhubaneswar
22	Rakesh Nayak	Technical Officer, EWDS	3/12/2019	Chatrapur, Ganjam

The researcher conducted most of the interviews in the post-disaster phase (immediately after the cyclone) in both cases of Titli and Fani. The fieldwork included visits to several worst-affected parts when the post-disaster relief and restoration work was underway. Apart from the episodic visits, the researcher came across several key experts and representatives of disaster-affected areas in the disaster assessment programme (organised by OSMDA), where the researcher

interacted in formal and informal ways with them to seek updates about the communication activities around emergency situation. However, apart from the selected cases, the researcher maintained regular contact over the phone with the key informants during the subsequent disasters of Amphan in 2020 and Yaas in 2021.

2.4.2. Focus Groups Discussions (FGDs)

Focus group discussions involve organised conversation with a predetermined group of people for gaining perspective about their engagement with the research phenomenon. Focus group discussions as a data collection tool are widely used across several social science researches to gain information from an ongoing conversation (Morgan, 2008; Darlington & Scott, 2002). Powell and Single (1996) describe FGDs as a "group of individuals selected and assembled by the researcher to discuss and comment on, from personal experience, the topic that is the subject of the research" (pp. 499). The idea behind FGDs is to gain a wide range of perspectives based upon the respondents' attitudes, activity, behaviour, past experiences and engagement that are more likely to be revealed through a single sitting. The FGDs are mainly helpful when the actors share mutual perceptions and similar backgrounds; it is also helpful to uncover a range of perspectives and contextual information on a research topic (Hennink, 2014). The moderator plays a significant role in conducting the discussion to gain breadth and depth from respondents' responses.

The focus group discussions are conducted with the consent of participants to gathered 'collective narratives' on research issues that go beyond the individual perspectives on the identified topic, and help to garner different facets of data than those gained from individual inquiry (Hennink, 2014, p.3). The focus group sites (location) are randomly selected based on several news reports (including regional newspapers, broadcast news and social media platform) and informed by the government officials – most disaster-affected villages (after both cyclones)

were taken into consideration. The discussions were electronically recorded and transcribed for detailed analysis. The discussions were accomplished in regional languages (Odia, mix of Odia-Telugu), in a threat-free environment where the actors would comfortably participate and express their views.

The criteria for selecting respondents for FGDs differed from each other, depending on the relevance and significance of the topics addressed. Some direct quotes (exact words in local language) of the respondents drawn from transcripts are used in the subsequent chapters to highlight the language used and the spirit of their specific response to the particular phenomena. However, the core meanings of the direct quotes have been translated into English next to their quote. Moreover, in addition to formally organised FGDs, a few unrecorded group interactions were conducted in several locations with the fishing communities, and notes were carefully written in the field diary. The table below presents the details of FGDs completed during the field study.

Table-2

List of Focus Group Discussions

S. No.	Participants	Users Background	Date	Location
1	Villager of Totagumda Village	Disaster Survivors	23/11/2018	Totagumda, Odisha-A. P border village
2	Village Disaster Management Committee	Community Members of OSDMA	04/12/2019	Baksipalli Berhampur, Odisha
3	Apada Mitra Group	Volunteers Group appointed by OSDMA	12/9/2019	Bramhagiri, Puri, Odisha

4	Journalist	Regional Television based reporters	17/11/2019	Puri, Odisha
5	Villagers	Survivors of Cyclone Titli	22/11/2018	Pallisarathi, AP

2.4.3. Participant Observations

In the ethnographic approach to research, participant observation helps to know the facets that the researcher may have escaped during the other methods. Becker and Geer (1957) argue that (as cited in Bauer & Gaskell, 2000) the participant observations "is the most complete form of sociological datum" (pp. 44). Essentially, to notice some of the invisible facts, interviewers rely on the respondents' behaviour or actions that occur in the particular space and context (Bauer & Gaskell, 2000). The case studies include a variety of forms, most of which do not subscribe to participant observations (Yin & Campbell, 1984). Krieger (1985) defines (as cited in Jorgensen, 1989) participant observation as a "very different strategies and method of gaining access to the interior, seemingly subjective aspects of human existence" (p. 21). It helps the researcher to effectively observe and experience the meaning and interactions of the community from the role of an insider (Jorgensen, 1989). In participant observation, the researcher primarily gathers information from direct observation of certain aspects which are available in the existing field settings such as; documents (newspapers, letters, diaries, manuscripts etc.), different forms of communication (images, audio-visual contents and moving images) and artefacts (painting/sculpture, tools, outfit, buildings) and life histories (Thomas & Znaniecki, 1918 as cited in Jorgensen, 1989). In this study, the researcher used field-side participant observation. The observation included visiting disaster hit/affected areas (after both cyclones), shelter houses, tower

houses, regional information dissemination centres (IMD Offices) and assessment workshops. The visits helped the researcher understand the ground level dynamics of mediated and offline (without technology) activities by institutional actors and the responses of the receivers within the context of emergency.

As an additional measure, the researcher visited several seaside fishing slums and huts at Gopalpur, Konark, Puri and Palasa, and interacted with several members of the fishing community to understand the role of mediated content in changing their behaviour around emergency situations. The observations included informal conversations with the fishing community and observing their geographical positioning and structural vulnerability. The conversations were beneficial to understand the attitudes and beliefs of the community towards technological mediation and information availability in several digital and offline forms. Moreover, it gave a glimpse of the conventional mode of practice pursued and adopted by the sea-side community during an emergency, and their relation with several institutional actors.

2.4.4. Documents Analysis

The document refers to several materials (both printed and electronic) that help in understanding the process, context and meaning of a situation or social activity (Altheide, 1996) and reviewing or analysing the existing situation in a particular setting (Schensul, 2008). Bowen (2009) defines "documents analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge" (p. 27). Further, he suggests documents could be of various forms such as text or images or printed materials that have been recorded without the researcher's interventions.

The document analysis for this study included official reports, periodicals, newsletters and assessment reports published by the Odisha government (especially by Odisha Disaster Management Authority). Also, several documents and policy guidelines of the Government of India were closely studied to understand the current structure, initiatives and disaster risk reduction plans advocated by the Union Government (under the purview of the National Disaster Management Authority and National Institute of Disaster Management). Apart from the institutional reports published by several governmental institutions, documents produced by civil society groups on their engagement with institutions and community were also analysed to articulate the reciprocal relationships of different actors engaged in disaster response. Most of the documents were collected as hard copies, while others were retrieved in electronic copies (shared by authorised sources of voluntary organisations as pdf, memos and yearly reports). Documents gathered during fieldwork helped the researcher obtain essential insights and develop the study themes.

2.4.5. Organisational Ethnography

Organisational ethnography is a part of ethnography which involves "ethnographic observation of, and participation, in a particular organisation, location and social activities" (Neyland, 2008, p. 2). The observations are noted based on the needs for understanding in-depth insights into how people and organisation interact with each-other in day-to-day practices. Maanen (1979) argues (as cited in Neyland, 2008) the idea behind organisational ethnography is to "uncover and explicate" how people in a specific workplace come to understand, take action, and otherwise operate their regular activities (p. 7). More specially, it proposes the "organisation and its materialisation through human and non-human forms, including individuals, institutions, norms processes, interactions, artefacts many more" (Cote-Boileau et al., 2020, pp. 2).

In this study the researcher conducted organisational ethnography of government institutions, non-governmental organisations and community-based organisations (supported by govt.). The organisational ethnography helped to understand the various layers of engagement, structures, location of operation, interaction with internal as well external organisation, and activities around the object.

2.4.6. Textual Analysis

Textual analysis refers to the interpretation of all kinds of text embedded with human life ranging from television programme to multimedia content (film, television programmes, magazine, advertisement, graffiti etc.) and websites on the internet (Travers, 2001). In textual analysis, the researcher interprets texts to explore and gain a sense of how, in a particular culture, people make sense of their surrounding living and non-living elements (McKee, 2003). Halliday (1978/1994) explains (as cited in Fairclough, 2003) "texts simultaneously represent aspects of the world (physical world, mental world and social world), connect social relations between participants in social events and the attitudes… and connects texts with their situational context" (p. 26-27). According to Fairclough (2003, p. 10) "Part of what is implied in approaching texts as elements of social events is that we are not only concerned with texts as such, but also with interactive processes of meaning-making."

Several texts were analysed to understand the likely interpretations generated by users and who consume them. The texts include the audio-visual contents generated during the specific context of emergency (collected from online as well as an offline mode), available crisis event content over the digital platform (social media and YouTube). Several screenshots of SMS and mobile-based applications were analysed to unveil form of discourses prevalent during emergencies. Besides this, a few risks mapping digital platform such as IMD home (Indian

Meteorological Departments), Regional Integrated Multi-Hazard Warning Systems, Earth Network and different platform designed by Govt. of India were analysed in order to study the relationship between risk mapping institutions and local emergency response actors.

2.5. Fieldwork for the Study

The fieldwork included several methods, along with site observation. In the first case study, the fieldwork in the cyclone *Titli*, covered the most affected parts of Odisha and bordering parts of AP, which involved on-site visits, interaction with the community members (survivors) face-to-face conversation with the institutional actors and volunteer organisation. Also, the researcher visited sea-side lighthouses and cyclone alert offices where most of the activities related to the emergency were carried out. The second case study of cyclone Fani involved visits to the OSDMA and allied departments, affected sites, multipurpose shelter houses/centres and Fani Post-Disaster Assessment Programmes. In addition, during the fieldwork, the researcher participated in a disaster management conference at the state level where he discussed various significant points with disaster management experts.

Before the fieldwork, the researcher conducted 'desk research' to learn about the emergency management activity around past disasters, especially severe cyclones Phailin and Hudhud, which had hit Odisha's coast earlier (2013 & 2014). A few weeks after cyclone Phailin, the researcher had visited several places of Berhampur, where disaster rehabilitation and restoration processes were undertaken and this helped him formulate some basic premise for this study. The researcher made contact through physical interaction or telephonic conversations with several disaster survivors/eye-witnesses who confronted cyclone Phailin. Besides this, the researcher himself had partially experienced nature's fury and emergency caused by cyclone

Phailin, which gave a clear idea of how people faced emergency situations. Based on the two extreme weather events, Phailin and Hudhud, which had brought global attention to the unique activities of emergency management, the researcher selected both these events for study and presented them before the doctoral committee. The ensuing discussion helped consider cyclone Titli and Fani, which had hit Odisha's coast in 2017 and 2018, respectively, as newer cases for study. As mentioned earlier in the chapter, in addition to the selected cases, the researcher closely observed the subsequent cases of Amphan and Yaas in 2020 and 2021, respectively.

In line with the finalising case study, the data collection research tools, including interview and FGD guides were developed for the fieldwork. Participants' consent forms and other important documents for initiating interviews and FGDs were also developed.

For the case study of cyclone Titli, the researcher selected several locations of Berhampur where cyclone high alert had been issued and most rescue and evacuation process were carried out (these places are known as the most vulnerable zones for cyclone; they experienced past two cyclones including 1999 super cyclone). Informed by the state-affiliated offices of Berhampur sea areas such as IMD and weather forecasting office, the researcher headed towards Gajapati district, where cyclone Titli had hit, and actual damages have been recorded. During the office visits in the Berhampur region, the researcher conducted several interviews with the state-affiliated actors and interacted with the volunteer organisations working since the inception of OSDMA or after the 1999 Super Cyclone. These interactions, especially with the state-affiliated actors helped to a great extent in understanding the diverse range of engagement and activity around emergency context. Also the crucial points made by the informants helped identify the plurality of their engagement with various non-state actors. The first case study, which started in Nov 2018, helped acquire

knowledge about the formation of legitimising institutional structure, structural reforms in the engagement and continuous activity throughout the year since the 1999 super cyclone.

In the second case study, cyclone Fani made landfall on May 26, 2019 in several blocks of Puri district, including the state capital Bhubaneswar and other parts of Bhadrak district. The researcher immediately visited the state capital 10 days after the landfall (when communication infrastructure was partially restored in the state capital) to accumulate insights from the crisis environment. However, travelling to landfall areas wasn't possible due to disruptions of transportation and communication facilities. During the emergency (aftermath of Fani), it was impossible to conduct formal interviews with the state-affiliated or non-state actors since they were engaged in post-disaster management activities such as rescue, relief, rehabilitation, and restoration. The researcher informally interacted with several people to gain insights into their engagement and relationship with the other actors in this crisis environment.

Later, during the fieldwork in August 2019, the researcher met several institutional actors and non-state actors to seek information about their engagement in cyclone Fani and the experiences in previous episodes of disasters, including cyclone Titli. In the first week of August, the researcher travelled to Bhubaneswar, including several parts of Fani affected areas, for the second phase of data collection, where he was able to access OSDMA office and conduct in-depth interviews with the state-affiliated actors, which helped the researcher to understand the power relations between different actors those are episodically engaged in disaster response activities. The interaction with actors helped attain knowledge on the instrumentalisation of digital tools for disaster response that are processed by institutional actors with the reciprocal support of non-state actors. During the OSDMA office visit, the researcher collected several newsletters, assessment reports and state emergency guidelines which helped obtain more information about their

longitudinal engagement and integral relationship with several non-state actors and users in the specific context.

Moreover, during the field visit for both cases, the researcher visited several Non-Governmental Organisations (NGOs) that are closely associated with the state-affiliated institutions to know their role in mediating relations between the state-affiliated actors and citizens. The visits established a good rapport between the researcher and actors of the particular organisation – the visits were often followed by personal interaction, and a few led to in-depth interviews. In the Berhampur area, a few interviews were carried out with the actors of NGOs who were involved since the inceptions of OSDMA. Some interviews were also done with other with globally-recognised organisations that were popular in region, such as OXFAM, Red Cross Society, and Islamic Foundations etc. working for social welfare and extended support to the state during an emergency.

The field site visits helped the researcher clarify numerous questions that arose during various occasions, especially after looking at the existing infrastructure set up by the state. During the field visit, the researcher attended one relief-aid distribution programme organised for the marginalised community at Kasia village of Bramhagiri area, initiated by Grama Unnayana Samiti (GSU) with the support of the Islamic Foundation (an international NGO). Moreover, the researcher visited several multipurpose shelter houses constructed in the disaster-prone areas. The shelter houses were equipped with several digital tools and basic amenities related to emergencies, and were managed and operated by shelter management committees. Also, the researcher closely observed several recorded videos of mock drills of search and rescue operations conducted in several shelter houses and school/colleges by Red-Cross Society, Fire department and ODRAF (Odisha Disaster Rapid Actions Force) teams.

The researcher also visited several disaster-affected areas, known as the most vulnerable zones of Odisha, to look at how people negotiate with the environment and infrastructure in their daily life for risk preparedness and disaster resilience. Although the study focused on the emergency management activity around Odisha, the researcher visited neighbouring Andhra Pradesh (sharing a border with Odisha in the Srikakulam region) to gain awareness of action on the other side. In the Srikakulam region of Andhra Pradesh, the researcher met a few state-affiliated actors, including Mandal Development Officer and lower-level actors to learn about their relationship or interactions with the individuals or community in the context of emergency.

Also, throughout the visits, the researcher visited several seaside villages of Konark, Puri, Berhampur and Srikakullam regions, where the severe cyclone caused damage to material infrastructure (mobile tower, lighthouse, and radio tower). The researcher visited several areas of Puri and Bhubaneswar where the existing material infrastructures and damaged infrastructure were replaced with updated technologies and resilient components to minimise disaster risk – in the aftermath of cyclone Fani.

2.6. Coding and Analysis of Data

The first phase of the data analysis process began after following the idea that Yin (2011) describes as "careful and methodic organising of original data" (p. 176) in the digital devices (personal computer/laptop, mobile phone). All the data collected from the field were systematically assembled in the electronic device. While analysing qualitative data, Coffey and Atkinson (1996) suggest "there is a no single right way to analyse qualitative data; equally it is essential to find ways of using the data to think with" (pp. 2). The researcher had to identify a productive way to collect and scrutinise gathered materials. Before jumping into the formal process, an elementary form of data analysis was simultaneously happening whilst data were being

gathered or electronically recorded, and audios were being transcribed. Some of the crucial parts of transcripts were instantly copied and pasted in different files that were created to organise the data in line with the related theoretical frameworks used in this research.

In qualitative research, the process of analysis shouldn't be seen as a distinct part of the research; instead it is an iterative process that informs data collection, writing, further data collection, and so forth (Ven den Hoonard & Ven den Hoonard, 2008). The data transcription and analysis of the first parts of case study helped to inform many insights to broaden the objectives. The analysis was not considered as the last phase of the research process, rather, is seen as part of the research design and the data collection. A substantial amount of parallel analysis was carried out as data collection progressed. The researcher kept moving from data collection to data analysis and back – a cyclical process of analysis and interpretation. This reflexivity helped decipher more nuanced and in-depth information during the case study that led to a broader understanding of the existing circumstances. After the analysis and interpretation of the first case study, the researcher moved to the second phase of data collection or the second case study. However, the entire process of interpretation and analysis were not accomplished in isolation with the researcher alone. The series of discussions with the research supervisor on a regular basis not only assisted the various stages of data collection but also guided in reshaping the outline of the thesis.

After an immersive reading of the in-depth interviews and focus group discussions transcripts, several quotes and stories were extracted, representing different thematic areas of the research. Repeated reading of transcribed data and data procured through participant observations, field notes, visual and textual documents, and social media contents also helped develop relevant themes and concepts. Data were analysed by using a system of coding. Coding denotes a process of breaking the available data in analytically appropriate ways to establish a link that helps in

thinking creatively with the coded data (Corbin & Strauss, 2008). Saldana (2016) suggests a code is a researcher-generated interpretation that symbolises 'translated' data representing separate units or individual datum codified for later purposes of pattern detection, theme generation, assertion or proposition development, and other ways of analysis. Further, two cycles of coding, as explained in Saldana (2021), were used to analyse the transcripts of interviews and focus groups. The portions of data coded in the first cycle or open coding employed to processes range in magnitude from a single word to full paragraphs or ideas and concepts as possible. In the second cycle focused coding, portions coded in the same units helped to reconceptualise longer passages of text, incorporating them into broader and more abstract categories.

The various concepts and multiplicity of ideas generated thereof, linked to the various themes and conceptual frameworks of the research and were separated to be included in the thematic chapters. However, the analysis was also guided by existing scholarship available under various theoretical underpinning that had informed the topic of the research.

2.7. Cyclone-turned Disasters: Two Separate Events

Odisha has come a long way since the 1999 Super Cyclone. A lot has changed in the institutional mechanism and perception of risk response; disaster risk reduction activities, involvement of different actors and citizen consciousness that affect the smooth conduct during a crisis. Since every emergency brings new challenges and opportunities, the state and citizens deliberatively engage in the activity of alleviating risk or hazard by adapting possible means of actions and measures. As witnessed in myriads of cyclones turned disasters over the years, the state saw two severe storms in two different locations, in 2018 and 2019 as cyclones Titli and Fani respectively. A brief description is given below.

2.7.1. Cyclone Titli

The cyclone 'Titli' was the most intense and 'rarest cyclone' to batter the Indian coast during the last quarter of 2018. Several weather mapping institutions i.e. Regional Integrated Multi-Hazard Early Warning System (RIMES) and IMD reports and news columns claim, over 200 years of cyclone track history in Odisha shows that the Titli cyclone is the rarest in terms of its features, such as recurvature after landfall restoring its destructive capacity and recurvature away from the coastal regions for more than two days (The Hindu, 2018). Two cyclonic storms – Titli and Luban – formed on two sides of the Indian mainland, albeit Luban was not considered severe as Titli, travelled through Arabian Sea and made landfall at Yemen and Oman of Gulf coast.

Earlier, the American Joint Typhoon Warning Centre observed a low pressure likely to occur in the Andaman Sea of Bay of Bengal (BoB) in October. On October 7, 2018, the Indian Meteorological Department (IMD) predicted a low pressure formed in the southeast of the Bay of Bengal adjoining the north Andaman Sea. The prediction made by various weather forecasting agencies, including IMD, was that the system would likely concentrate into a deep depression within the next 24 hours and move north-westwards towards the Odisha coast within the next 72 hours. Over the next two days, it entered the Bay of Bengal. The designated forecasting from IMD at 2.00 pm on October 8, mentioned that the concentrated low pressure laid centred at 0830 hrs. IST of 08.10.2018, over east-central Bay of Bengal, between latitude 14.0^{o} N and longitude 88.8^{o} E, about 720 km south-east of Gopalpur of Odisha and 690 km south-east of Kalingapatnam of Andhra Pradesh (Govt. of Odisha, October 2018).

On October 9, the depression rapidly strengthened and intensified into a 'Very Severe Cyclonic Storm' (VSCS) named as 'Titli' and categorised Category 3 cyclonic storm of Saffir-Simpson Scale (SSHWS). The IMD prediction changed and modified several times regarding the

intensity of rainfall, wind speed, the exact location of landfall, and warning message types (green, orange and red message). Between 0430 and 0530 hours IST of October 11, 2018, cyclone Titli crossed between North Andhra Pradesh and Odisha coast near 18.8° N and 84.5° E, to the southwest of Gopalpur, made landfall at 'Pallisarathi' of Palasa (Andhra Pradesh), at peak intensity. The deep depression declined into a depression and moved towards northeast ward with a speed of 12-17 kmph over Gangetic West Bengal and adjoining Bangladesh in next few hours.

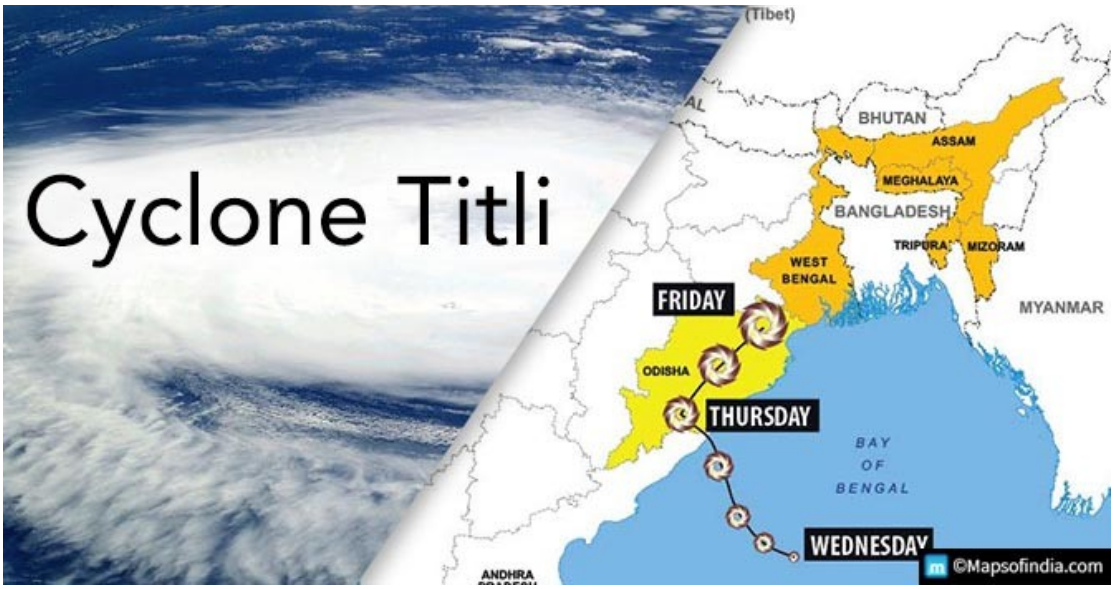

Figure. 2.1 *Satellite image of Cyclone Titli during Landfall at 4.30 am 11.10.2018 (Source: SRC Odisha)*

The cyclone Titli turned into a 'severe cyclone' and recorded an estimated maximum gale speed of 140-150 kmph gusting to 165 kmph during the landfall. It entered into 'Gajapati' district, which is situated around 120 km away from Gopalpur coast areas, where, as reported by IMD, maximum wind speed reached 130-140 kmph, and continued for five hours maintaining the same speed. The next day of landfall on October 13, the cyclone recurved its path between Rayagada and Kandhamal. It moved towards Bangladesh and swept across several coastal districts of Odisha

such as Nayagarh, Cuttack, Jajpur, Bhadrak, Balasore, and Mayurbhanj. These adjoining coastal districts experienced heavy to mild rainfall with the wind while crossing the path, and the above parts received rainfall of more than 100 mm. The cumulative rainfall at Gajapati and Kandhamal of Odisha was recorded as high as 295.8 mm and 294.4 mm respectively from October 10 to 13.

The torrential rain on these days caused flood situation in several rivers – Rusikulya, Vansadhara, Baitarani, Budabalanga, and Jalaka. The Risikuly River received maximum rains and the water level reached so high that it flooded many blocks of Ganjam district. Due to the heavy rainfall, landslide occurred in the many blocks of Rayagada and Gajapati districts. Since the Government of Odisha was keen to ensure 'zero casualties', 24 hours preceding the cyclone landfall, according to BBC report (India, October 11, 2018), about three lakh people were shifted to shelter houses and other safe places in Odisha. Most evacuation processes were carried out at low-lying areas of the coastal region i.e. Ganjam, Khurda and Puri districts. In Odisha, a total of 62 people died due to landslide and most of the death were recorded from Gajapati district. 18 people from an extended family in Baraghara Basti (tribal village) of Rayagada district died while they halted in a cave (traditionally used for shelter). On the other side of the border, in AP, a total of 85 human casualties (mostly fishing communities) were recorded (HT, 2018). On both sides of the two states, many electric poles, embankments, bridges, telecommunication networks, tube wells, water tanks, trees, roads, kutcha houses and public properties were extensively damaged.

The cyclonic storm Titli affected most of the parts of the state – a total of 16 districts in Odisha were affected. As *Down to Earth* reported (Sangomla, 2019a), more than 5.7 million people across 7,402 villages were affected. According to the Government of Odisha Titli Assessment report, around 0.75 million livestock were affected and 0.58 million acres of crop land was damaged by cyclone and flood in the six districts i.e. Ganjam, Gajapati, Rayagada, Puri,

Kandhamal and Cuttack.[5] The total estimated damage for all sectors was INR 2779.32 crores in Odisha. In Andhra Pradesh, as per the final report, around 422 lakh people were affected, and the property damages reached INR 2521.06 crore (The Hans India, 2018).

2.7.2. Cyclone Fani

Cyclone 'Fani' (also called as Phani or Phoni) was the first cyclonic storm of the year 2019 that occurred in summer and just a few months after cyclone Titli. The Down to Earth Report (2019) claims that cyclone Fani is the 'rarest of rare' and 'only severe cyclone' to form on the Bay of Bengal coast over the last 118 years in April and swept across the Indian mainland (April storm are rare, last severe cyclone 'Nargis' hammered Myanmar in 2008) (Sangomla, 2019a). Several weather forecasting institutions called it 'rarest of rare summer cyclone' – the first to occurred in 43 years – one of the only three (summer) cyclonic storm to hit Odisha in the last 150 years (Odisa, 2019). The cyclone Fani, categorised as Extremely Severe Cyclonic Storm (ESCS) made landfall on the Indian eastern coast state Odisha between Satapada and Puri city on May 3, 2019 between 0800 and 1000 hours, and battered through the adjoining districts of Kendrapada, Jagatsinghapur, Khorda and Cuttack.

Cyclone Fani had a complicated life cycle since it originated as low pressure over the Indian Ocean and the southern part of Bay of Bengal. Weather monitoring institutions, including IMD, struggled to identify the exact location of landfall and predict its track and speed. First, the weather forecaster predicted that after forming and intensifying into a depression, it would likely move towards the Sri Lankan coast and make landfall in some parts of Tamil Nadu state of India. However, it changed its path and halted over the Bay of Bengal for the next eight days, changing

[5] Very Severe Cyclonic Storm 'Titli' and Subsequent Floods

characteristics and ending up as an extremely severe cyclonic storm. Further, before reaching Odisha coast over the Bay of Bengal, the storm changed its character again. Earlier, IMD predicted that cyclone Fani would make landfall on the morning of May 4 – revised its estimate to the evening of May 3 – before the day of landfall further revised it to afternoon. However, in the end, it made landfall in morning 0830 hours on May 3 near Puri city of Odisha. During the landfall, the storm contained a ferocious gale speed ranging from 175-185 kmph and gusting 205 kmph at Satapada area (Govt. of Odisha, 2019). Cyclone Fani was categorised as 'category four hurricane' as per the Saffir-Simpson scale (some meteorologists claim gusting reached 250 km, which is ten kmph less than 1999 super cyclone) (Sangomla, 2019).

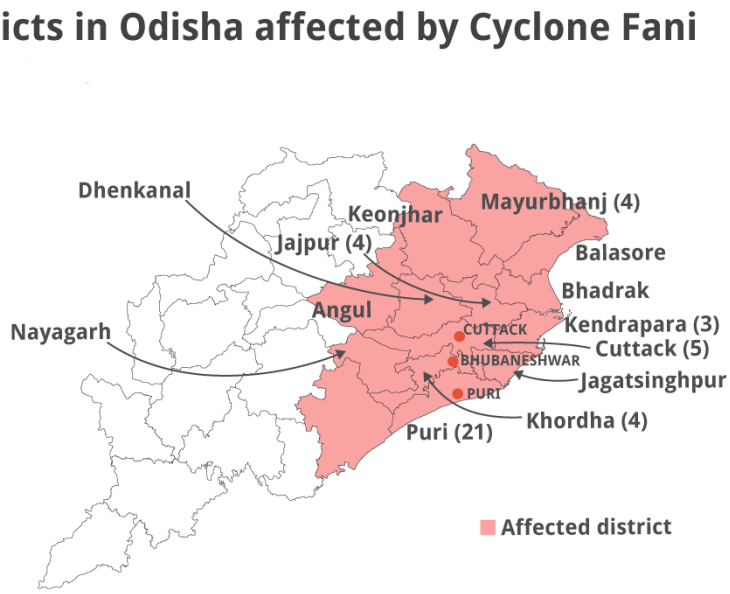

Figure 2.2 *Cyclone Fani affected districts of Odisha, Source (OSDMA, Govt. of Odisha)*

Upon receiving the risk alert from the IMD, national and state machinery was kept ready as an act of preparedness to initiate an immediate post-disaster response after landfall. The state government evacuated more than 1.55 million people. It shifted them to 9,177 shelter houses, including multipurpose shelter houses and safe places i.e., schools, colleges and other safer sites (Govt. of

Odisha, 2019). On the verge of an impending severe cyclone, more than 25,000 tourists were evacuated from several tourist sites of Puri, Konark and Bhubaneswar by mobilising special trains and buses. Vulnerable communities, especially fisher folk, were instructed not to venture out into the sea for the next few days. According to the state government report, twenty units of ODRAF teams, 335 Fire Services team and more than 20 units of National Disaster Response Force (NDRF) were sent at several coastal parts for operationalised search and rescue operations.

The cyclone Fani left 64 human casualties and extensively affected more than 16.5 million people in over 18,388 villages in 14 of 30 districts, whilst Puri, Khurda, Jagatsinghpur, Kendrapara and Cuttack were recorded as most affected districts (these districts were also affected during the 1999 super cyclone). The high-speed wind hammered the state's material infrastructure, including telecommunication, road, transportation, electricity and connectivity. The physical infrastructure of Odisha's capital city Bhubaneswar left a trail of destruction, and the life of the city in the next few days continued to remain nightmarish without basic amenities such as electricity, water and mobile connectivity. The cyclone Fani in its wake uprooted millions of trees from both sides of the national highway of Puri to Bhubaneswar. Major roads were blocked, destroying thousands of kutcha houses and asbestos roof tops, which left many people homeless. Fisheries, agriculture and livestock were hugely damaged across the region.

Since the region generates the second largest income from plantation-based cultivation after rice, large scale damage to coconut orchards, cashew, casuarina and betel trees, resulted in heavy losses to the livelihoods of cultivators. The high-speed wind uprooted about 1.38 million coconut trees in the region, covering 7,930 hectares (Senapati, 2019). The cyclone storm resulted in huge losses in various sectors, including, fisheries, housing, tourism, horticulture and electricity. According to a government of India study conducted by the United Nations, World Bank and Asian

Development Bank, the estimated total damages caused by Fani were worth INR16,465 crore (US $ 2,352 million).

Chapter-3

Disaster and Socio-Political Transformation: Building Critical Infrastructure for Digital Connect

This chapter provides the foundation for studying the role of information and communication technologies (ICTs) in a disaster context. It presents an overview of major debates in academia on the role of ICTs in the context of emergency. The following sections outline the social and political changes that occur during an emergency. There are a lot of approaches and debates in popular research on the role of ICTs in the emergency or disaster context, but they deal mostly with the optimisation of technologies. Apart from looking at the instrumental intervention of digital platforms, disaster response needs a deeper study of the social, political and infrastructural settings of disaster.

This chapter is divided into two sections. The first section highlights the diversity of approaches used in academic research related to the ICTs in response to a disaster. The following section on social transformation explains that although disaster ruptures the socio-economic harmony but it also gives opportunities to develop a new society. The political side of disaster emphasises the mode of relationship between institutions and citizens in an emergency situation. It outlines whether a disaster either creates an external force to make the political structure fragile or acts as an opportunity to strengthen the system. Then in infrastructure transformation, it reviews the social and material aspects of infrastructure. This section raises the issues that although disaster has a destructive nature which destroys material components of infrastructure first, but the havocking results enlighten human beings to reinforce resilience infrastructure. It also emphasise

infrastructure are essential components to run ICT tools and communicative infrastructure play a crucial role in enhancing disaster communication.

The second section also gives an overview of how after the super cyclone of 1999, Odisha's social-political and infrastructural aspects have undergone a sea change. The social transformation section unveils how the risk response mechanism and practices were changed in the state. Then it moves to speak about the politics of disaster and decentralised governance and mentions various functions and sharing of responsibility within the government, civil society organisations and citizens. Then it goes on to highlights the infrastructure currently built in the various parts of India and Odisha, particularly for disaster risk management. It gives an overview of how this infrastructure functions during disaster and the social capital linked with the infrastructure in response to disaster risk mitigation.

3.1. ICTs in the Context of Disaster Management

The intervention of ICTs and various tools-mediated practices in the emergency context is just two decades old and came into the limelight since the massive emergencies erupted worldwide, i.e. the tsunami in South Asia (2004), Hurricane Katrina (2005), the tsunami in Japan (2011) and the Hurricane Sandy (2012). Following several emergencies, a number of individual experts and organisations for crisis-related ICTs experts and volunteers, including 'Crisis Mappers', 'Crisis Commons' and Social Media for Emergency Response (SMER), evolved during the year 2009-2010 (Meier, 2015; Asmolov, 2016). Based on the observations, many scholars claim that the earthquake in Haiti (2010) was the epicentre for the role of ICTs in an emergency context. The Harvard Humanitarian Initiatives (HHI) report of 2011 claims that in the lifespan of the Internet, the Haiti earthquake of 2010 response will be recorded as a departure point when the ubiquitous of mobile technologies and digital platform enable a types of "collective intelligence to emerge"

– when a large numbers of citizens around the globe "collaborated in volunteer and technical communities (V&TC) to help make sense of a largescale calamity to give voice to an affected population" (p. 11). The relevant literature based on the role of ICTs in emergency response is drawn from several policy reports as well as various scholarly works associated with academic fields and sub-fields. Often there is a degree of overlap between policy-driven works and scholarly insights because a large group of practitioners are belongs to academia. Further, due to the specific characteristic of the field, a significant amount of literature has highlighted the technical parts of ICTs and made suggestions regarding policy upgrades and the expansion of modern tools and technologies to expedite emergency response systems. As a consequence, research often depends on cooperation between academics and practitioners, which is valued by many institutions.

In academic literature and policy documents, most of the suggestions pointed out the 'mapping and classification' of the role of ICTs in emergency response (Asmolov, 2016). In a report summary, the US Department of Homeland Security (DHS) highlighted that social media could be helpful for three types of activities, "(i) as a channel for public service announcements, (ii) as a source of information, and (iii) as a means to crowdsource certain capabilities" (Jacobs & Tuohy, 2012, pp. 3). Another report by the Congressional Research Service (CRS) claims social media could be used in two distinct cases, first to pass crisis-related information to ordinary citizens, and then as an disaster management tool, such as disseminating crisis alerts, communication with disaster survivors/victims, updating situation awareness and smoothing recovery process (Lindsay, 2011). Arguing for the relevance of social media, Simon et al. (2015) postulate how social media could be used in both aspects; first for information gathering from various sources such as government officials, local community and mass citizens, and secondly, for disaster management. While categorising the multiple roles of social media in disaster risk

reduction and crisis response, Alexander (2014) identified seven crucial types of functionality, including "listening to the communities, monitoring a situation, integration of social media into emergency planning and crisis management, crowdsourcing and collaborative development, and creating social cohesion" (p. 717-733).

A larger body of research on the role of ICTs advocates the instrumentalisation of new digital technologies that can improve disaster response and ensure that "mechanisms for leveraging the collective intelligence of the public are accelerated in a systematic fashion, and with a serious consideration to ethics, the practical aspects of emergency management, and human needs" (Palen et al., 2010, pp. 10). Pointing out the relevance of the Actor-Network Theory methodology in his study, Potts (2014) claims that an ecosystem of information systems would facilitate us to "start building spaces that can engage participants" in emergency response (p. 22-23). Detjen et al. (2015) propose to develop ICTs-driven mechanism for integrating volunteers into the practices of institutional actors.

In efforts to investigate the role of ICTs in emergency response, several disciplinary frameworks have emerged worldwide, such as "crisis informatics" (Hagar, 2010), "crisis mapping" (Ziemke, 2012) and "neogeography" (Meier, 2011), as well as new research consortium such as Information Systems for Crisis Response and Management (ISCRAM). In addition to that a several inquiries has questioned how ICTs change the practices of collecting information on a crisis and categorisation, authentication and dissemination of information to inform the citizens about the current situation. (Shklovski et al., 2008). Based on the recent observations and discussions, most crisis informatics scholars agreed that digital platforms and other modes of ICTs were appropriated by the citizens, institutional actors and other responders for sharing information, monitoring situation awareness, organising response efforts and others (Dailey & Starbird, 2017).

The emergence of ICTs constituted 'new information pathways' which bridge the gap between various institutional actors, including communities affected by a crisis, people outside the crisis zone and the disaster management agency. In this context, developing ICTs could enhance new forms of 'peer-to-peer communications' in emergencies (p. 734). Several scholars highlight the role of specific platforms in an emergency context. For instance, some pieces of literature argue how Twitter handle, and its various features, such as hashtags used not only in large-scale information filtering but also in coordination, conversation and disaster response with different authorities (Bruns et al., 2012; Purohit et al., 2013; Power et al., 2014).

In the area of ICTs and emergency response, the user or individual participation is another important area of discussion. Palen and Liu (2007) called ICTs increasing citizens' active participation in emergency response and "becoming more visible, active and possession of greater reach than ever seen before" (pp. 727). Goldman et al. (2009) proposed a concept called 'participatory sensing' that gives prime focus on how citizens confer new responsibilities, not only as information receivers but also interpreting and sharing the information related to the emergency.

Some scholars argue that social media creates 'new possibilities' where people can "organise, engage and coordinate action as activists." (Baruh, 2015, p. 132). Papadimitriou et al. (2014) called social media platforms to help 'organise action', 'mobilise citizens as well as resources', and 'seek citizens' involvement in various steps of an emergency' (Watson & Hegen, 2015). While arguing for engagement in underdeveloped countries, Arora (2015) addresses how social media was used in response to the Nepal earthquake in 2015. She said, "Online communities have emerged new actors, supporting citizens and intervention agencies in humanitarian aid distributions" in response to emergency response (p. 1-18).

On the other hand, several cyber-pessimist scholars point out that ICTs create various difficulties for traditional institutional actors on the national level and the members of the global humanitarian systems. Hence, on both sides, institutions, as well as citizens, must be trained to be empowered by ICTs, otherwise, new tools of ICTs can distort the traditionally shaped emergency response systems. Alexander (2014, cited by Asmolov, 2016), called "the command and control structure of traditional emergency response systems, as well as bureaucratic nature of emergency-related organisations, is challenged by ICTs that enable horizontal communication, data sharing and participation by the public" (p. 27). Alexander (2014) suggests two different characteristics of ICTs effects. He says it facilitates "chain of command flatter and less hierarchical" at the other hand it transfers "authoritarian commands towards a more collaborative form of management" which tends to "a more distributed model" of commands (p. 138).

The ICTs intervention in crisis situations increases complexities and creates further challenges in terms of collaboration between engaged actors and citizens. The HHI report says there is a missing formal protocol for collaboration or coordination between the traditional humanitarian agency and technical experts. Further, the report suggested building an "ecosystem where every actor comprehends its role" (HHI, 2011, p. 9). The role of information and communication technologies (ICTs) needs to be studied in the framework of the "continuum between command-based and collaborative models of emergency management" since social media doesn't require hierarchical structure and "fit much better into a collaborative model than a command one" (Alexander, 2014, p. 721). Following the field, a number of case studies tried to develop concepts and models indicating a collaborative relationship between formal institutions and organisations (St. Denis et al., 2012; Starbird & Palen, 2013).

3.2. Emergency and Social Transformation

The term ‘disaster’ denotes multiple meanings of social events, and at first glance, it seems strange and confusing. While disaster is associated with the notion of destruction, chaos, and damage to social structure, and to replace the social order with disorder, at the same time, it provides a pathology for testing the “integration, stamina and recuperative power of large social systems” (Dynes, 1987, p. 1). Further, it gives a basis to study social change, human behaviour, and political transformation of institutions and governance patterns.

In the sociology of disaster, the most important questions addressed include, how human behaviour and social structure change or transform following an emergency. Guggenheim (2014) asserts two basic queries of disaster in the context of social science. The first he called “relates to an interest in breaks and ruptures, rather a continuity and structure” and observed the production of the new composition of the world linked with disaster. The second is “treating disaster as a non-human actor and associated with Actor-Network Theory” (p. 3).

Russian sociologist Pitirim Sorokin is known as one of the pioneers of disaster research. He describes, along with the devastation, mobility and other social disturbances, the common “effect of calamities upon the political and social structure of society is an expansion of governmental regulation, regimentation, and control of the social relationships and a decrease in the regulation and management of social relationships by individuals and private groups” (Sorokin, 1943, p. 122). Barton (1969) asserts how a paradigmatic shift occurs in society following a disaster, from everyday social setup to an ‘emergency social system’; citizens confer an additional set of roles, practices and normative functions. Further, he called that sometimes the transition to a new social setup would create challenges for the community to accept new rules and regulations. If environmental changes are gradual and continue over a more extended period, society would adapt

through the “normal process of collective decision making and change in role systems”. If it is certain and instantaneous, “it disrupts these processes and creates the new ones, which call into being an emergency social system” depending upon the duration of the engagement (p. 66).

A separate body of literature highlights the rise of volunteerism. Aguirre et al. (2016) told specific volunteering called ‘spontaneous volunteers’ those who have no prior affiliations with any organisation – not professionally trained and allocated specific resources – work outside of the institutional affiliations for rescue and relief and other activities. Twigg and Mosel (2017) highlight the emergence of spontaneous volunteer groups in urban disaster response by summarising cases from several Asian countries such as Nepal, Sri Lanka, Thailand, Maldives and Indonesia. They outlined how citizens within and outside the community organised as a first-hand responder before reaching institutionalised actors in various actions, including medical support, information/communication, shelter, building and services, coordination and support, preparedness and others (pp. 447). Medina (2011) advocates that the spontaneous volunteers, as a form of pragmatic participation by the citizens, fulfil the vacuum showcased by the media (including new and old media) and the grief of survivors they know.

While addressing the disaster and social transformation or social change of society, crucial questions are addressed in Cuny’s work (1983). His work advocates that “disaster creates a climate wherein changes in society are more acceptable” (p. 12). Further, it suggests the climate of uncertainty push to change in governmental policy and institutional setup, as well as changes in the structure of community leaders. Sorokin (1942) called that apart from the development in the normative structures, large-scale disaster release a creative force which paves the idea of an adaptive society.

However, various works of literature show different ways in how human struggles, transforms and learns to be resilient or live with a disaster. Solnit (2010) called that human being slowly acquire knowledge for an 'alternative way of existence', Hannigan (2010) said 'post-disaster utopia' and 'window of opportunity' and Asmolov (2016, p. 33 cited by Barton, 1969) "changes become permanently embodied as a social system as a consequence of a particular event". While in the 'risk society', Ulrich Beck (2006) shows the relationship between emergencies and changes in social structures. He observed social structures increasingly organised around risks and anticipation of emergencies.

3.3. The Politics of Disaster and Transformation

Scholarly work dealing with political transformation advocate that emergencies play a central role in transforming modern political systems, developing institutions, and developing national consciousness (Abney & Hill, 1966; Rozario, 2007). Some of the literature questions the political aspects of disaster and differentiates whether 'disaster politics' or 'disaster of politics' (Klitzsch, 2014; Guggenheim, 2014). Guggenheim claimed that both disaster and politics are interrelated. He called "disaster as producing politics and politics producing disasters". In the first sense, he called "disaster not only produces politics but a particular kind of (cosmo-)politics" which deals with disasters; in the second sense, related to the disaster management activities, "politics is the productive force, and disasters become means to legitimate, produce and arrive at certain politics" (2014, p. 1). Klitzsch (2014) highlights the post-tsunami experiences of South-Asian regions such as Sri Lanka and Indonesia. They argue disaster effecting conflict zones can play a catalyst role in pre-disaster developments.

Scott (1976) says 'politics' is inherently embedded within social relations, and consequently, the focus broadens to include socio-political systems. Pelling and Dill (2010)

explained that in the contemporary context of research and policy priorities driven by climate change (IPCC, 2007) and rapid urbanisation (UN-HABITAT, 2007), a significant amount of literature emphasised on how "disaster impacts and reconstruction might reshape political system and the governable space they inhabit" (p. 22). Earlier, they called the state's inability to respond adequately to an emergency to form a 'power vacuum' and mirror the fallacy of developmental policy, which "can open to scrutiny dominant and institutional systems" (Pelling & Dill, 2006, pp. 4-5). Further, they highlight the disaster as a 'tipping point' where several types of political transformation occur, including shifting the balance of power between institutions and community or civil society organisations. Also, a disaster shows a short window of opportunity for novel socio-political action at a different level of government (i.e. national to local) (Pelling & Dill, 2006).

Disaster or climate-related emergency equally affects every section of society apart from socio-political differences. When it comes to response and management systems, the political system becomes more totalitarian. In a sovereign state, the normative responsibility of a government is not only to protect its citizens from the damages and harm caused by a disaster but also to revive the current form of regulation and distribution of state power (Hewitt, 1998). In a comparative study on political-economical shift, Drury & Olson (1998, cited in Pelling & Dill, 2010, pp. 24) called "political change most likely when disaster losses were high when the impacted regions were repressive." The Neo-Foucauldian reader Agamben and his followers have suggested a model interpreted by Guggeinheim (2014) in how the state of emergency imposed a new model of power and politics over its citizens. Further, the argument underlines that emergency is a "trick to enforce stricter control of the population, and a new biopolitics that would not be possible in normal circumstances" (p. 15).

Pelling and Dill (2010) emphasise that the increased frequency of cases could temporarily weaken the "dominant political and social systems" and emergencies "open space for alternative social and political organisation to emerge" (pp. 25). Nakagawa and Shaw (2004 as cited in Pelling & Dill, 2008) assess the political impacts of civil society in post-disaster. They highlighted cases from Kobe, Japan and Gujrat, India. They pointed out that local-based organisations or groups help the "structure of local reconstruction efforts" and create a "new political space in the process of reconstructions" (pp. 7).

Some of the literature advocating the political aspects of the disaster, claimed disaster creates a window of opportunities for the traditionally formed institutions to revive the practices and regulations of their institution. Sobolev et al. (2012) argues that that disasters stimulate people's trust in institutional authorities. Egorova and Hendrix (2014) says although a disaster might lead to internal political instability and armed conflict, but at the same time they also constitute a new sphere for interaction between different parties, such as collaborative efforts for managing disaster risk and cooperation during an adverse situation, thus paving the way for collective actions. Le Billon and Waizenegger (2007, pp. 422) speak of "reshaping governable spaces and public discourses" in the pre-disaster phase or post-disaster scenario.

3.4. Disaster, Human and Infrastructure

Apart from socio-political changes, human beings develop various critical infrastructure to deal with a catastrophe, which function with the support of social systems and political structures. The true nature of a disaster is fixed by the devastation it causes. When it erupts, it severely affects the lives, livelihood and material infrastructure. In response to such uncertainty, humans invest massive capital and resources to restore normalcy from a crisis and avoid future risk. Also, the disaster risk reduction mechanism emphasises on increasing the social capital and building disaster

resilience infrastructure. However, in the academic literature, meagre concentration has been given to the role of infrastructure, networks and their social relations in the context of an emergency, albeit the disciplines of engineering and social aspects of sciences increased research on crisis or risk infrastructure (Sims, 2007).

Infrastructure constellates and serves material and symbolic goods in an institutionalised manner to generate collectiveness (Bhat, 2020). Bowker and Star (1999 as cited in Bhat, 2020) argue the study of "infrastructure is a categorical act, conscious system" of classifications that foregrounds the "historical, epistemological and political commitments" associated with the analysis. Infrastructure indicates a 'common metaphor' which stands as a "substrate: something upon which something else runs or operates", such as a mobile network system upon which voice and data transmit (pp. 112). Larkin (2008, p. 6) posits infrastructure refers to a "totality of both technical and cultural systems that shapes institutionalised structure whereby goods of all sorts circulate, connecting and binding people into collectiveness."

The infrastructure could be understood with a plethora of materials, discourses, symbols and practices that span the globe. In terms of hard infrastructure, it could be understood as constructed or 'tangible infrastructure' that covers all the material components, e.g. roads, harbours, bridges, tunnels, railways and others, while 'soft infrastructure' or 'intangible infrastructure' are those which are required to maintain socio, economic and cultural standard in the society such as institutions, social capital and other value-added services (Turner, 2020). As Edwards defines (2001, p.186), "to be modern is live within and by the means of infrastructure" thus, in the broader context, it could be seen as a "mechanism to control time, instigating wave of social progress" (Marvin & Graham, 2001, pp. 42).

In the discipline of media and communication studies, the role of communicative infrastructure has occupied a distinct place since the 'transmission view of communication' propounded James Carey during the 90s. Infrastructure would be accepted as part of media distribution, whereas the concentration remains on the "media content and media industries – producers, consumers and political economy" (Bhat, 2020, p. 22).

While defining the historical positing of the concepts, Star and Ruhleder (1996) define:

> We hold that infrastructure is a fundamentally relational concept. It becomes infrastructure in relation to organised practices. Within a given cultural context, the cook considers the water system a piece of working infrastructure integral to making dinner; for the city planner, it becomes a variable in a complex equation. Thus we ask, *when*— not *what*— is an infrastructure. (pp. 4)

In that aspect, infrastructure gain significance when it is considered in relation to a set of organised practices. However, these types of practices raise questions about the historical trajectories where it begins – which kinds of organised practices should be considered and that becomes the point of departure.

Since we have seen ICTs create new opportunities and challenges, they also provide new meaning to emergency response. The material components of artefacts and systems are more apparent than the premises, procedures and concepts that shape the use and usability of ICTs (Aakhus, 2002). Some of the scholars located infrastructure within a large-scale ecosystem. Aakhus (2002, cited as in Bowker & Star, 1999) defines infrastructure as "found in procedures, policies, categories and protocols although often it is implicitly negotiated and seemingly intangible" (pp. 27). He says that, although the tools of ICTs may be individually owned, the

infrastructure they construct to function all the artefacts has implications for how people relate to each other and negotiate their everyday affairs.

Sims (2007) argues that infrastructure is relevant in an emergency context and works from the background to accelerate work practices and social relations. He considers infrastructure as "relational concept: it refers to something that enables something else – most often a technology that enables some human activity… organisational form or intellectual tools that enable technology to work" (p. 94). Further, he explains it includes various utilities, including communication systems, bureaucratic rules, hazard maps, roads, and homes. Granger (1999) analysed Pacific Island Countries (PICs) context and called the crucial information needs of institutional actors fulfilled by 'information infrastructure'. He underlined two important aspects of information infrastructure; first, it felicitates a "guide to follow by those engaged in disaster management and research in building their own project, national or regional disaster information collection." Secondly, it keeps an eye over the "technical and organisational issues, such as data formats, transfer standards and custodianship arrangements that need to be considered in establishing and operating any modern information infrastructure" (p. 20).

The field of disaster management reflects various theoretical underpinnings and conceptual approaches to question the role of ICTs in an emergency. More often, either the theoretical framing of issues addresses a broader context of understanding risk and crisis or emphasis is given merely to tools in particular case of an emergency. This tradition of research advocates domain-specific questions focusing on disciplinary interest. However, some socio-political forces sway the change process. The specific activities in disparate crisis contexts are influenced or mediated by digital artefacts and complex power relationships that become legitimised in various ways. In Odisha, after the Super Cyclone of 1999, political history, governance, communication systems and

adaption of strategies have significantly changed. It is routed like socio-political transformation, policy framework, and infrastructural practices. The emergency management agencies/organisations, several actors, volunteers and citizens formed an integrated network or ecosystem around the context of the disaster. In light of the scholars' ideas mentioned above, this chapter analyses the several transformations that occurred over the years in the structure and practices in the Odisha context after the devastating cyclone of 1999. Many such changes are identified here.

3.5. Super Cyclone of 1999 and Social Transformation in Odisha

In its recent transformation, the Odisha disaster management system made many changes in its emergency response approach, coping mechanism, disaster-resilient capacity and build-back-better systems. Several government officials and disaster survivors or victims claim that the 'super cyclone of 1999' was the turning point from which the socio-political transformation and people's consciousness towards disaster response have been changed into a new prospect.

Super Cyclone of 1999 is regarded as one of the worst catastrophes in Odisha and Indian history. Two consecutive disasters occurred in October 1999. The first one, called '*severe cyclone*', or '*Ganjam Cyclone'* occurred on October 17th and 18th, 1999. In this cyclone, the maximum wind velocity of 90 knots (equal to 180kmph) also recorded widespread rainfall of a maximum 400 mm across several parts of Jagatsinghpur, Ganjam, Puri, Bhubaneswar, Balasore, Cuttack, Keojhar, Mayurbhanj and Dhenkanal districts. The second one was '*super cyclone*' or '*Ersama Cyclone*' which made landfall on October 29th and 30th barely ten days after the first one. It hit the port town of Paradeep, Odisha, engulfed several coastal districts such as Jagatsinghpur, Kendrapada, Cuttack, Khurda, Puri, Jajpur, Bhadrak, Balasore; including peripheral districts such as Keojhar, Mayurbhanja, Dhenkanal and Nayagarh.

At the time of the super cyclone, the IMD (Indian Meteorological Department) wasn't well equipped with satellite communication, and radar systems for weather forecasting and warning were issued a little while ahead, leading to mass deaths. Four days before the super cyclone, an IMD advisory warned unambiguously that a very severe cyclone would hit the state on October 28th and 29th and make landfall between Puri and Balasore. Before that similar warnings were circulated for Ganjam cyclone, which hit just ten days back on October 18th and 19th. The warning alert for Ganjam fluctuated several times, and the intensity was not as severe as earlier measured by IMD; it made landfall with gale winds, widespread rain, and 2-3 high tides. As a result, IMD warning system lost its credibility and prediction of the Ersama warning. Therefore, people assumed that Ersama cyclone would be similar to that of Ganjam cyclone. Despite the warning alert delivered through news broadcasting over radio, television, and several regional print media, people took it lightly and stayed inside mud houses instead of evacuating themselves to a safer location. In the super cyclone, the highest wind velocity reached 270 to 300 kmph at Paradip where the exact landfall point was identified. Later the storm resulted in heavy-to-very heavy rainfall with a maximum of 955 mm in Oupada and 600 mm in Astaranaga, Akhuapada, Chandibali, Hadgarh, Anandapur, Suneidam and Bhadrarak, which resulted in a high flood in Baitarani, Budabalanga, and Salandi Rivers Basin.

According to some official data sources, the Super Cyclone killed 10,000 people (as per some official data) and millions of livestock. At the same time, more than 3.5 million kutcha houses collapsed, several villages were washed away, around 2.5 million people were stranded, thousands of hectares of farmland submerged, millions of people were affected, and an estimated

USD 1.35 billion property damaged[6]. The super cyclone was recorded as a great government failure in terms of disaster preparedness which later turned into a great disaster in human history.

Before the super cyclone, the Government of India, Ministry of Irrigation and Power, appointed a committee headed by Dr. P. K. Koteswaram in 1969 to examine in detail measures to mitigate human suffering and reduce loss of private and public property. The reports concluded that the preventive measures are expensive and require longitudinal interventions. Earlier disaster management merely concentrated on the rescue and relief operation during and after the occurrence of natural calamities, which was initiated under the supervision of Special Relief Organisation (SRO). Sudesh Kumar Sethy, shelter coordinator of OSDMA says:

> Earlier, prior to super cyclone, disaster management activities were initiated under the think tank of Orissa Relief Code (ORC). The ORC guidelines were laid down on the rescue and relief measures that seek to promote; no one should die of starvation, lack of hygienic food and water, and allocate gratuitous grants to the vulnerable section as a duty of welfare state and development guidelines (Interview, Bhubaneswar).

Several intrigue points were highlighted during the post super cyclone assessment. Those claimed responsible for the disaster include unavailability of woeful infrastructure (shelter houses), most rugged communication networks, damaged/dysfunctional portable wireless systems, unavailability of structural governance system, and culture of complacency. Hence, the ravaged picture and state of emergency became the turning point from which the state was forced to simultaneously work towards relief and rehabilitation as well as disaster risk mitigation.

[6] https://www.osdma.org/publication/1999-super-cyclone/#gsc.tab=0

As an organisational transformation, amid the chaos and instability, the state has established a separate organisation called the Orissa Disaster Mitigation Authority to govern the emerging crisis in the state. Immediately after its formation, OSDMA has undertaken several crisis management activities in the most affected areas, such as restoration, reconstruction, and rehabilitation, with the collaboration of multiple national and international humanitarian agencies. The OSDMA was formed with the following objectives:

1. Act as the nodal agency for disaster reconstruction works,
2. Coordinate with all government departments involved in reconstruction,
3. Coordinate with bilateral and multilateral aid agencies, including UN Agencies, International, National and State-level NGOs,
4. Promote disaster preparedness at all levels in the state, and
5. Network with similar humanitarian organisations for disaster management. (OSDMA, 1999, "Objectives," para. 2)

The National Disaster Management Cell (NDMC), a State office has been operating at Bhubaneswar since 1996. The NDMC was engaged in providing training to different government and non-government actors for managing crisis situations in the state. Before the 1999 super cyclone, no such organisation existed that could coordinate with the various departments of government and communities.

The notion behind establishing an organisation is to spearhead disaster risk mitigation in the state. Initially, OSDMA brought together all the governmental departments, including SRC (Special Relief Commissioner), into a single thread and worked together under the purview of a single institution. Also, it emphasised the creation of leaders at various districts and sub-districts

level in order to produce a positive environment where all agencies can come together and work collectively with a common goal. OSDMA official Sudhesh Kumar Sethy says:

> The OSDMA is recognised as a pioneer organisation in the South Asian region that emphasised on disaster risk reduction activities. It is established to foster disaster preparedness and build a resilient state after looking beyond the conventionally practised rescue and relief-centric approach (Interview, Bhubaneswar).

The Government of India enacted Disaster Management Act in 2005 (DM Act 2005). Following the DM Act, in the same year, the government changed the nomenclature of Orissa Disaster Mitigation Authority to Orissa Disaster Management Authority[7], and priority was given to disaster risk governance to manage disaster risk. Thus, under the decentralised governance, the power was transferred into the hierarchy of government structure such as State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA), and Village Disaster Management Authority (VDMA) at state, district and panchayat level respectively. Also, the state government enacted policy, guidelines systems, plans, capacity enhancement, mechanisms, partnership and cooperation to act as first responders to disaster events.

However, disaster risk management focuses on strengthening the resilience of the system and the community, intending to reduce the magnitude of damage caused by natural hazards through the principle of prevention. As a first step in coordination with UNDP (United Nations Development Programme), OSDMA started a capacity building and empowerment programme at several institutional level and community level. Sarbeswara Mohapatra founder of Nirmata NGO states:

[7]https://www.osdma.org/about-us/osdma_overview/#gsc.tab=0

> Community empowerment programme was started just after a few months of the super cyclone. Initially, it was created as a pilot project in the Balikuda Panchayat of Jagatsinghpur district. With the massive success of the program, it was extensively implemented over several coastal districts in later phases (Interview, Berhampur).

Initially, the community empowerment program started with the idea of Community Contingency Plan (CCP). In the CCP model, several task forces such as warning group, rescue group, relief group and first aid group were created within the community, and they were given three days in-house training at the district headquarters as well as block headquarters. After the completion of trainings, mock-drills were conducted at the community level to assess the applicability and effectiveness which included, rescue and search operation, relief distribution, first aid and warning alert interpretation. Mr. Mohapatra informed:

> Since the catastrophe was havocking and fresh in people's memory, it pursues many members of affected families or communities to actively participate in the program to build their capacity to deal with any future emergency situation. However, in the course of time, the CCA program was terminated due to irregularities of maintenance, improper coordination and insufficient monetary assistance to run a huge workforce (Interview, Berhampur).

From 2003 onwards, the state has started various initiatives at the block and district levels to scale up the disaster risk management program. The plans emphasised the preparation of a district-level, block-level and village level action and several leaders (master trainers) were created from each cluster for empowerment and capacity building of the community. Describing the initiatives, Gyan Ranjan Das, state project officer of UNDP said:

> Initially, we had our own resource person in 16 districts, but that was not enough to contact during emergencies because of the lack of proper road connectivity and transportation and the unavailability of robust telecommunication networks. So we have created several master trainers in each group, and training was given at district headquarters and, in some cases, at shelter houses. Further, those master trainers were assigned to train and empower the community from their respective jurisdiction (Interview, Bhubaneswar).

After the formation of OSDMA, the apex body built partnerships with multiple NGOs, philanthropic organisations and humanitarian agencies to foster resilient communities and develop disaster risk reduction culture across the state. In the disaster crisis situation, several national and international NGOs such as Oxfam India, Indian Red Cross, UNICEF, Islamic Foundation, Catholic Relief Services (CSR) and others have engaged in relief and rehabilitation activities. Later the NGOs emphasised encouraging capacity building and the creation of social capital at each cluster level with the support and collaboration of the government. Initially, small NGOs were given training by their parent organisation to implement disaster risk management programs at community and peripheral levels. Laxman, field coordinator of Red Cross Society elaborated:

> College students, school students (of all ages), and members of the community were trained through the mass campaign on an episodic basis for road safety awareness, community mobilisations, and disaster rescues and relief works. Initially, the college students were given certificates for participating in capacity-building training. Then instruction has been given to voluntarily participate in the disaster management programme or any national emergencies (Interview, Bhubaneswar).

Consequently, several community-based organisations have been created over the years with the coordination of NGOs. They work in disaster-prone areas to foster disaster risk management

activities. Cyclone Shelter Management and Maintenance Committee and Flood Shelter Management and Maintenance Committee (CSMMC/FSMMC) were formed to ensure sustainable maintenance of cyclone/flood shelter houses/buildings. The OSDMA has identified several nodal NGOs in every block level, and they are involved in coordinating activities in their respective block. The idea behind engaging local/nodal NGOs is to stimulate volunteerism among community members and enlighten them on the art of social coordination and infrastructure management, which creates an ambience of community ownership and engagement from the bottom. While narrating the activities of committees, Sudhes Kumar Sethy said:

> For managing and maintenance of shelter houses built by OSDMA, the responsibilities of respective shelter houses were handed over to the CSMMC/FSMMC. The committees were democratically constituted following the diversity of community and governed by the by-law of OSDMA. The activities include the maintenance of the shelter building. They have been trained to operate several shelter house machinery, arrange meetings, record maintenance, assist communities in rescue and relief, rehabilitation, and organise community kitchens etc. (Interview, Bhubaneswar).

In the current development, to manage local knowledge systems and first hand measures to prevent and save people from any forms of life-threatening conditions, more than 200 volunteers called 'Apada Mitra' was created on a pilot basis in Puri and Jagatshingpur districts. The Apada Mitra group were trained in various fields in order to engage in any forms of disaster management, road safety measures, community mobilisation programmes, and vulnerabilities identification. Biranchi a volunteer from Kasia Village of Bramhagiri block said:

> With the support of the district emergency cell, before three to four months of cyclone Fani in 2018, we were trained at district headquarters. The training includes search and rescue,

first-aid measures, vulnerability identification, and community sensitisation measures. The group constitutes with a fair proportion of male and female volunteers (Focus Group Discussion- FGD).

Further, the state realised it was imperative to improve state machinery while dealing with an emergency. A professionally skilled group called Orissa Disaster Relief Force (ORDRA) was formed and equipped with state-of-the-art emergency instruments to support and assist the civil administration in the response, recovery and relief efforts, and all forms of disaster management activities, including natural or human-induced disaster. The ODRAF was the first disaster relief force in India. A specialised group of 20 units of armed forces has been carved out from different battalions of Orissa armed forces in the aftermath of super cyclone and posted in different parts of Odisha.

After finalising the ODRAF structure and the battalion, the Union Government formed the National Disaster Response Force (NDRF) and made appointments in different parts of the country. Both forces employ during various emergencies, including national and international disaster management operations, throughout the year. They have been engaging in various activities of training and capacity building, mock exercises, school safety, rescue, relief and restoration programs. Also, several units of the Fire Services Force recruited across the state, including the departmental headquarter at Bhubaneswar, are kept alert around the clock.

In rendering disaster preparedness and equipping citizens with adequate knowledge and skill in emergency management, the government of Odisha on May 29, 2021, passed a resolution in State Assembly to make disaster management syllabus mandatory in school and college curricula. The resolution also highlighted every student, elected representative from ward to upper

level, government officials, members of mission Shakti groups or Self Help Group will be trained in emergency or pandemic management (Barik, 2021).

3.6. Political Transformation and Decentralised Governance

Devis (1978 cited in Bose, 1994) pointed out that several deficiencies in communication during disasters are due to three major causes, including "lack of preparedness on the parts of government that intend to conceal the fact" (p. 2).

Inadequate state response was compounded by the realisation that the state failed to generate legitimate infrastructure and preparatory system for pre super cyclone. The then sitting Chief Minister (CM) of Odisha, Mr Giridhari Gomango, who took charge just a few months before, was severely criticised due to improper management of the crisis because of the political turmoil within the ruling Congress Party. Discontent grew among the people and political parties, Mr Gomango stepped down from his position, but finding a successor from the long list of contenders took quite a long time. Finally, amid the state of commotion, Mr. Hemananda Biswal took over the CM charge in the mid-November. Given its inability to provide pertinent services to the disaster victims, the major opposition parties demanded to BJP-led central government in Delhi to declare cyclones as National calamities. However, the political instabilities continued for the next few months. Amid the crisis, the state conducted a legislative election in March 2000. The election results were declared in April, and the ruling Congress Party lost to the coalition front of the Biju Janata Dal and Bharatiya Janata Party (INTRAC, 2022). As a result, the super cyclone deeply planted a new political force. Odisha gained a new CM Navin Pattnaik in 2000. He continues as a CM in the state, and has shown a new direction to the world in the field of disaster risk management. He is appreciated by various international organisations for his robust disaster

preparedness mechanism (Misha, 2021). Therefore, the super cyclone and post-crisis situation saw three chief ministers within five months.

At that time, the tipping effect and asymmetric impact of super cyclones created a space for political participation and humanitarian action on post-disaster peace-building. The relief and rescue efforts were carried out with the help of neighbours, and spontaneously formed volunteers groups and NGOs. The central government in Delhi urged all the state governments, public sector units and humanitarian agencies to extend their supporting hand to Odisha government with whatever resources they could contribute. Hence, the event was an important juncture in the Indian context, when various states came to the forefront with abundant relief and support. States government across the country as well as the Central government, provided several crucial relief assistance such as food items, medical supplies, special transportation, volunteers (medical staff, debris removal worker), satellite phones and special armed forces and more to the affected state (Reliefweb, 1999). While rendering help in the form of reconstruction and restoring to normalcy, different state governments adopted the most severely affected districts i.e. Rajasthan adopted Bhadrak, Goa adopted Keonjhar, while Maharashtra, Gujrat, Delhi and Madhya Pradesh adopted, Jagatsinghpur, Balasore, Puri and Jajpur districts respectively.

The government of Odisha, through diplomacy urged UNDP office at New Delhi to supply relief materials and other assistance on an emergency basis. Thus, consulting with Centre and state governments and collaborating with other national and international NGOs, the UNICEF, UNDP and World Bank, it prepared a situational report on a daily basis and shared it with donor agencies. The major international organisations such as UNDP, the United Nations Population Fund (UNPF) not only allocated initial needs of relief material, monetary assistance and social support during

the crisis but also extended a supporting hand in later phases in order to develop disaster risk reduction capacities and resilient state.

The National Disaster Management Act 2005 was enunciated after the massive disaster ruptured in India's mainland, such as the super cyclone of 1999, the Gujarat earthquake of 2001 and the Indian Ocean tsunami of 2005. Following the consecutive disasters on a large scale, the government of India realised the importance of disaster management as a national priority. After the super cyclone, the government of India appointed a high-powered committee in 1999 and a national committee following the Gujarat earthquake in 2001 to make recommendations for preparing disaster management plans and identifying effective risk mitigation mechanisms.

The NDMA was established to boost preparedness and resilience, promote a culture of prevention, encourage mitigation measures, designs policy frameworks, develop resilient infrastructure and communication networks, facilitates relief and rehabilitation resources and coordinate with all state and disaster management institution. NDMA is an apex body for disaster management in India, and comes under the Ministry of Home Affairs – headed by Prime Minister, who is the chairperson[8] and other members nominated by him. Mr. Sethy, elaborates on the role and responsibilities of Central institutions:

> They have several bodies/institutions such NDMA, NIDM (National Institute of Disaster Management), NDRF, NCCF (National Calamity Contingency Fund) and a few others headed by the central ministry working for the country, and their role and responsibilities are making new policy, guidelines for developing disaster risk reduction in India. All action plans are prepared following international guidelines and in consultation with the state

[8] https://ndma.gov.in/Reference_Material/DMAct2005

> government. The SDMA is s replica of NDMA, that has the same roles and functions, but the NDMA hold an additional function of finance which comes from the central ministry (Interview, Bhubaneswar).

As mentioned in the section 23 of the DM Act, 2005, there shall be a disaster management plan for every state. Mainstreaming DRR into the developmental plans and making state-specific policy framework, State Disaster Management Authority (SDMA or OSDMA) upgraded in Odisha state. The CM is the chairperson of OSDMA, and following the same structure as NDMA, it nominates several chief secretaries into the body. Along with promoting disaster preparedness culture, the main function of OSDMA is to stimulate an integrated and coordinated management system. Also, it is responsible for gathering relevant data from every aspect of disaster for identifying major causes, conducting research and study concerning the potential effects of events that may result in disasters, and coordinating and monitoring the disaster readiness and progression of plans (OSDMA, 2022).

Under the new provision and guideline, the power and responsibilities of administrative roles of disaster management are shared with various departments. The Revenue Department of the state manages the administrative department for disaster management under the guidelines of the government. The OSDMA plays a coordinating role in various phases of disaster such as pre-disaster, during and post-disaster, while the SRO plays a central role in the phase of response and relief activities. However, all the activities are initiated under the assistance of OSDMA. Moreover, it bridges the gaps between special relief organisations and all the district collectors during response activities. The OSDMA has identified multiple stakeholders across different levels of the state and assigns various roles during any or all the phases of emergency response. Further, the state government also designates specific department and provide special power to the nodal

departments in case of special disasters – during the COVID-19 outbreak, Sarapanch of Gram panchayat was given the power of district collectors.[9]

Section 32 of DM Act 2005 mentioned preparing District Disaster Management Authority (DDMA) for every district to identify district-specific hazard vulnerabilities and risk assessment. In the DDMA, the district collector is designated as the Response Office (RO), and s/he will coordinate at the district headquarters level with all the line departments and remain responsible for initiating disaster management activities in the district. As mentioned in Section 30 of DM Act, DDMA shall act as the highest authority in the district for "coordinating and implementing body for disaster management and take all measures for the purpose of disaster management in the district in accordance with the guidelines laid down by the National Authority and the State Authority" (CTC DDMA, 2019, p. 3).

In the block level, a special cell, Block Disaster Management Authority (BDMA) created to identify disaster preparedness and mitigation plan, and communicate with all the Panchayat Samiti (PS) or Gram Panchayat (GP). The Block Development Officer (BDO) is nominated as chairperson of BDMA. In the impending disaster, s/he will immediately hold a meeting with all stakeholders and alert themselves for emergency preparedness. Also, multiple duties and responsibilities are given to the BDO, such as to inform to the district collectors about the resources needed, ensure function of control room, early warning dissemination to the vulnerable communities, arrange food items and medical services, keep alert armed forces and essential rescue instruments, monitor the relief distribution, coordinate with community based organisation or NGOs and send assessment report to district collector (OSDMA, 2019).

[9] https://www.downtoearth.org.in/news/governance/not-being-kept-in-loop-odisha-s-sarpanches-on-cm-s-power-decentralisation-move-71113

However, in democratic and decentralised disaster governance, community ownership and power distribution among the community are found to be important elements. The bottom line of government is more priority in DM Act, which proposed to create Village Disaster Management Committee (VDMC) in order to prepare Community Based Disaster Management Plan (CBDM) based on area-specific disaster mitigation plans through community involvement. The purpose of CBDM is that the local community becomes a significant player in creating plans, decisions, and implementation. The plan should be designed by the community members through the democratic participation of the society and facilitated by the community experts from NGOs, multilateral agencies and government representatives[10]. In the VDMC, crucial responsibilities are conferred to local NGOs related to the formation of the local assets generation, consultation with the community, creation of various teams, data collection and informed district administration about the status. The rationale behind the transfer of power to NGOs is to reach out at the grassroots level since they have a significant stake in the community. Each NGO is allotted the appropriate number of villages. Although the VDMC is an autonomous community-led organisation, it must work under the purview of respective authorities like GP, Block, District and State and update all the activities annually (OSDMA, 2018-2019). Pradeep Panigrahy mentioned:

> Earlier, we had Community Based Disaster Management Plan, which started just after the consequence of the super cyclone in 1999. Later it upgraded to VDMA with the formation of the DM Act 2005. The program was initiated in ten blocks of seven coastal districts across Odisha state; with the success of the program, it was extended over sixteen disaster-prone districts in two phases from 2002-2008 (Interview, Bhubaneswar).

[10] https://www.osdma.org/vdmp-guidelines/#gsc.tab=0

Moreover, through the distribution of power among various departments, the OSDMA has built a symmetrical relationship with the local and regional level NGOs and parental NGOs in order to make the governance system more transparent and accountable. As mentioned in the DM Act 2005, the preparation of the DM plan is by state governments, while humanitarian agencies are giving additional support to the state in order to lessen the disaster risk and recovering from the disaster. Also, the National Policy on DM in 2009 exceeded more responsibilities over NGOs to motivate to empower the community and enhance awareness through the respective institutional mechanism. As mentioned by the IAG coordinator of Puri District Sangram Tripathy:

> Currently, Odisha has Inter-Agency Group (IAG), is a consortium of 29 NGOs, civil society groups and international organisations. Oxfam India is the Chair the group, while Catholic Relief Foundation holds the vice-chair. As a function of Go-NGOs coordination, the government arranges regular meetings with the IAG coordinators and seeks important suggestions during different phases of disaster. Also, the IAG group is employed to maintain check and balance in the overlapping condition of aid and grants and identify actual beneficiaries from the affected areas. Further, to curtail the government's workload, we regularly engage in rapid disaster assessment and documentation and reach out to the last mile of the community through proper channelisation.

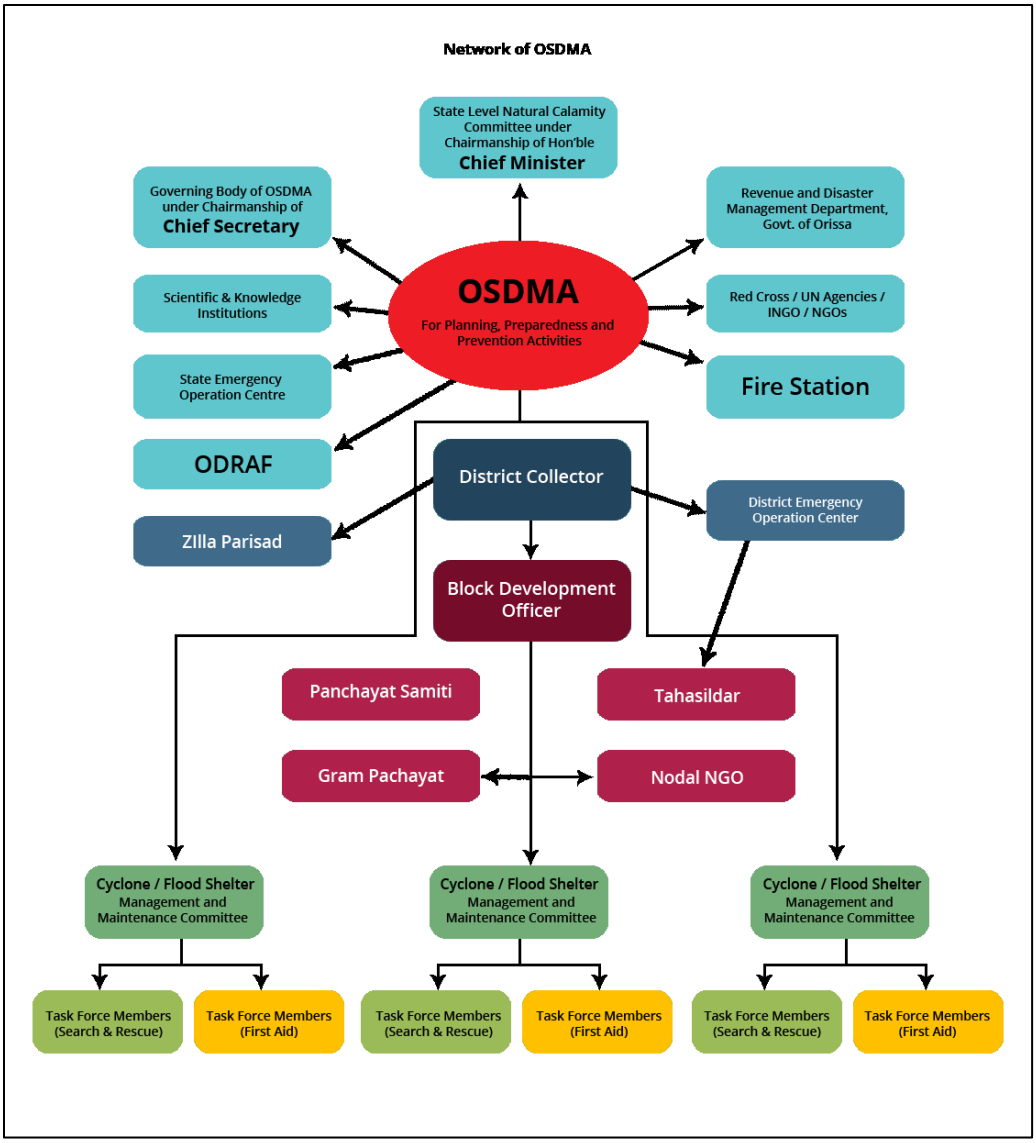

Figure 3.1. Institutional Structure of OSDMA, *Source*: OSDMA website

3.7. Infrastructural Transformation

The post-disaster assessment was conducted by the government of Odisha with the help of different international agencies and educational institutions. The study found major causes of failure, including unavailability of adequate material as well as communication infrastructure in the super cyclone of 1999. Sudesh Kumar Sethi mentioned:

> The initial move by the OSDM scientifically assessed the major causes of failure. Initially, a 'vulnerability assessment' was conducted in coastal districts to understand the critical gaps aroused during the past cyclone. The preliminary observation revealed that Red Cross Society had constructed 23 Multipurpose Cyclone Shelter (MCS) houses for emergency use in different parts of Jagatshingpur, Kendrapada, Astaranga and Puri areas, which reportedly housed and saved 42,000 lives. The marginal community from those areas took shelter at their nearest MCS houses. Still, in the Erasama area of Jagatsinghpur, identified as the worst-affected region, people struggled to shelter themselves when the storm surged to peak level. The above reflection became an eye-opener for the state – additional shelter houses could have saved millions of lives during the previous disaster (Interview, Bhubaneswar).

Henceforth, in the beginning, as a priority, the state government proposed the cabinet ministry for the construction of additional disaster-resistant shelter buildings in disaster-prone areas. The OSDMA assigned IIT Kharagpur (Bhubaneswar Extension Brach) to conduct an impartial assessment study for locating suitable places for the construction of shelter houses. The study was undertaken in two separate phases, first in 2001 and later in 2005 at different parts of coastal Odisha. The report, prioritising the cyclone-prone zones, socio-economic vulnerability, and most marginal community inhabits, mapped a total of 512 vulnerable locations within the 10 km radius of the coastline where the new houses could be constructed. Also, the branch had engineered disaster-resilient homes and democratically accessible structures. Sudesh Sethy explained:

> The buildings are designed so that they can be easily and quickly accessed by all vulnerable people, such as physically challenged, elderly people, women and children. Also, all basic

facilities are available in the house. Moreover, it has the capacity to protect livestock and important assets and arrange community kitchens during any natural calamities.

However, to develop infrastructure for disaster readiness, Odisha has constructed a total of 879 multipurpose cyclone/flood shelter houses in different parts of the state (65 made by Indian Red Cross Society) by availing financial grants/support from the Union government and various international organisations, especially from World Bank. The total number of shelter houses is mentioned below:

Name of the Project	Number of Multipurpose Cyclone Shelters (MCS)	Number of Multiple Flood Shelters (MFS)
Chief Minister's Relief Fund (CMRF)	60	50
Prime Minister's Relief Fund (PMNRF)	38	
World Bank (Immediate Phase-after Super Cyclone)	37	
CMRF/State Plan (Post Phailin, 2013)	36	220
National Cyclone Risk Mitigation Project (NCRMP) (World Bank funded, including 5 Godown-cum-MCS)	154	
NCRMP (Additional Financing) (World Bank funded)	162	
Integrated Coastal Zone Management Project (ICZMP) (World Bank funded)	14	
Container Corporation of India Ltd. (CONCOR)	2	
CMRF (surplus fund)		3
State Plan		23
CMRF (through RD Dept.)		15
Total	503	311

Figure 3.1. Total number of Shelter Houses. (Multipurpose Cyclone Shelters, 2012, p. 5)

While pointing out the current structure of shelter houses Mr. Sethy said:

Building shelter houses were not enough to undertake rescue and evacuation operations, but it requires other essential machinery and equipment in different phases of disaster. Each shelter house is equipped with several instruments which are highly essential during any phase of disaster. For conducting search and rescue operations, adequate tools such as multiple lights, electric saws, generator sets for electricity backup, first aid kit items in emergency treatments, and instruments for operating free kitchens and other safety equipment are placed in the shelter houses.

However, all the equipment is handled and taken care of by the CSMMC/FSMMC group members. Also, for the safeguard and maintenance of those instruments, the OSDMA has designed a separate manual and register which are supervised by shelter house management secretary.

The shelter houses are constructed at the helm of populated villages or, in a few cases, adjacent to the premises of school or college boundaries. However, for easy reach during an emergency or relief activity, several roads (many weatherproof) are connected to the shelter houses. Also, various features and facilities are available at the houses, such as separate halls and lavatories for males and females, a ramp slope for physically challenged people, a store room, drinking water facilities and labour room for pregnant women. In addition to that after the super cyclone the school and college buildings of coastal districts were designed to be used as multi-purpose shelter houses.

3.7.1. Risk and Hazard Forecasting

The IMD was established in British India in 1875 to monitor meteorological services under the purview of central authority. With its inception, in the same year, the IMD has progressively expanded its physical and material infrastructure, such as meteorological observations,

communication, forecasting and weather services. The IMD issued a cyclone warning three days before the super cyclone battered Odisha in October 1999. The people from risk zones disregarded the forecasting because of prediction inaccuracy in previous events. During the super cyclone, the IMD was not well equipped with the latest technologies and machinery, but in the course of time and with the growth and innovation of technology, the department deployed various modern tools and applications for the identification of accurate weather data and hazard mapping.

At present, the meteorological department functions under the Ministry of Earth Sciences (MoES). The IMD New Delhi headquarters is a leading coordinator of all six regional centres (Delhi, Mumbai, Chennai, Calcutta, Guwahati and Nagpur) and also coordinates the state meteorological centres (situated in every state capital). It also deals with the separate divisions with the specialised subjects and with Agrometeorological Advisory Service Centres, Flood Meteorological, Area Cyclone Warning Centres and Cyclone Warning Centre. From the telegram to satellite observation, the institution has continuously upgraded and adopted advanced technologies to collect weather-observational data and deliver early warning information. IMD has introduced the latest tools and technologies over the years, such as 'message switching computer for supporting its global data exchange.' It is also a pioneer institute that has facilitated the first electronic computers and scientific applications in meteorology. Moreover, IMD is the first among the developing nations, globally, to have its geostationary satellite called the Indian National Satellite System (INSAT) for round-the-clock weather monitoring within its selected periphery and especially focuses on cyclone warnings. The Director of IMD Bhubaneswar branch said:

> We are currently observing all atmospheric movements and seasonal weather data. The weather forecasting and reports are shared within the various departments, i.e. OSDMA, Special Relief Commissioner (SRC), Agriculture University, Railway Departments,

Aviation Department, sub-meteorological department, Ports Authority, Fishery Department, All India Radio, Regional Doordarshan Centre and District Informatics Cells (Interview, Bhubaneswar).

In Odisha, Meteorological state centre in Bhubaneswar and several sub-offices at Paradeep, Gopalpur, Puri, Balasore, Jharsuguda, Keonjhar, Hirakud, Sambalpur and Chandbali monitor 24x7 earth movements and provide the latest weather information to the state.

Moreover, different public institutions established in India operate under the purview of the Ministry of Earth Sciences: These are listed below:

- Indian Meteorological Department (IMD)
- National Centre for Medium-Range Weather Forecasting (NCMRWF)
- Indian Institute of Tropical Meteorology (IITM) Pune
- National Centre for Earth Science Studies (NCEES) Thiruvananthapuram
- National Centre for Seismology (NCS)
- National Institute of Ocean Technology (NIOT) Chennai
- National Centre for Antarctic & Ocean Research, Goa
- Indian National Centre for Ocean Information Centre (INCOIS) Hyderabad. (Ministry of Earth Science, "Structure", n.d.)

These institutes are established to detect weather and atmosphere-related risks and hazards and deliver alerts across the nation pertaining to climatic updates, oceanic movements, hydrology, seismology, natural hazards and other phenomena of the earth (MoES, 2021). In addition to that, these institutions post weather-related news, and all the updates on their specialised official websites.

3.7.2. Early Warning Dissemination

After the successful management of cyclone Phailin in 2013 and Hudhud in 2014, the OSDMA intended to design a fool-proof communication network across the coastal districts to lessen the existing communication gaps between actors and the community. On July 9, 2016, the government of Odisha set up Early Warning Dissemination System (EWDS), which is an integrated network system that is connected to the State Emergency Operation Centre (SEOC), District Emergency Operation Centre (DEOC) and Block Emergency Operation Centre (BEOC) thereby exchanging information within the state, district, block and community or vice versa, so that the information could reach in local language to the vulnerable community (fishing community and inhabitants) living in the sea areas.

With the active engagement, help, and suggestion of World Bank, a total of 1205 villages in 22 blocks of 6 coastal districts of the state, known for multiple hydrological disasters (cyclone, tsunami, and flood), are now connected through the EWDS network. There are 122 siren towers installed within a 1.5 km radius of the coastline and operated at the control room of SEOC, DEOC and BEOC. In order to function in severe conditions and deliver early information to the fishing community and the last mile of community, multiple technologies are integrated into the EWDS network, such as satellite-based mobile data, Mass Messaging Service (MMS), Digital Mobile Radio (DMR), Ground Plane Antenna (GPA), Alert Tower Siren etc. Moreover, emphasising transparency in information and two-way communication, EWDS networks linked various community groups around the coastline areas. During Cyclone Titli, the EWDS network was first time used as an experiment basis to disseminate warning sirens to various locations in Gopalpur, and then used in subsequent cyclones.

3.7.3. Telecommunication Network

Development of telecommunication equipment and infrastructure coincided with disaster; when communication technology failed, the disaster losses reached the maximum. With the advent of telecommunication networks such as mobile connectivity, internet connection and social media play a critical role in disaster preparedness, risk reduction and information exchange during various phases of disaster.

In recent years, the telecommunication density has increased substantially over Odisha state. As per the latest report of the Department of Telecommunication (DoT) of the Government of India in January 2021, the total number of telephone users in Odisha has reached more than 34 million, and overall tele density remains at 77.38 per cent[11]. The TRAI's (Telecommunication Regulation Authority of India) report claimed that the total broadband internet connectivity in Odisha reached 25 million and total mobile connection reached 25.89 million (Updateodisha, 2021).

With the growth of telecommunication industries and smartphone connectivity, during an impending disaster, several weather forecasting, risk alerts, climate updates and emergency advisories are delivered in the mode of SMS, pictures, video clips and visual elements to a diverse range of users by the state disaster risk reduction cell. Moreover, the government of India and the state government of Odisha have designed a few mobile-based applications such as 'Weather & Radar Storm Radar', 'SAVE ODISHA from FANI CYCLONIC STORM'[12], 'Odisha Climate', 'Umang' etc. These apps are designed in order to facilitate weather updates and address any risk or hazards related queries. As Sudesh Sethy mentioned, "during Fani, more than three crore text

[11] https://dot.gov.in/sites/default/files/MTS%20January%202021.pdf
[12] Accessed from google Playstore

messages were sent to the secretaries and group head of several committee area-specific people (identified vulnerable zone) of Odisha for disaster preparedness and risk alerts" (Personal Interview).

3.7.4. Expansion of Media Houses

The media play a vital role in delivering early warning information and weather reports, identifying vulnerable people and uncovering various gaps during a crisis. Over the year, with the expansion of cable channels and satellite television, several regional, national and international news channels are now airing programs related to hazard updates and risk alerts in the state.

As per the latest development, there are ten major regional news channels, including public-private, and several national and international channels operating in cable TV and satellite television, broadcasting weather-related programmes. In the phase of a disaster, the regional news channel airs the latest updates, often telecasting live coverage of affected sites and press conferences of IMD officials. From the government of India, All India Radio and Doordarshan are airing disaster-related programmes on a priority basis. Moreover, at the hyper-local level, to deliver information to the most vulnerable community and reach the grassroots level, there are 20 community radio operating across the state. A few of them are Radio Konark, Radio Bulbul, Radio Baliapal, Radio Surabhi in Nayagarh, Radio Kisan Khurda, Radio Saurabh in Jagatsinghpur, Lok Bikas Jajpur, Bhabagrahi Kala Niketan Kendrapara, Youn, Alternative for Rural Movement in Balasore, Utkal Sevak Samaj in Cuttack[13]etc. which are established in disaster-prone areas.

[13]https://mib.gov.in/sites/default/files/List%20of%20operational%20CRS%20with%20valid%20GOPA%20as%20on%2001-06-2022.pdf

3.8. Conclusion

This overview has highlighted the background for studying of the role of ICTs in disaster situations. In the beginning, it stressed the existing field of academic research on the role of ICTs and several approaches used in the academic debate to understand what role ICTs play in the aspects of disaster response. This review, however, suggests that role of digital tools/platforms is embedded within a complex social system and takes shape with the growth and transformation of socio-political structure.

The above discussion advocates that there are interrelations between the social system and political structure of disaster. The relationship is not only in the system of social order but also in the design of the relationship of power between legitimate institutions and citizens. This review of the critical insights about the two case studies will form the base for situating the argument and analysis further in the following two chapters. The next chapters will discuss the case studies through an in-depth analysis of data gathered from the field related to the role of digital tools in mediated activity in an emergency context. In addition to that, the field insights suggest that following the 1999 super cyclone, the state has undergone a series of socio-political and infrastructural transformations, which is essential to dealing with vulnerabilities and future risks and hazards. Also, this review highlighted the super cyclone of 1999 as a juncture from where the disaster response process moved to a new direction, and all the systems and structures were integrated into a single thread to work with collaboration and cooperation citizen's end. The study of two cases will guide the relationship built by ICTs with citizens and disaster and individuals and institutional actors during an emergency response.

Chapter- 4

Mediation of Activity: The Role of ICTs in Disaster Response

As information and communication technologies (ICTs) are becoming more prevalent in disaster preparedness, mitigation, response and recovery, research efforts have also increased to study the use and impact of ICT tools during an emergency. By nature, ICTs refer to all the tools and services, including software and hardware that are used in human activity. The humans or individuals who have access to and use those tools or services are considered users. The popular research trends and approaches on ICTs merely emphasise the outcomes after the tools are used by the user. Also, to study the use and impact, a large body of research ignores or controls the key elements such as historical background and the socio-political aspects that support the smooth functioning of ICTs. In order to understand the user's activity in a specific environment, the previous chapter highlighted the different socio-political and infrastructural transformations that occurred in emergency response across Odisha.

This chapter discusses the role of ICT tools in the mediation of the relationship between the users and disaster. By following the conceptual framework of Cultural-Historical Activity Theory (CHAT), it could be understood as the modes of subject-to-object relationship and tool-mediated activities in an emergency context. The CHAT refers to the 'subject' as an individual or human or user, determining that there is a need or motive to reach the object. The subject moves toward achieving the object by using the tools (e.g., technology, training, conceptual ideas, and people). At the same time, the object refers to an intended outcome or attaining something meaningful. The primary goal of any activity is to produce an outcome (object), whether physical or mental. In that premises, it can be considered how people/human beings use various tools for emergency response or related activities towards disasters.

In that context, CHAT offers a pertinent framework introduced by Vygotsky and his followers. Some of the scholarly works argue that activity theory is a socio-cultural and historical lens through which the human activity system can be studied. The theory is a guide to understanding the interaction of human activity and human thought within a specific environment. Each activity is an output of interacting elements and their relationship to each other, which is mediated by multiple instruments, artefacts, division of labour, social groups, norms and regulations and exchange of products in a cultural set-up.

The current chapter analyses the case study of two separate cyclones, Titli and Fani, in order to understand how ICT tools can mediate disaster response. As analysed in the methodology chapter (See Chapter 2 for details), the data set presented here based on the empirical research carried out through onsite focus group discussions, in-depth interviews, insights from digital platforms and systematic note-taking and data gathered through interacting with associated actors and the community catered to by the ICT tools.

In both the case studies, the human-generated content, such as risk alerts, weather warnings and information dissemination, were mediated by different digital tools. These tools were used not only for content delivery but they also built a symmetric relationship between government actors and non-associated actors and volunteer actors and citizens. Also, different tools such as World Wide Web, mobile applications, social media platforms, and smart phones played multiple roles based on the context and time. In some cases, the tools may not help in engaging with any specific activity, but they motivate users to undertake a specific activity.

This chapter first gives an overview of the theoretical approach that endeavours to conceptualise mediated activity in the context of a disaster response. For the purpose of the theoretical analysis, this chapter cites various scholarly engagements on activity theory. The term

CHAT and Activity Theory (AT) are used interchangeably in the chapter by the researcher as the understanding about concepts such as subject, object, community, outcome, rules, and division of labour within activity systems is common in both theories. This section explains how these concepts have been used by various scholars to explain the human activity. First, it refers to the classic model or first generation of activity model of Vygotsky (1978), 'mediated action' which he initially proposed to explain the pedagogy of human learning. The analysis of case studies is also based on various scholarly insights on the 'mediation of activity' (Leontiev, 1978; Wertsch, 1985; Nardi, 1996; Yamagata-Lynch, 2010; Kaptelinin, 2014). Then it explains the second generation activity theory known as 'learning by expanding' proposed by Engeström (1987/2015) to know the collective form of human activity. The first generation of activity theory helps to understand the interaction of tools and human beings in the cyclonic storms Titli and Fani in Odisha. The second generation of activity theory is used to explore the relationship built between different actors, and discursive practices shared within various actors.

The second section briefly describes the functions of various digital tools as well as actors in the context of cyclones Titli and Fani. The first part sheds light on different tools and channels used for multiple purposes. It highlights popular tools such as the World Wide Web, mobile phones and social media-driven activities in the various phases of an emergency. In support of the arguments, it presents various quotes and references gathered from the field site. The second part discusses how the actors are engaged in multiple activities as negotiators, intermediaries and mediators, while few engagements are institutionally regulated, and a few are spontaneous. The chapter concludes by synthesising the two sections and pulling together the important points from them.

4.1. Theoretical Perspectives on Mediation of Activity

In the field of communication and media studies, the concept of mediation is linked to the early day's transmission, rituals, and mediational models. In *Complicity and Collusion in Mediation of Everyday Life*, Silverstone (2012), advocates that media technologies/tools occupy a distinctive space in our everyday life to the extent that "all communication involves mediation, mediation as a transformative process in which the meaningfulness and value of things are constructed" in the process institutionalised media (including traditional and modern) "involved in the general circulation of symbols in social life. The circulation no longer requires face to face communication, though it does not exclude it" (p. 1-2).

Following the conceptual framework of CHAT, the researcher draws on this mediation aspect to understand the role of ICT tools in the mediated relationship between the user and his/her environment. CHAT advocates that human activities and interactions are found within a complex environment that simultaneously grows locally and is mediated by historically constructed tools and practices. The tools can be differently perceived, ranging from machines, artefacts, and semiotic means (languages, genres, visual contents, or symbols etc.); and the practices are dynamic of power, a system of institution, history, and culture (Sam, 2012).

Activity Theory is an interdisciplinary approach, and its genesis is rooted in the scholarship of 18th century classical German philosophers Kant and Hegel's, 'dialectical materialism of Marx and the 'psychological development of Vygotsky' (Sam, 2012, p. 3). Russian psychologist Lev Semyonovich Vygotsky (1896-1934) is known as the pioneer of CHAT, whose work is called mediated action. He describes that human consciousness in a particular environment is mediated by culturally developed tools, artefacts and social others. The mediated action deals with the semiotic process that enables human consciousness development through the interaction with

artefacts in an environment, and individuals produce meaning out of the interactive process (Yamagata-Lynch, 2010). The artefacts can work as resources for the subject in the activity. Vygotsky represented human activity in a triangular shape, and it has three nodes; 'subject', 'tools', 'object'. He proposed that subjects denote individual, groups or community; tools/artefacts refer to machines, instruments or technologies; and object refers to carrying out an outcome, results, motivation, or problem solution (p. 16). Thus, the subject uses tools/artefacts to gain meaning.

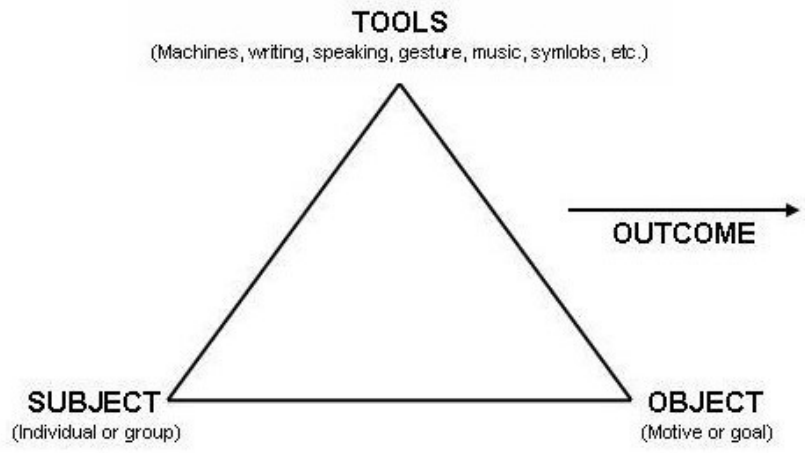

Figure. 4.1 *The process of human mediation activity (Source: Vygotsky, 1978)*

In this model, the subject is motivated to work towards an object deploying in different artefacts or tools. As per him, tools can be technological as well as psychological. The focus of the activity theory is to gain an outcome, whether physical or material; it depends upon the context.

Vygotsky's student who worked closely with him, Leontiev (1978), shifted the emphasis from the mediation of higher cognitive functions to the role of tools in explicit mediation as part of the relationship between the individual and the environment. For him, activity is "the purposeful interaction of active subjects with the objective world (i.e., the 'S ↔ O' interaction), rather than

on higher mental functions and their ontogenetic development" (Kaptelinin, 2014, p. 207-208). Kaptelinin outlines Leontiev's concept of mediation as follows:

> Tool mediation shapes the entire structure of meaningful, purposeful activities. Over time, some external components of an activity can be translated into the internal plane through internalisation to ensure efficiency, and, as a result, transform a person's mental processes. (Kaptelinin, 2014, p. 208)

Yamagata-Lynch (2010) explains the text of Leontiev. She defines human activity "as the unit of analysis that is distributed among multiple individuals and objects in the environment" (2010, p. 20). For Kaptelinin and Nardi (2006), "activity is proposed a basic unit of analysis" which is a way to understand both subject and object; it cannot be understood by focusing on each separately (pp. 32). Sam (2012) proposed activity theory helps to understand the nexus between people, technology, and online life. He argued that in the activity theory, tools play two distinctive roles. First, they help to attain a specific goal, for example using text to communicate with others. The second function is the "accumulation and transmission of social knowledge" that changes and is changed by individual activity (p. 85).

Yamagata-Lynch (2010) elucidates Vygotsky's work on mediated action in the development of human psychology. She says the concept of mediated action deals with the "semiotic process that enables human consciousness development through interaction with artefacts, tools and social others in an environment and result in individuals to find new meanings in their world" (p. 16). According to her, the relationship between artefacts, tools and social others is not static; rather, it forms a new meaning over a context and time. Wertsch (1985) explains that interaction, in which humans participate, allows opportunities for mediated action that facilitates

the social formation of their consciousness. Yamagata-Lynch (2010, cited as Scribner, 1997, p. 16), describes that humans do not simply act as "passive participants waiting for the environment to instigate meaning-making process for them", rather, individuals make sense of their world by interactions when they alter and change activities that entirely transform the nature of artefacts, tools, and humans in their surroundings.

Vygotsky's model of tringle was reconstructed by his followers Engeström (1987/2015), into 'learning by expanding'. Blunden (2015) interpreted Engeström's concept and pointed out this tringle model stood for the activity of the social animal. He said that 'individuals' relationship to their environment is mediated by their community.' His model signifies a three-way relationship of 'mutual mediation.' At one node, the "community's relationship with its environment is mediated by individuals", and then in the other node "individuals' relationship with their community is mediated by the environment" (p. 1). Engeström's analytical framework extended towards the notion of 'collective activity' focusing on the analysis of "joint activity or practice and activity system" are seen as "systems of collaborative human practice" (p. 30).

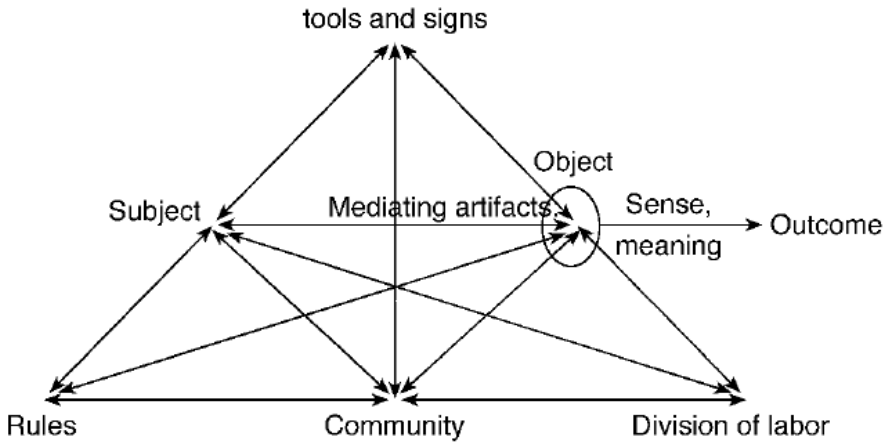

Figure 4.2 *The process of human activity system (Source: Engeström, 1987)*

In the above model the upper components of tringle are similar to Vygotsky's triangular model of mediation that is subject, tools and object. Although the proposed model of Engeström is the extended version of Vygotsky, he emphasised on a collective form of "external activity as activity systems mediated by tools". In this analytical framework, three new elements were added such as 'rules,' 'community' and 'division of labour' (Blunden, 2015, p. 1). Blunden summarised CHAT model of Engeström as:

> Activity Theory has a strong candidate for such a unit of analysis, in the concept of object-oriented, collective, and culturally mediated human activity, or activity system (Engeström 1999, p. 9). The subject refers to the individual or sub-group whose agency is chosen as the point of view in the analysis. The object refers to the 'raw material' or 'problem space' at which the activity is directed and which is moulded and transformed into outcomes. (Blunden, 2015, p. 5)

The added elements in Engeström model, 'community' refers to a social group or larger environment that a subject/individual belongs to and shares a common object. The 'rules' refers to a range of formal or informal regulations that are shared by the community and that often influence the activity system. The rules can be explicit such as laws, or implicit such as habits or norms. The 'division of labour' denotes how the works/tasks are mutually shared, either within themselves or with the rest of the community (Sam, 2012).

However, growing literature related to activity theory added several elements and concepts in the model based on the contextual set-up and environment that can affect the outcome. Star (2010) proposed a concept called 'boundary of object' as a type of "arrangement that allows different groups to work together with consensus" (p. 602). However, the shape that this might take are not random. They are basically 'organic infrastructures' that have developed in response

to what Griesemer and Star termed ‘information demands’ in 1989 (p. 602). Later he adds a new concept called ‘information and work requirements’ as perceived locally and by groups who wish to take part. He defines ‘work’ as a complete system or continuum where human cooperation and serious endeavour are reflected. For him, what is relevant for ‘boundary objects’ is how practice structures and language evolved for doing things in a shared space with mutual consent.

In the beginning, during the 90s, the activity theory was conceptualised to understand development psychology, learning theories and organisational activities, but in popular research, the theory has widely been used to study information systems and human-computer interaction (HCI). In his doctoral work, Asmolov (2016) conceptualised ICTs as mediating artefacts that have dual positions. First, following Silverstone’s ‘double articulation’, he says it is both a material object and symbolic tool. Secondly, it can function as “psychological tools that mediate cognitive functions or as material tools that mediate external forms of object-oriented activity” (p. 69).

Nardi (1996), in her book *Context and consciousness: Relating to activity theory and human-computer interaction*, advocates activity theory is meaningfully related to HCI research and specifically when difficult to comprehend and analyse ‘context’ ‘situation’, ‘practice’ of how technologies are used by human beings (p. 4). Kaptelinin (1996) mentions that the research field has broadened to understand ICTs from the lens of activity theory since “the only way to come to an adequate understanding of human-computer interaction is to reconstruct the overall activity of computer use” (p. 56). When it comes to activities that would be impossible without ICTs, Kuutti (1996) argues that they “can be the principal enabler for an activity” (p. 35). Kaptelinin (2014) proposes a comprehensive view of the mediational perspective on digital technologies. He says “technology is considered as mediating means that affects, and even shapes, the structure, the functioning and development of human mind and action” (p. 203). For Crawford and Hasan

(2006), activity theory is pertinent to examine the quick shift in 'socio-technical' systems where all the elements such "people, their purposes (objects) and their tools are in a process of rapid and constant change" (pp. 66).

Some studies suggest that CHAT is directly associated with the development of new ICT-mediated forms of activity (Asmolov, 2016). As mentioned by Kuutti (1996), CHAT helps us to understand the crux of development and fundamental aspects of human activity. He pointed out it is equally important while trying to understand the development process at an individual level as well as organisation level; also, it advocates the development of new tool design.

Activity theory is often used in an educational context to explain what role ICTs play; scholars explored how learning activities occur in the online platform. Nyoni (2013) suggests it is pertinent to 'development of online learning system', Heo and Lee (2013) elucidate the role of 'blogs or social network in learning' while others have explored activities around networked organisations relying on ICTs and technologies (Foot, 2001; Er & Lawrence, 2011). In this context, various ICT tools are mediating relationships between the subject and the object, and that can be found within a particular activity system. While advocating the characteristics of CHAT, Foot (2001) sees it as 'practice theory' culminating in insights that help to improve systems.

Based on the discussion, CHAT has provided a conceptual framework to explain the organisational structure of emergency response, interaction between officials and community and role of technologies in the disaster response. The activities around an emergency are evolving into a complex structure. In accordance with the data gathered from Odisha, context was emphasised on selected disaster events to decipher multiple characteristics of tools and actors within a particular situation, as well as examine the array of mediated activities of humans. While pointing

out various ranges of activities, it exceeded beyond these events and analysed longitudinal usage of tools around several other forms of emergencies. Considering the ideas of scholars discussed above, the chapter analyses the subject-object activity, tool/platform-mediated activity, and division of labour in an emergency system. Many such activities are discussed here at length following the core characteristics of activity theory to reflect the complex process of subject-object interface during the two cases of cyclone turned disaster.

4.2. Tools Mediated Activity in Emergency Management in Odisha

The aim of emergency management is to 'mitigate the risk' and 'risk avoidance.' Risk refers to a diverse range of elements and issues, and while dealing with risk, different sets of actors and institutions are involved in it. A wide range of factors and situations are involved in emergency management, and the area of engagement is extensive and broad. Since the emergency is related to the safety and security of everyone's daily life, the management abilities and functions should be integrated into daily decisions instead of episodically engaged or called at the time of the disaster. In contemporary characteristics, emergency management is associated with four major steps such as mitigation, preparedness, response, and recovery. Hence, an immediate step in an impending disaster is to map the risk and channelise risk information within the government structure and citizens, and take the immediate steps to confront the risk. This section seeks to investigate the role of digital platform in risk mapping and risk warning activities in two consecutive disasters, Fani and Titli.

4.2.1. Role of the World Wide Web in Cyclone Response

Information and communication technology have had the greatest impact on society in the last 50 years. Digital technology permeates every social process and activity system. It not only

laid the groundwork for the World Wide Web and its offshoots but also built a new network of communication systems around the world (Ruckriem, 2009).

In India, various organisations are functioning under the Ministry of Earth Sciences, including Indian Metrological Department (IMD) (mentioned in chapter 3). They closely observe the risk, hazards, ocean movements, hydrology, seismology, and the movement of earth as an activity of risk mapping. The major function of these institutions is to deploy advanced communication technologies and machine to detect climate-related risks and hazards, and also share crucial information (maps and climate database) with government officials as well as upload it to official websites for citizen's knowledge/queries. The official web page of IMD (https://mausam.imd.gov.in/) is one of the prime websites of the government of India where all the climate-related information and data are made available. It is considered a prominent public information portal and risk mapping institution.

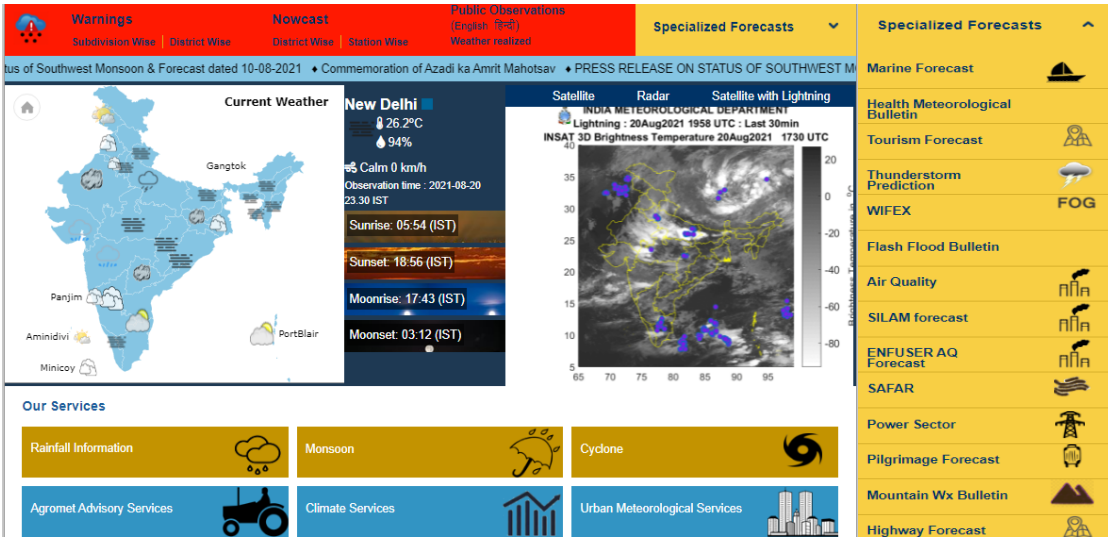

Figure. 4.3 *(a) homepage of IMD portal. (b) Special forecast link (Source: IMD Govt of India)*

The IMD homepage (as shown in figure- 4.3) features all the crucial information and imageries related to earth. The director of IMD Bhubaneswar branch Habibur R. Biswas said:

> IMD website is an authentic, official page of the Government of India, which keeps observing climatic and atmospheric movement round the clock, and uploads real time information and updated imageries on a priority basis. The database, including maps, images, and bulletins shared on the page, is verified by a team of expert scientific communities and presented in simple languages that any citizen can easily understand (Interview, Bhubaneswar).

The information presented here, according to categories available on the official site, such as major services (seasonal, climatic and risk and hazard), current weather, maps (satellite, radar and satellite with lightning), forecasts, and current weather, is from across major cities of India. The 'warning' bar appears on the top of the page and is linked to all weather-related warnings in districts and subdivisions. The next bar, 'nowcast', represents the nowcast-warnings database of districts and stations. The 'public observation', on the top of the page is linked to all climate monitoring databases in 14 major Indian languages. Moreover, a separate column appears at the right corner of the main page as "specialised forecasts"; in this section, 14 rows, each contains an internal link to specific types of forecasts, including air quality, highway forecast, marine forecast, tourism forecast, pilgrim forecast, thunderstorm forecast, etc. While mentioning the forecasting patterns Mr. Biswas explained:

> We study world databases while making weather reports, and based on that, prepare forecasting for Odisha. Every day between 10.30 am to 1.30 pm, all members of the regional team virtually join for the preparation of daily forecasting and weather bulletins for their respective zones, and all the observations, such as temperature, humidity, wind speed and pressure are meticulously studied. However, in case of precarious situations such as a severe cyclonic storm or tsunami, we regularly keep in touch with the scientific team

> and experts. Meteorology functions like a medical science system, before taking a decision or prescribing medicine to a patient in adverse situations they confer or seek suggestions from other experts. In the same way meteorology department functions. All the meteorologists are like doctors, during the meeting they closely see inputs of all the scientific experts, and in adverse climatic conditions we seek suggestions from others. Medical surgeons are dealing with separate parts of body and diseases, likewise we also have specialist in different areas as like thunderstorm, cloudburst, cyclone etc. (Interview, Bhubaneswar).

Another notable feature of the web portal is the uploaded 'press release'. On the front page, the latest press release crawls on a priority basis. The press releases generally consist of information for all Indian states regarding the current risk and hazards, rainfall measurements, thunderstorm and cyclone warnings, climate maps, wind speed etc. Moreover, the website keeps updating information about yearly climatic information, atmospheric or surface reports, publications and journals. It also provides links that allow users to access other external websites. Invariably, the information uploaded in the IMD portal becomes a major source of information for the media organisations to air weather-related update.

This website plays the role of 'aggregator' where experts-generated content about the weather, risk, hazards, and earth surface database are displayed for the use of citizens.

Likewise, during other climate-related risks, such as an impending cyclonic storm, the IMD features all the maps, press releases, satellite imageries and relevant information on the website. Also, it has a separate link called 'cyclone' where the upcoming and previous cyclone databases are stored. On April 18, 2019, a press release was uploaded on the IMD website that mentioned a low pressure had formed on the coast of the Bay of Bengal and adjoining the

equatorial Indian Ocean which would be intensified into a cyclonic storm between April 25 and May 2, 2019. The earlier date was shuffled later and made landfall on May 5, 2019. In the lifespan of cyclone Fani, it changed track, speed, and predicted landfall areas several times (details mentioned in chapter- 2). The first official confirmation of cyclone Fani came 15 days (about two weeks) before landfall. The IMD started uploading the satellite imagery or visual content of INSAT-3D images and Doppler images from different stations on the eastern coast (Paradeep and Gopalpur of Odisha; Machilipatnam and Visakhapatnam of Andhra Pradesh – A.P.; and Kolkata of West Bengal - W.B.). The page also featured visual clips of the moving directions of the cyclone wave (mentioning the time and date to be moved) and the predicted area to make the landfall.

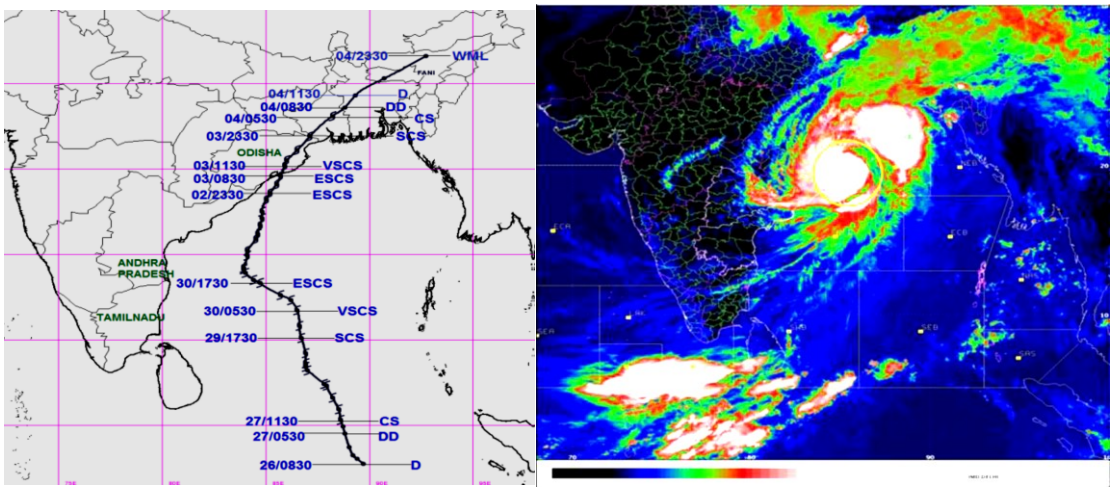

Figure-4.4 *(a) Observed track of ESCS Fani over east EOI and adjoining southeast BoB, DT: April 26, 2019. (b) INSAT-3D imageries of DRW Paradeep during landfall on May 5th 2019 (Source. IMD, Govt. of India)*

In the case of cyclonic storm 'Titli', the IMD predicted the formation of low pressure over the Bay of Bengal. First, the IMD shared a press release of risk alert on the website and internally communicated to other official departments, mostly through email and WhatsApp messages. Then it continuously monitored and updated to others about the changing directions, possibilities of landfall and expected gale seed.

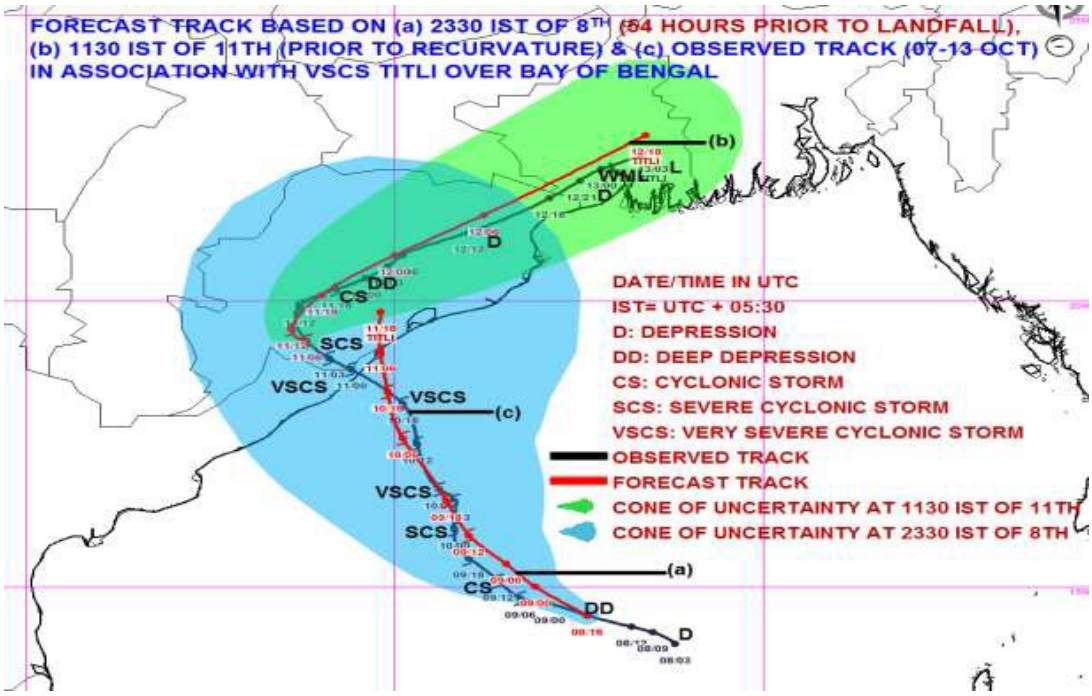

Figure 4.5 *Forecast track of Cyclone Titli on October 8th 2018 (Source- IMD, Govt. of India)*

The idea behind the sharing of risk alerts and weather bulletin is to create a vivid image among the government office holders, media organisations, humanitarian agencies and citizens about the impending emergency. The information indicates all to stay alert for further announcements and take adequate measures in the case of an emergency. And the risk alerts/warnings motivate the state's institutions to act on and assist in deploying state machinery and logistics to the expected destinations.

Moreover, Mr. Biswas said that as a legitimised institution, their responsibility is to make information authentic and scientifically justified in order to support the activity of government institutions. He underlined, "the IMD have different types of signals and coded languages through which risk alerts or emergency signals are communicated with different organisations e.g., aviation, port authority and railways." In order to make citizens alert about the cyclonic storm,

four types of alerts, categorising the intensity, 'red' ', yellow', 'orange' and 'green', were communicated through the IMD website. Mr. Biswas added:

> The 'red alerts' denote remaining extra vigilant, keeping up-to-date with latest forecast and obeying orders given by the government officials and being prepared for extraordinary measures. The orange and yellow alerts refer to remaining vigilant and being aware respectively for further updates. While green alerts indicate no severe weather expected (Interview, Bhubaneswar).

The risk alerts, especially red and orange, assisted citizens in remaining extra vigilant during Titli days. The database presented on the website triggered internet users to stay updated and let others know about the event.

Cyclone 'Titli' was likely to be intensified into a Very Severe Cyclonic Storm (VSCS); before 24 hours of landfall. The IMD, in a special bulletin, issued different risk alerts to several districts of Odisha, Andhra Pradesh, and West Bengal. Since it was moving north-eastwards, the red warning (heavy to very heavy rain) was issued for adjoining border districts such as Boud, Kandhamal, and Dhenkanal in Odisha and the Kalingapatnam region of Andhra Pradesh. At the same time, orange alerts (heavy rainfall) were forecasted for several coastal districts of Odisha, such as Ganjam, Gajapati, Nayagarh, Puri, Jagatsingphur, Kendrapara, Bhadrak, Jajpur, Balasore, Cuttack and Bhadrak. In cyclone Fani, the IMD issued red alerts to the coastal districts of Tamil Nadu, Kerala, Puducherry and Odisha state. In Odisha, a red alert was issued for 17 coastal districts such as Gajapati, Ganjam, Puri, Khurda, Nayagarh, Cuttack, Jagatsinghpur, Jajpur, Bhadrak, Kendrapara, Balasore, Kandhamal, Rayagada, Angul, Dhenkanal, Keonjhar and Mayurbhanj, while Puri, Rayagada, Khurda and Kandhamal were kept in orange alert zone.

The platform is a facilitator of an online database related to any form of natural calamities and disasters. The database is prepared by an expert scientific team relying on multiple mathematical logic, automated climate monitoring supercomputers and the latest applications. Their main functions are media monitoring, aggregation, and verification of the database about the cyclone. The idea behind clubbing information together is to remain updated on what is happening around.

According to Mr. Biswas the imageries and maps supported horizontal communication between other governmental officials and media organisations, which also worked as moderators to manage information in the phase of an emergency. Mr. Biswas said:

> Apart from various types of nowcasting and warnings, we also prepare and upload different types of short-term and long-term bulletins depending upon the needs, i.e., three-hour bulletin (prepared during an emergency), daily bulletin, weekly bulletin, extended bulletin and long-days bulletin (Interview, Bhubaneswar).

Another platform is the official webpage of the Odisha State Disaster Management Authority (OSDMA), designed by the Government of Odisha. The website offers an online database dedicated to all the disaster management services and citizens' inquiries/needs. The officials of OSDMA closely observe the weather forecasting of IMD, and also the forecasting of two major internationally reputed organisations called 'Regional Integrated Multi-Hazard Early Warning System' for Africa and Asia (RIMES) and 'Earth Networks' (Automate Weather-Influenced Decision and Real time Alerting Anywhere in the world). After the close study of the weather forecasting of these three separate portals, the OSDMA team prepares their own forecasting. Laxminarayan Sethy, coordinator of OSDMA specified:

> The OSDMA made collaboration with the RIMES of Thailand and Earth Network of the USA for monitoring climate-related updates. Sometimes the risk and hazard forecasting of separate institutions tend to fluctuate in terms of the time and exact geographical location of occurrence. Therefore, to eliminate the possibilities of error and make sources of information more reliable, we prepare our own forecasting which is considered for the state's disaster response (Interview, Bhubaneswar).

The OSDMA website also plays the role of an aggregator at the state level of the officially generated content about all the disaster-related information and services. After generating insights from various sites, they prepare a master information list and share within the departments such as district collectors, block offices and lower levels. Laxminarayan explained that the major features of OSDMA during any form of disaster or cyclone is to upload risk alerts, predict risk zones, facilitate preparation, arrange emergency cell and issue caution instructions on the website. This website also became a major source of information during the COVID-19 pandemic. All updates related to the total affected people, total deaths, arrangement of hospitals, government officials' press briefing and important queries and guidelines were regularly updated on the page.

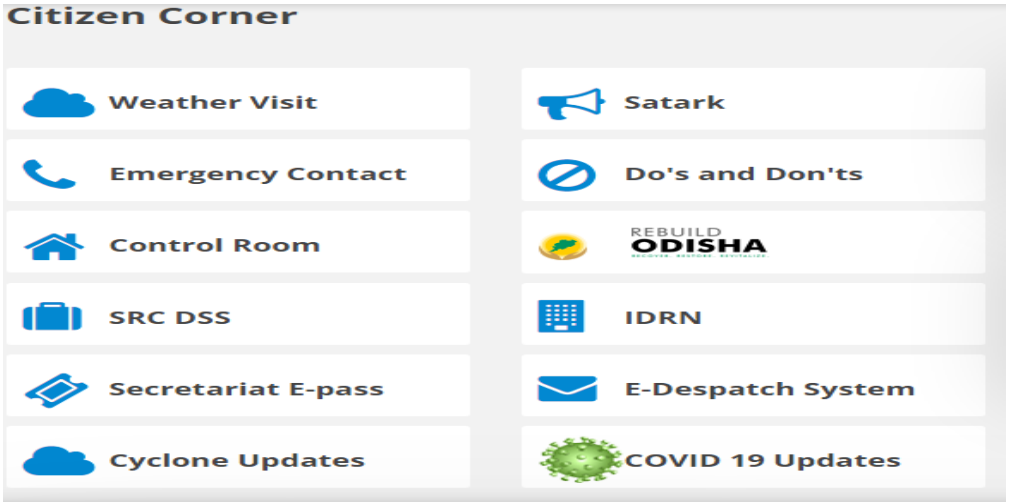

Figure. 4.6 *Important services of OSDMA (Source, OSDMA, Govt. of Odisha)*

According to Sudesh Sethy, state coordinator of OSDMA, during the cyclones Titli and Fani, all the information related to cyclone alerts, preparations were taken up by the authority, and the dos and don'ts instructions were posted on the official page of OSDMA (www.osdma.org). He said, "We got an emergency alert from the official website of IMD five days prior to cyclone Fani making landfall" (Interview, Bhubaneswar). Hence, as a normative function of the state, all the risk alerts and preparation activities were communicated through the official websites. The posts and imageries became a reliable source of information for local journalists, state coordinators and citizens to know about the latest development of emergency and remain attentive. Sanjiv, a journalist from ETV who voluntarily took part in the rescue and evacuation process during cyclone Fani in Bhubaneswar informed:

> We regularly attend the IMD Director's press conferences at the regional office. However, at the time of Fani, the OSDMA's official website provided us with in-depth information about what was happening around us and important initiatives taken by the government, such as the availability of shelter houses, deployment of armed personnel, public safety initiatives, and emergency contact numbers for citizens' help (Interview, Bhubaneswar).

Apart from field observations, the data gathered through internet surfing suggests that the Regional Specialised Meteorological Centre (RSMC) for tropical cyclones over the north Indian Ocean of Government of India is one the most prominent sources of information for cyclones. This is an open platform/site that offers a cyclone monitoring database, including satellite imageries, cyclone warning graphics and several other information regarding cyclones.

There are many such institutions available in the Indian continent which are monitoring natural calamities and inform about risks or hazards. Most of the institutions are interlinked with each other's work as a 'network of networks', and it enables a consortium of government officials

and scientific communities to deliver adequate services to the citizens. As indications suggest, the official sites of the above-mentioned webpages are considered tools and platforms that complement each other for delivering emergency preparedness.

4.2.2. Mobile Phone and Mediation in Cyclone Titli

The advancement of mobile technology has resulted in a new set of activities in human life. Communication relationships and social interaction, along with the technology transition, have led to new ways of performing activities. Human communication, such as sharing thoughts, information, ideas, and social practices, is mediated by mobile phones. Looking in this way, the usage of mobile phones in human life does not stick to the portability of the device but rather the fact that the "user becomes a mobile terminus for mediated communicative interaction across the various contexts of daily life" (Helles, 2013, p. 14).

The activity about cyclone 'Titli' is quite distinct in comparison to cyclone Fani. Since it struck the political boundary of Odisha and Andhra Pradesh, the diversity of language, distance location and unavailability of adequate infrastructure made it difficult for all information facilitated by the state government to reach out. The citizens' interaction with emergency and activity during a crisis situation is mediated by mobile phones and other services of mobile phone, such as call over mobile, SMS and WhatsApp. Although the mobile phone didn't play a specific role in emergency response to begin with, but it allowed citizens to do specific activities. These activities started to gain momentum, including the generation of content, dissemination of information, resource mobilisation, and storing data for further reference.

While Fani was approaching the Bay of Bengal coast, as a function of the mass alert system and citizens' communication rights, several risk alerts or emergency warnings were sent by both

Odisha and Andhra Pradesh states to their respective vulnerable locations. On a priority basis, the risk warnings were communicated to the fishing communities and people living in low-line areas. During a casual interaction, the fishing communities in Pallisarathi area of Andhra Pradesh said "we got several risk alerts from government sources and the port authority of Visakhapatnam not to venture into the sea." As a result, prior to one day of cyclone strike, they left for their native home Visakhapatnam. They also added, "now-a-days Jio network is found up to 4-5 kilometres radius from the coast, so we got several calls from fellow community and relatives regarding cyclone Titli."

Some of the specific locations of Odisha are marked as the most vulnerable zones for cyclone-turned disasters. Earlier, most of the severe cyclones, 1999 super cyclone, Phailin and Hudhud battered through particular areas such as in the East, Balasore, Kendrapada, Puri, Cuttack, Jagatsinghpur, Khurda and Bhadrak and in the West Ganjam specially Chatrapur and Gopalpur areas. Hence, most of the infrastructural arrangements and stimulation of social capital are confined to those areas. In the impending cyclonic storm Titli, most of the preparedness and states' machinery was deployed in those locations because of the past records of measurements.

The Gajapati district is situated on the borders of Odisha and Andhra Pradesh, whereas most of the cyclones hit either the Ganjam region of Odisha or the Visakhapatnam region of Andhra Pradesh. The initial measurements indicated that it would have made landfall in between Gopalpur and Kalingapatnam areas, hence, most of the preparations were carried out, particularly on those areas. However, the places where actual severity and damages were documented, such as the Gajapati district and bordering sections of Andhra Pradesh, were not on the government's bucket list for preparedness, rescue, and response. For the first time in Fani, the residents of the

affected areas felt the gale and the storm's fury. A 48-year-old survivor name J. Bhaskara of Totagumda village of Parlakhemundi block of Gajapati district mentioned:

> Although we heard a couple of stories from our parents about *Batya* (a severe storm), at my age, it was the first time we had experienced a cyclone's fury. We have learned from various sources, such as public announcements, news channels, and people's conversations, that Batya is moving toward the direction of the Odisha-Andhra coast. Still, we didn't expect it to reach us. Previously, we had experienced high-speed winds and heavy rainfall during cyclone Phailin, but it was not as severe or destructive as Titli (Focus Group Discussion-FGD).

Nevertheless, in the pursuant of citizens' awareness, several public announcements were made through 'megaphone' by the district collector's office. Moreover, risk alerts, indicating high-speed wind, and red and orange alerts were disseminated in many vulnerable parts of Odisha through several communication channels, including SMS services.

At the last moment, the wave slightly changed its direction and battered through Gajapati and Palasa regions, which severely damaged electric poles and mobile communication networks first. While narrating the live visuals, P. Mohan Rao, resident of Totagumda village said:

> Heavy rainfall increased the water level at the adjoining river of our village, and later it flooded crop lands, and major roads connecting to the district head office and other villages went under water. Then flood water started heading towards village areas the next day. Looking at the furious nature of floodwater, we rescued our elder parents, and children to the safe places and brought all the livestock to the nearest hilltops. At that time no mobile

networks were functioning in our areas, we had to survive next couple of days without electricity (FGD).

According to P. Rajesh, ward member of Totagumda village, “While the gale reached to its peak, the electricity and mobile network was abruptly disrupted. Although private mobile network was restored in the next few days but public network, such as BSNL took a couple of days to work” (FGD). After the mobile network was restored, most of the communication was relying on mobile phones.

The villages remained disconnected from the district administration for the next few days. The people were trying to contact the district collector and local elected representatives but were unable to connect to them. As a result, discontent rose among the people and they captured all the live visuals and photographs related to flood and devastation on their mobile phones. Mr. Rajesh added:

> I have forwarded all the videos and photos to the district collector and local political representatives via WhatsApp to express our grief. After the messages were delivered, I checked two blue check marks, which meant that both had been received. After receiving those inputs, the next day, a rescue team reached here to clean roads and garbage.

Since the electricity was entirely disrupted, people arranged alternative power modes for charging their mobile phones, such as solar panels and generators, and installed manual chargers on their bikes. During the field visit to Totagumda village, a few cases were noticed where manual chargers were installed on the bikes. As P. Sirunjala, a resident of Totagumda village, informed, “Since we were not able to watch television, we had to keep on using our mobile phones to access the news and contact our extended family members” (FGD).

People in the Pallisarathi region, where cyclone Titli made landfall, locked themselves inside their respective homes after seeing the fierceness of the storm. Many people, especially those who were staying in kutcha houses, took shelter in their neighbours' houses. During those days, the whole region was completely detached from the mainstream. As mentioned by D. Narayan Rao, a government employee posted in Assam, who had come to his native place on vacation, "My children were studying outside, and my colleagues were trying to contact me after seeing the news on television. We were completely disconnected from rest of the world because no mobile network was functional at that time" (FGD). As soon as mobile phone service was restored after three days, he received several voice calls and video calls from his family and co-workers asking if they were safe and inquiring about their current status. He added, "We could not watch television because there was no electricity in this region. Hence, our mobile phones became the only medium to get updated with the latest information about the aid and relief packages declared by the government for disaster survivors."

In the post-Titli scenario, several rescue and relief drives were operated by the government of Andhra Pradesh in the Palasa Mandal of Srikakulam district. During relief distribution, WhatsApp played a mediator role between government officials and rescue and relief teams. The WhatsApp groups were used to increase transparency and primarily to track the activity of rescue and relief teams.

As an immediate aftermath of cyclone Titli, several search and rescue teams and volunteer groups were deployed to evacuate people from hazardous zones and instant relief materials were distributed to the evacuees. All the assigned teams were added to different WhatsApp groups based on their location of engagement, and each group was monitored by a Mandal officer. The workers assigned by the officials were instructed to upload images and videos to their respective groups

related to activities carried out in the field, such as the delivery of relief materials, rescue efforts, and food delivery. The central intention of the WhatsApp group was to work in collaboration and to keep the higher officials updated about the rescue and relief activities. The Mandal Parishad Development Officer of Palasa, Mr. T. Kalyana Chakravarty, showed a few WhatsApp groups created during the crisis, in which several photos and videos were exchanged by assigned officials. Mr. Chakravarty said, "These groups were also used to convey higher authorities' messages to rescue and relief teams" (Interview, Palasa, AP).

4.2.3. Cyclone Fani in Disaster-prone Areas

Another more powerful storm 'Fani', after seven months of cyclone Titli, struck on the eastern coastal region, including three major cities of Odisha, Puri, Cuttack and Bhubaneswar. In response to Fani, using the SMS geofencing method, millions of risk alerts were sent to mobile users in the east zone (Cuttack, Puri, Kendrapara, Balasore, Bhadrak, Jagatshingpur, Khurda and Bhadrak). SMS geofencing allows for sending of text messages to users in a specific geographical area.

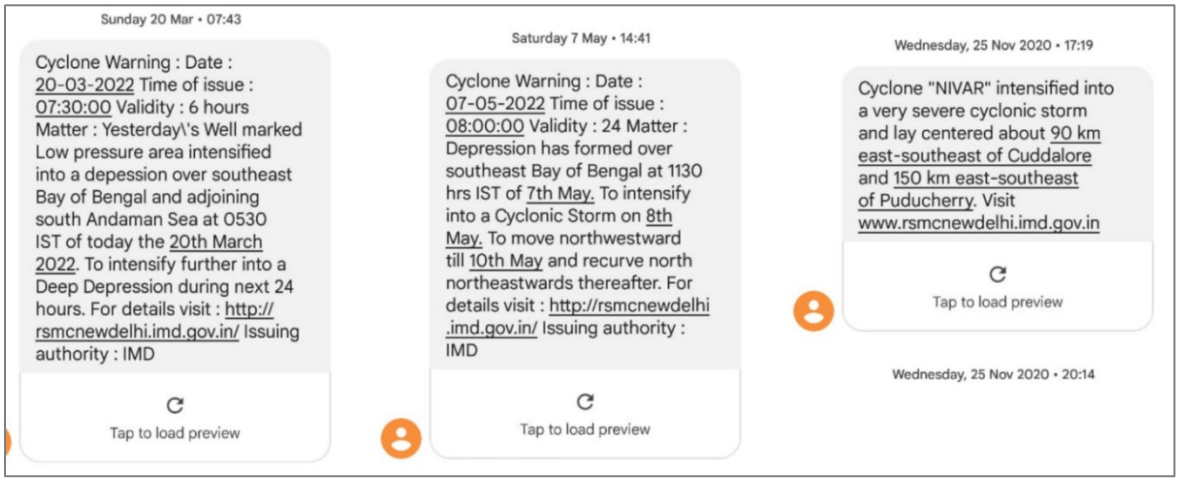

Figure. 4.7 *SMS based cyclone alerts. (Source: India Today)*

Figure 4.7 illustrates the length of messages and how frequently it was sent to the users. On several occasions of impeding emergency, the government of Odisha send risk alerts or pushed notification to all the mobile users of risk zones as well as moderate risk zones. The SMS alerts generally consist of 100-200 characters, indicating information related to the risk warnings/signals, district helpline number, preparedness guidelines and other instructions.

According to Laxminarayan, an official of OSDMA "Two types of messages were sent during cyclone Fani as warning alerts and relief alerts – generalised content for risk alerts and customised content during relief distribution" (Interview, Bhubaneswar). Several rescue and relief operations were carried out at various parts in Puri, Khurda and Cuttack districts, hence, SMS were sent mentioning the areas and date of relief distribution and process of beneficiary registration. Also several push notifications were sent regarding the maintenance of adequate behaviour during an emergency. He also added, "The SMS are mostly sent in regional Odia languages, and in some cases in English focusing on the diversity of users."

According to Madhusudhan Mishra, OTV reporter of Puri town, they got an SMS from the government of Odisha regarding the risk warning of cyclone Fani on May 2, 2019. Following the risk warnings from the government sources, in coordination with the district collector, the local police had given high alerts to the citizens of Puri district, especially, requesting tourists to evacuate the hotel/city as soon as possible. Madhusudan said:

> Puri is known as the land of Jagannath. During the month of May, thousands of devotees come to this place to visit Lord Jagannath. Also, many gather here to visit Puri sea beach and the Sun Temple of Konark. Hence, on a priority basis, all the hotels were vacated first, and devotees and tourists were sent to their respective destinations (FGD).

Before the evacuation of tourists from several places of Puri, many SMS-based risk alerts had been sent to their mobile numbers regarding cyclone 'Fani' from the Special Relief Commissioner, Government of Odisha.

The community-based volunteers such as Apada Mitra Group (AMG) (meaning 'friends during disasters'), Cyclone/Flood Shelter Management Committees CSMC/FSMC and Village Disaster Management Committees were instructed by their respective area officers to spread risk information at the community level. The alert messages allowed to fill the information vacuum and establish connections between top government officials and volunteers at the margins. According to Biranchi Narayan, member of AMG, the purpose of the information was to inform people about the upcoming cyclonic storm and take adequate measures to their own level: "We were instructed to inform the most vulnerable people and sensitise them to cope with *Batya* Fani" (FGD).

Risk alerts and weather forecasts are becoming crucial elements to knowing about emergencies and building consciousness among the young masses. It not only helps them learn about upcoming risks or hazards but also motivates them to inform other family members or neighbours to take adequate measures close to an emergency. In an interaction with the researcher, Raj Kishore Swain, a graduation final year student of Pipli block of Puri district mentioned:

> I got a message two days before cyclone Fani from the Government of Odisha, mentioning that cyclone Fani would make landfall in the Puri district. When I got the Fani warning, after locking my educational certificates and essential documents in a small trunk, I passed it to my friend's house. My parents witnessed the 1999 super cyclone and narrated the fury through storytelling. The Red Cross Society trained us on how to protect ourselves during

an emergency. Hence, all the instances helped me to take preparatory measures (Conversation, Pipili).

Another student Sudeepta Nayak, "These days, the home screen of Android mobile phones displays all weather-related information for a specific geographic location, including temperature, rain, and thunderstorms. Hence, that information is quite helpful to know about weather-related information and remain alert" (Conversation, Puri).

In a recent development, in addition to the SMS-based alert system, the WhatsApp-based alert message system was started by the government of Odisha. During Fani, many WhatsApp messages containing visual content and text were sent to thousands of smartphone users by the government of Odisha, urging people to take precautionary steps and follow different protocols during an emergency. As per Laxminarayan, an official of OSDMA, this function has been added to the disaster preparedness system to update citizens with the latest information and deliver visual content to them. He also explained, "When it comes to SMS or push notification, people sometimes ignore the message or delete it before reading. Hence, the platform (such as WhatsApp) messages are more appealing and more convincing" (Interview, Bhubaneswar).

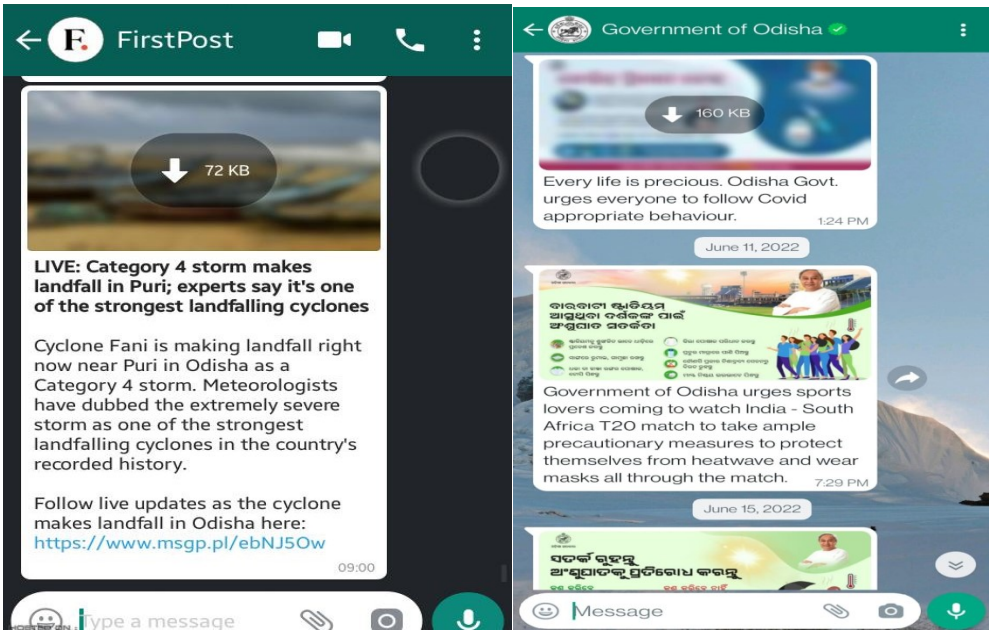

Figure 4.8 *WhatsApp-based risk alerts (Source: OSDMA)*

According to Subrat Kumar Mohanty, district coordinator, OSDMA, Ganjam district, at every cluster level, many community-based organisations (such as Village Disaster Management Committees, Flood Shelter Management Committees, and Cyclone Shelter Management Committees) are trained in response to any form of emergency. In order to work in collaboration and have transparent communication, several WhatsApp groups were created based on particular areas, and all the stakeholders, such as government officials, the president, and the secretary of a community group, were added to their respective area-specific groups. In these groups, all the activities related to the workshops, training programs, humanitarian aid, meetings, and disaster preparation messages were shared and discussed. All the participants actively followed and responded to every message conveyed by the government officials. Mr. Mohanty emphasised that "When Fani was approaching the Odisha coast, all the government instructions were forwarded to these groups in order to inform all the community members to be prepared for an upcoming emergency" (Interview, Berhampur).

Moreover, direct phone calls over the phone established a symmetric relationship between lower-level government officials and community-based organisations. Through phone conversations, they often communicate useful information about upcoming meetings, government initiatives, and the present state of affairs. Mr. Mohanty added, "Throughout these years, I have built a friendly relationship with the community members of my jurisdiction. So, when I call, they answer right away."

Mr. Vasudev, president of Village Disaster Management Committee (VDMC), Baksipalli village, Berhampur, Ganjam district, described his perspective of the most recent communication procedures using WhatsApp and voice call:

> We got a number of messages in the VDMC WhatsApp group as Cyclone Fani approached. Subrata Mohanty, the district coordinator of OSDMA, also phoned me on May 2, barely two days before the hurricane made landfall, to discuss cyclone Fani preparedness. Although it would not touch the Gopalpur area, he suggested being vigilant nevertheless (FGD).

4.2.4. Social Media and Emergency Related Activities

Cyclone Fani can be regarded as the first instance in which individuals posted/ shared/uploaded live visual content, such as images and video clips related to devastation and self-rescue, on various social media platforms. Although several pieces of content are available on different social media platforms related to previous cyclonic storms, they are either in the form of news clips or animated visuals shared by an organisation. With its growing popularity, social media has evolved into a viable communication tool and functions as a mass notification system. Thus, various risk mapping institutions and weather forecasting organisations have created their

own social media pages, handles, or groups to give comprehensive emergency notifications and public emergency plans. These organisations incorporate social media strategies into their emergency notification and information plans for accountability. This process is made up of a series of steps that involve creating, posting, and updating information, as well as teamwork to keep an eye on and manage the channels.

In recent years, the IMD has also created several social media accounts/pages (including on Facebook, Twitter, and Instagram) to disseminate weather forecasts and warning alerts. It is also available on the YouTube platform. The URLs links are mentioned below:

Twitter: https://twitter.com/Indiametdept

Facebook: https://www.facebook.com/India.Meteorological.Department/

Instagram: https://www.instagram.com/accounts/login/?next=/mausam_nwfc/

YouTube: https://www.youtube.com/channel/UC_qxTReoq07UVARm87CuyQw

(Source: IMD, Govt. of India)

Social media not only informs citizens about the scale of a disaster but also gives a detailed account of the activity that is produced by a disaster, such as victims' griefs or needs, as well as several activities performed by volunteers and emergency service providers. In response to Cyclone Fani, the government of Odisha shared many posts on social media platforms. Twitter was also actively used, while popular disaster-related hashtags included #CycloneFani, #odisha, #MarineDrive#ListenToTheSea and #Fani (meaning: stand with Odisha). Most of the hashtags initiated from the official twitter handle of government of Odisha including @cmo_disha, @SRC and @Navin_Odisha.

In addition to that, many Community Based Organisations Organisation (CBOs) have shared cyclone Fani warnings and alerts, and relief related activities through their social media channels. According to Rojalin, a volunteer of Action India, a civil society organisation based in Puri, their official page as @radionamaskar is available on twitter handle. On this official page, they have shared various posts related to Fani alerts, Fani awareness, relief activities, and rescue and evacuation operations. They used several hashtags related to local activity, such as #Tandahara #Kakatpur, #FaniCyclone, #BayofBengal, and #CR4Change. The hashtags indicated area-specific engagement and types of activity being carried out in the affected areas. According to Rojalin, the initiatives helped to draw the attention of government officials and other humanitarian organisations in order to get a clear picture of the affected areas. It also depicts their team's involvement in an emergency situation (More about the community mobilisation and engagement initiatives of Radio Namaskar by Action India mentioned in Chapter 5).

4.3. Activity of Community in Response to Emergency

Foot (2014) summarised Vygotsky's CHAT and argued that it stands on three central ideas. Apart from deploying tools or artefacts for gaining an outcome or object, "community is central to the process of interpreting meaning—and thus to all forms of learning, communicating, and acting" (p. 3). He also explained that the activity systems are multi-voiced and multi-layered. He says collective activity is performed by actors with differing roles, positions, and perspectives. They are multi-layered because they are comprised of conscious actions as well as unconscious routine operations. Based on the conceptual framework of CHAT, actors could be seen as subjects, and they are divided into four groups: institutional actors, government-affiliated actors, volunteer actors or community actors, and citizens.

The actors played multiple roles such as arbitrators, mediators, and intermediaries not only during Cyclone Fani but also in every case of emergency. According to the conceptual framework, the variety of roles played by different actors indicates the division of labour of government actors, government-associated actors, and volunteer groups. The analysis of data seems to suggest there is a degree of relationship between government officials and volunteers and with the community.

In some cases, government officials or volunteers are able to communicate risk messages to the citizens while, at the same time, there is a degree of opposition between them. However, there are also some instances, following an emergency, where the actors build collaborative relationships with the community itself.

4.3.1. Perception of Institutional Actors

In the case of cyclone Titli, because it was approaching the vulnerable zones, such as adjoining parts of the Gopalpur areas, the collectors of respective districts were advised to remain vigilant and take appropriate measures based on the cyclone's intensity. As insight was gathered from the onsite field visit, reckoning the risk of disaster, the district collector of Gajapati immediately called a meeting with all stakeholders, including government and volunteer organisations, and briefed them about emergency management strategies. The block disaster management cell disseminated early warnings about cyclone Titli through 'megaphones' in their respective areas. According to villagers of Totagumda and Pallisarathi, several announcements were made by government officials about the *batya* Titli. The announcement contained messages asking people to protect their essential belongings and to rescue and evacuate the most vulnerable people on a priority basis.

According to Subrata Mohanty, “Although we tried hard to alert the citizens through various tools and channels, a few people remained at home, either due to failure of technology or adamant nature.” As propounded by the government’s ‘zero casualties’ policy, government actors tried to protect every life. Hence, general messages were conveyed to citizens of vulnerable parts. Also, as a welfare state, it is the state’s job to spread important information and protect people’s lives from any danger or emergency.

Mr. Mohanty also underlines the passivity of the citizens. In many instances, “The fishing communities won’t listen to what you are trying to convince them because they are more dependent on the conventional sources of weather prediction mechanisms.” In some cases, people tend to remain passive when the cyclone wave is far away; either they are accustomed to nature’s variabilities or unwilling to leave their essential belongings amid catastrophe. Further, some people show a sceptical view of information delivered by institutional actors. In these cases, the roles and responsibilities of government actors are doubled. They would approach vulnerable people and convince them to shift to safer places through a door-to-door visit, and in a few cases, they would deploy police or armed forces for evacuation. He added, earlier during cyclone Phailin in 2013:

> Many people were reluctant to leave their homes and essential belongings amid the possibility of destruction. The district collectors deployed armed forces and police personnel for evacuation, and within the next 24 hours, more than one million people were evacuated and sheltered in safer places. Many evacuees realised the motive behind rescue and evacuation and praised government officials later for saving their lives during cyclone Phailin. Nowadays, those living in low-line areas, especially mud houses, evacuate themselves when they get an emergency warning from government officials (Interview, Berhampur).

In some cases, the government actors play the role of arbitrator in a chaotic or hostile situation. A concern raised by the residents of Satasankha area of Puri district. In this area, most of the people belong to fishing communities, either they have migrated from different parts of Andhra Pradesh or are local inhabitants of Odisha – they are considered as Dalit caste or untouchable section of the society. According to the fishing community of Satasankha, while cyclone Fani was approaching to their area, they were not allowed to enter the shelter houses by privileged caste of the village. In such circumstances, with the intervention of local BDO, the issue was solved, and they were provided shelter in other school buildings.

According to Rabinarayan Barik, as a BDO of Puri Sadar (Town), on the night of May 3, 2019, thousands of people were evacuated and sheltered in school buildings, community halls, college buildings and multi-purpose shelter houses. In every shelter house, community kitchen services were arranged as per the disaster management provision of the government of Odisha. He said:

> I was assigned to take care of all the shelter houses of Puri Sadar. In a shelter house in Bramhagiri Panchayat, the Brahmin community (the Puri Brahmin consider themselves as most superior in the society) denied sharing a dining table with the Dalit community. Also they said if they entered or touched kitchen crockeries, they won't have food there. At that moment, as a Brahmin and top-ranked officer in the block, I prepared food and served them all. Also I shared my meal with the lower caste as a gesture of brotherhood. Seeing at my behaviour, the situation got normalised (Interview, Puri).

As mentioned by Mr. Barik, he has played the role of an arbitrator when distress reached to its peak. Since the government actors are conferred with certain legitimised power, their position is valued by the people.

Vinay Soni, a volunteer associated with a reputed donor organisation, described his own experiences of Puri district. An incident occurred during the relief and aid distribution drive conducted at Puri. When they were about to start relief distribution, a chaotic situation erupted. A section of the privileged class reached out to them and forced volunteers to distribute relief kits among them first. Then they called local police and distributed relief kits among the neediest people in the presence of police personnel.

4.3.2. Perception of Volunteers in Communities

This section discusses the activity of volunteer workers and communities during cyclones Titli and Fani. Biranchi Narayan, an AMG volunteers from the Puri district, stated that two days before Fani made landfall, they initiated a cyclone warning alert campaign by visiting door-to-door those at vulnerable locations, making megaphone announcements and calling known people over phone in their respective panchayats. He said, “We randomly selected the PDS (Public Distribution System) centre for the public announcement because people frequently assembled there to pick up monthly rations” (FGD).

The volunteers, basically AMG, are permanent volunteers associated with government institutions and trained in how to use local knowledge and first-hand measures to prevent and save people from any form of life threatening conditions. The idea behind enlisting volunteers from the community is to map and navigate the vulnerabilities within their periphery and take immediate action in response to any emergency by using available resources. According to Manoranajan, rescue and search volunteer of the AMG, “First we did Fani announcement in every village of our panchayat, and then we visited and inspected the availability of resources in the shelter houses we were assigned, such as food, drinking water, and lights” (FGD).

In addition to this, considering the risk, the female volunteers organised an internal training program for safety and rescue techniques. Mitali Sahoo said, “I taught the youth of my village how to prepare homemade life jackets out of plastic bottles” (FGD). Another volunteer, Bhagashree Suna, emphasised, “With the help of Asha and Anganwadi workers, we shifted all the pregnant women who were very close to date of delivery to nearby hospitals and others to shelter houses” (FGD). These female volunteers rescued many older people, primarily women who had no idea that Cyclone Fani was approaching them.

The role of volunteers is not limited to alerting or sensitising the community, they also have another role to play – as intermediaries between government and community and humanitarian agencies and disaster survivors. When cyclone Fani was about to hit on the Puri coast, several volunteers were assigned in different shelter houses to give updates to people about the current location of reach, expected location of landfall, wind speed and intensity. On the previous day of Fani, at an hour interval, they made announcements through shelter house megaphone and siren networks. Biranchi added, “We got several messages and calls from government officials regarding current status of reach.” The Odisha government had facilitated bus services for the evacuation of vulnerable people from risk zones to shelter houses. In that scenario, the AMG volunteers acted as state agents, mobilising thousands of vulnerable people from their respective jurisdictions.

The role that volunteers played during the phase of relief material distribution was to identify beneficiaries, maintain registers and organise meetings with aid agencies. Manish Jain, the coordinator of an international agency called Islamic Foundation, revealed: “We located different partner NGOs across several parts of Puri district, and Grama Vikas Samiti (GVS) was one of them. With the help of GSM and the AMG, we were able to navigate actual beneficiaries

from the Bramahagiri area" (Interview, Puri). During the field visit, a relief drive was organised at the Kasia Multi-Purpose shelter house.

The donor agencies, as intermediaries, assigned AMG volunteers to carefully investigate the affected parts of the panchayat and identify actual beneficiaries or disaster victims for the distribution of relief and aid. The AMG volunteers prepared a master list through onsite field observations as well as devastation noticed during the rescue operation, then submitted it to the donor agency. During the crisis phase, an instant revenue generation drive was run by the donor agency under the supervision of AMG volunteers in several places in the Puri district to provide instant monetary assistance to the disaster victims, such as clearing debris, disinfecting ponds, and decontaminating tube wells.

4.3.3. Role of Crowds during Emergencies

This section explores the discussion around the role of crowds in emergency situations. A crowd denotes to general citizens those who have no affiliation with the organisational framework for emergency-related activity. The crowds are generally considered recipients of information about the disaster, and most of the agencies, either government or non-government, expect they should react to them. According to many remarks made by the interviewees during the field visit, in the 1999 super cyclone, many people did not receive adequate information on time. Hence, in the post-super cyclone years, emphasis was given to delivering disaster risk alerts to the maximum number of people. Several respondents claimed that risk alerts could reduce the degree of threat to people in a disaster zone. The idea behind delivering information to people is to communicate well with them and motivate them to make the best decision considering the information.

There are a number of instances recorded where people did not get information or frequent alerts. In some cases, the leaders of the community or educated people played the role of intermediaries, those who initiated to pass risk alerts to the community members or vulnerable sections. In the case of cyclone Titli the children of illiterate people, especially those who used smartphones or other technologies shared risk alerts with their parents. As expressed by P. Sirunjala, a student from Totagumda village:

> Currently I am pursuing B.Ed. and staying in a hostel. During Titli, I came home for vacation. When I came to know from several sources about the cyclone, I immediately informed my family members and other neighbours about the calamity (FGD).

In other cases, the leader's activity in response to an emergency is spontaneous volunteering, when it comes to risk alerts and participation in rescue and evacuation. P. Trinath Rao, a retired teacher from *Totagumda* village, felt that due to several socio-political constraints, information about disaster did not reach to a large section of the society. He explained, "First of all, most of the Telugu speaking people are residing here and the literacy rate among elder people is very less. However, the information delivered by the state through different channels was in regional Odia language. Hence, many people did not comprehend it." He further said: "Many people do not own mobile phones or television sets in their homes. Since I hail from the community and as an educated person, it is my primary duty to take care of my own people" (FGD).

Furthermore, in many cases, the volunteer himself attempted to play the role of coordinator of spontaneous volunteering. This role included motivating, organising, and instructing volunteers in the context of a specific disaster. According to Mr. Rao, when flood water was about to invade their village, he immediately called a meeting and advised the young people to shift livestock and vulnerable people to a safer place. The young people emerged as spontaneous volunteers and took

the lead in the rescue and restoration process despite not having any formal training or rescue equipment. He added, “Many students of mine, whom I taught in primary school followed my instructions; my village friends also joined in the volunteering activities.”

Some of the representatives of regional news channels highlighted the importance of spontaneous volunteers. According to Sanjiv of ETV, the presence of volunteers gives people some amount of strength and a sense of courage amid emergency. During cyclone Fani, many people were stuck in the Kalimandir Street and Satyanagar Street of Bhubaneswar. They could not save themselves, and at that time, several media professionals and young people emerged as spontaneous volunteers and rescued those people and shifted them to safer places. These volunteers also arranged basic foods and drinking water on their own for the evacuees.

The spontaneous volunteers served as an intermediary between humanitarian agencies and the disaster survivors. A reporter of Puri suggested that when many victims from Puri city were eagerly waiting for food, these volunteers transported food packets from state-run free kitchen and non-government agencies or cooked food for the needy. According to the reporter association of Puri, when many beggars were without food amid disruption and destruction, the spontaneous volunteers provided them food for two days.

4.4. Conclusion

The tools and infrastructure (social and material) developed in response to an emergency constitute a relationship between citizens and their allied environments, such as socio-political, material, and cultural, in which humans make meaning by performing various activities. Emergency management does not precede but rather develops from “individual(s) involved in the activity and the activity elements such as the product of activity, mediating tools, community

members, guiding rules while the individual(s) is/are acting on attempting to produce an outcome" (Koszalka & Wu, 2004, p. 492).

This chapter examines the subject or user activity in an emergency context and various activities of digital tools to attain an object. Here, the role of the subject changes over certain context such as users, community members and citizens. At the same time, the object offers a variety of forms, such as risk alerts, emergency warnings, relief distribution, and emergency-related activity. In the first section, the analysis of field data allows us to see that the digital tools confer the subject as a recipient of information or as a channel that can provide information or as a medium that builds interlinkages with two parties, or as a partner that can take part in response to an emergency. The tools reinforce collaboration between state actors and other emergency response agencies and suggest various relationships between institutional actors and citizens during the risk phase and a crisis situation. They also motivate the subject to take independent initiatives while looking at the context. The mobile phone has emerged as a unique ICT tool, which is used for multiple purposes, such as information dissemination, communication practices and production of knowledge. The preliminary data from cyclones Titli and Fani suggest the initiatives that were driven by citizens appear to present a wider variety of objects.

The last section highlights the various relationship forms in the setting of a disaster and the activities of governmental and non-governmental actors as a dividing of practices. In the case of cyclone Titli, the community built a symmetric relationship with the fellow community as well as volunteer actors. Also, the reachability of government actors in Titli clings to certain limitations. Since, cyclone Fani shows a greater diversity of actors, they play multiple roles based on the circumstances. This relationship could be considered cooperative and open, while in some cases, contradiction arose between the government actors and citizens. The insights from both cases of

Titli and Fani indicate that the subject behaves and operates differently based on the tenacity and needs of the situation.

Looking closely at the data from both cases, we can find the diversity of tools and active innovation processes among state-affiliated agencies. Further, the responsive mechanism of Odisha indicates that the state-affiliated actors have given special attention to certain aspects such as user-generated content, mapping risk, emergency warning, and information and engagement. The observation also indicates that several digital tools are changing practices and perceptions, especially in the emergency-related activity system.

Chapter-5

Communication and Community Radio: Steps towards Disaster Resilience

5.1. Introduction

The eastern Indian state of Odisha has a long history of devastating cyclones and natural emergencies. The 'Super Cyclone of 1999' is marked as one of the worst natural disasters in the history of Odisha (earlier, Odisha was known as Orissa)[14]. It claimed over 10,000 human lives and 0.2 million of animals lives while leaving millions homeless. After a pause of about a decade and a half, starting from the last quarter of 2013, the state has witnessed one or more severe cyclones every year; floods, hit waves, and epidemic diseases are frequent too.

The Super Cyclone of 1999 taught numerous lessons to the state and the administration, apart from leading to the formation of a decentralised organisation named the Orissa State Disaster Management Authority to address and develop robust and resilient approaches to handle future disasters. The OSDMA took a step further towards the idea of a disaster risk reduction (DRR) approach different from the conventionally accepted relief-centric approach along with strengthening focus on rescue and relief, mitigation, and build-better-back (BBB) process. Multilateral agencies and regional organisations have supported OSDMA to foster social capital, build infrastructures, create robust preparedness mechanisms, improve early warning capacities, ensure fool-proof communication systems, and develop resilient communities to address disaster vulnerabilities (Govt. of Odisha, 2019). Considering the exposure to natural disasters, Odisha was the first to draft a 'Disaster Preparedness Action Plan' in August 2009. The plan encouraged departments to pursue innovative ideas and seek greater civil society participation in the various stages of the disaster mitigation process (Jogesh & Dubas, 2014).

[14] https://legislative.gov.in/sites/default/files/A2011-15.pdf

During the last decade, the state has faced myriads of cyclonic storms, a few of which have been categorised as severe cyclonic storms. Most cyclones, such as *Phailin, Hudhud, Titli, Fani, Bulbul, Amphan* and recently, cyclone 'Yaas' that have swept through Odisha's coast, affected the economy and material infrastructure. However, each of them has also reflected different levels of proactiveness aimed at risk reduction by the state, including delivering early warning information through several communication channels such as media, as well as traditional and new communication tools. Besides this, active civil society organisations/volunteer groups at the grassroots level helped save millions of lives – otherwise, fatalities could have been manifold. The vast networks of community-based organisations (CBOs) that operate at the hyper-local level, played a critical role in helping communities to build resilience (Drennan & Morrisey, 2018).

The community is the initial responder to any disaster, and community-led collective action is important for developing a more robust disaster management mechanism to minimise risk. For garnering participation in any community-based disaster management processes that reduce vulnerabilities and provide creative solutions, effective disaster communication plays a crucial role in preparedness and risk reduction. Based on this premise, this chapter examines disaster communication as a process. It focuses on the ways in which CBOs used community radio as a tool to facilitate social relationships and collective action that enhanced the effectiveness of the process.

This chapter is relied on the case study of disaster communication by two community radio stations during the 'very severe cyclonic storm' Yaas, which made landfall in the eastern Indian state of Odisha on May 26, 2021. While disaster communication is primarily seen as the obligation of state agencies, community radios are increasingly getting involved in information exchange,

and community connect strategies during the pre-disaster period and credibly addressing the communication needs of the impacted communities.

The two community radio stations (CRSs) in Odisha, Radio Namaskar in Konark of Puri district and Radio Bulbul in Chandan Bazar of Bhadrak district played a crucial role in delivering early warning information in local languages, sensitised marginal communities, built synergies between state-affiliated actors and vulnerable communities and tied community collectiveness across the disaster-prone areas. Also, these two CRSs, licensed to and operated under the purview of NGOs, have taken a common approach to foster community-based disaster risk reduction activities and build disaster-resilient capacities at the grassroots levels because they have a significant stake in the community and are familiar with their resources as well as needs and necessities.

At the beginning, this chapter describes the conceptual shift in the disaster risk reduction approach towards community's participation in becoming disaster resilient, as well as the role of information and communication in the disaster management process. It then analyses how community radio stations and the social relationship facilitated by them augment the effectiveness of the disaster communication process. Then it discusses the historical trajectories of disasters and vulnerabilities in the context of Odisha. It emphasises on the dimensional shift towards the disaster risk reduction activities, and the states' obligation towards transcending essential infrastructure and laying down policies and plans to mobilise and address the communication needs of the vulnerable communities.

The next section of the chapter gives an overview of how community radio stations (CRSs) in disaster prone areas of Odisha are engaging vulnerable communities and enhancing local

participation for facilitating preparedness, early warning, as well as response and revitalising measures during the cyclone 'Yaas'. As mentioned earlier, this study derives from insights of communities reached by Radio Namaskar and Radio Bulbul and their potential to serve areas which are regularly affected by severe cyclones. The insights are drawn from field visits, and data were gathered through in-depth interviews, discussion over the phone and participant observation at the study sites of the two CRSs. Apart from the field observations, the theoretical propositions were drawn from the scholarship on community radio and community-based disaster management.

This chapter proposes that community radio must be incorporated as an important tool in all plans that prioritise disaster communication as a means of strengthening of community capacities and enhancing community resilience.

5.2. Disaster Communication and Communities

Climate change and global warming pose a significant threat to the living species worldwide and are responsible for the rising natural disasters and climate-related risks and hazards. According to the Asian Development Bank report (2015), globally, 'the rising intense floods, cyclonic storms, droughts, and heat waves has a likely and ominous link to climate change.' For more than a half a century, disaster risk reduction has shifted from earlier narrowly perceived technical discipline to a broad-based global movement intended to pursue sustainable development (there is a paradigmatic shift). From 1990-1999, called 'The International Decade for Natural Disaster Reduction,' the United Nations has been actively advocating for policies and measures to reduce risk and prevent the impact of natural disasters for vulnerable communities (UNDDR, 2021). The world conference on disaster risk reduction called 'Hyogo Framework for Action 2005-2015,' held at Kobe, Hyogo in Japan, adopted a framework for 'building the resilience of the

nations and communities to disaster' and reiterated that nations should promote a strategic and systematic approach to reducing vulnerabilities and risks to hazards (UNISDR, 2005).

The Sendai Framework for Disaster Risk Reduction 2015-2030, Paris Agreement for Climate Change 2015 and the 2030 Agenda for Sustainable Development Goals in 2015 revealed some promising goals with regards to addressing disaster vulnerabilities. These frameworks also petitioned that governments and their national and international partners think for a common cause and undertake adequate efforts to combat climate change, and building 'resilient communities' and ecosystems across the different sectors to tackle any forms of disasters (Chakrabarti, 2017).

South Asia is considered as one of the most vulnerable regions to climate-induced vulnerabilities and environmental-related risks or hazards such as tropical cyclones, earthquakes, floods, droughts, landslides etc. (World Bank, 2021). The Govt. of India legislated the 'Disaster Management Act 2005' (DM Act) after a series of disasters such as the 1999 Odisha Super Cyclone, the 2001 Bhuj earthquake and 2004 Indian Ocean Tsunami to spearhead and implement holistic and integrated disaster management plans across the country (Patra, 2021). The DM Act has prioritised fostering a culture of preparedness, prevention, reconstruction, and mitigation, which has led to advancing in disaster resilient infrastructure, early warning systems, and building coordination among various actors in the multilayers of the government (Govt. of India, 2005).

Since every region has a diverse community and specific vulnerabilities, the State, international agencies and regional organisations must build a risk-free environment through grassroots mechanism and participatory strategies that engage local communities in coping with disasters. Such initiatives help to increase capacities of communities to endure and protect

themselves from hazards and mitigate the root causes of vulnerabilities by strengthening democratic governance and adequate access to resources (Moorthy et al., 2018).

It has been observed that community-based disaster practices and collective action for minimising disaster risk and building resilient community capacities have proven more effective and useful in a global context (Shaw, 2014, p. 4). Such initiatives associate communities with the policy measures and value local knowledge systems and capacities of local people to construct their own resources. Allen (2006) argues that Community Based Disaster Practices (CBDP) could be helpful not only in operationalising local coping and adaptation strategies but also in positioning them in the larger development planning and discourses. The CBDP approach focuses on reducing vulnerability, understanding risk, strengthening capacity or empowerment and network of coordination during, after and before the disaster for safeguarding lives, property and the environment (Shaw, 2016).

In the present context of disasters, including natural and human-made, 'community resilience/resilient community' or 'building resilience' has become a dominant strategic theme and operational goal in global policy discourse. A community is considered resilient if it has the ability to 'bounce-back' after adversity. (Manyena, et al., 2011). Community resilience, informed by linking a network of adaptive capacities (resources with dynamic activities) of resilient individuals or community following a disaster, "emerges from collective activity in which individuals join together in efforts that foster response and recovery for the whole" (Pfefferbaum & Klomp, 2013, as cited in Houston et al., 2015, pp. 279). Scholars stress that community resilience emerges from four significant adaptive capacities, such as "economic development, social capital, information and communication, and community competence" (Norris et al., 2007, as cited in Houston et al., 2015, pp. 271). The communities' adaptive capacities are inherently embedded with various

factors such as “community action, critical reflection, critical reflection and problem-solving skills, collective efficacy and empowerment, flexibilities and creativity and political partnerships” (Houston et al., 2015, pp. 271), and bounded by multiple attributes as roles and responsibilities, skill-building and communication (Pfefferbaum et al., 2013). Further, the adaptive capacities of community resilience could be understood by focusing on multiple community subsystems, including economic, physical infrastructure, civil society and governance – sectorial coordination and interaction is vital for a community to be resilient (Longstaff et al., 2010; Houston et al., 2015).

Communication is considered one of the central elements found in each domain’s conceptualisation within the community resilience model. Norris et al. (2008) informed ‘communication and information’ as one of the core adaptive capacities in order to build community resilience. Further, the capacities could be expanded with the attributes of narratives, community consciousness, skill and access to infrastructure, responsible media, and reliable or authentic sources of information. The community resilience scholars posit that communication and media are the significant attributes in the community resilience context; simultaneously, communication and information systems are considered critical infrastructures for strengthening the organisation and system resilience (Houston et al., 2015). Also, the infrastructures remain indispensable throughout the different steps of disaster situations such as connectedness with vulnerable/affected communities, family, social support systems, interagency or institutions. Media and communication technologies have been recognised as an integral part and process of disaster risk management.

In Odisha, India, too, emphasis has been given to establish last mile connectivity with the rural pockets and vulnerable communities to ensure fail-safe communication during a disaster (Govt. of Odisha, 2019). The deployment of the INSAT series of satellite communication, internet

connectivity, and instant broadcasting, including multiple digital platforms (television and social media) has added a new dimension to global and instantaneous communication (ISRO, 2022). Nevertheless, in spite of the policy measures and technological developments, the modern technologies have not yet fulfilled the promise of speedier dissemination of information to all and democratisation of access (Sen, 2020). Thus, the risk amongst vulnerable communities, especially those in remote rural pockets and the marginalised in South Asia remains a challenge when it comes to adequate infrastructure, access and interpretation of content, reliability of sources, and sustainability of modern infrastructure in the event of a disaster.

5.3. Community Radio and Disaster Management

As part of the disaster management process, pertinent information and a robust communication system have been considered a binding domain of requirements. Access to essential information at the last mile or among weaker sections of communities is a fundamental right of every citizen, (Hibino & Shaw, 2014). Instant and trustworthy/authentic sources of information encourage people to take appropriate measures in the event of a disaster. The "community broadcast radio", or simply called "community radio", is often more convenient for its surrounding communities because its programs are designed following peripheral, cultural and demographic specificities (pp. 122).

Community radio has emerged as a reliable tool or medium in the time of a disaster that delivers early warning information and communication, promotes preparedness, mitigation, response and recovery, and constitutes synergic relationships among institutional actors and vulnerable communities. Community radios are considered convenient to provide more inclusive access than other communication technologies, and have played a vital role during emergencies

(Sen, 2020; Kapoor, 2020). Community radio are run by and for the community in local language, often mirroring issues related at the heart of local interests such as vulnerabilities and climate-related awareness (Chandramouli, 2019). Parker (2019) exemplifies how community radio could be used to transform emergency preparedness education in disaster prone-states and apply it to the development of community prosperity. According to Parker, they enable 'constructive resilience' – a type of community-building – that emerge 'alongside the dominant societal structures that are either oppressive or ineffective.'

According to Tabing (2002), "community radio station is one that is operated in the community, for the community, about the community and by the community" (p. 9). The community radio is characteristics by access, public participation in production and decision making, management by listeners, and its operation be dependent on mostly on their own available resources (Pavarala & Malik, 2007). Since the community radio stations are guided by the ethos of the community and work as participatory tools of communication, they generate area-specific content in the local languages to address the communication requirements that otherwise remain uncovered by mainstream media (Malik, 2020). Apart from being a tool of participation and social change, CRSs provide a platform where a marginalised community or dis-empowered people, through engagement in daily media activity, exercise their right to communication and active citizenship (Pavarala and Malik, 2007; Shukla, 2015; Malik, 2020).

Community radio across Asia, especially Southeast Asia, have taken the lead to work with vulnerable communities in disaster-prone areas to improve disaster risk reduction capacities and disaster management (Shaw, 2016; Sen, 2020; Sukhwani et al, 2021). There is enough documented evidence across African, Latin and South American, Australian and Caribbean contexts how local communities have used their communication abilities to channelise information about disasters

risks, communication within communities during post-disaster phases and built resilient communities for safeguarding them from future consequences of disaster (Pavarala, 2013). There are myriads of stories recorded across the globe how community radio as a voice of vulnerable communities and a tool of democratic media played a significant role to leverage the consequences of the coronavirus pandemic (COVID -19) (Pavarala & Jena, 2020).

The role of community media in the context of disaster management has been highlighted in the report of WSIS (World Summit on the Information Society) Forum 2010 high-level panel on ICTs and disaster response on community media and disaster response, which asserts;

> What is notable in the response of community broadcasters to disaster is that they can be a focal point for local organisation, receiving as well as imparting information, working with local community leaders, facilitating dialogue and assisting people to understand and come to terms with what has happened. They should not be considered simply as a relay for information from public agencies, but also as a means by which those directly affected by disaster can engage in disaster response. (AMARC, 2010, para.7)

Alternative media such as community radio or people's radio, give sharp coverage of the real situation based on people's daily experiences to fulfil their communities' needs and help to address intriguing queries (Birowo, 2009; Hibini & Shaw, 2014; Sukhwani et al., 2021). In the Asian subcontinent, countries like Japan, Indonesia and Bangladesh, CRSs have, in collaboration with civil society organisations (CSOs), taken up ground-breaking step towards active learning process, research and training to train their staff in giving out real-time information related to hazards (i.e. tsunami and volcanic eruptions). This information caters to the needs of vulnerable people and so, CRSs are called 'life savers' of the technologically deprived communities (Sen, 2020).

In Japan, community radio is perceived as ‘disaster radio’ or ‘emergency disaster radio’ installed in the various rural corner and primarily disaster-affected areas to deliver the most crucial information to the vulnerable communities at the different phases of a disaster. The CRSs deep-rooted connection with the grassroots community helps to build common bonds among people and maintain community identity, which creates open space for dialogues and enhances the community’s capabilities and self-government abilities (Hibino & Shaw, 2014). In Indonesia, initially the Aceh Radio Reconstruction networks (ARRnet) dealt with emergency response in the aftermath of the tsunami of 2004, and later they were deployed as media for recovery and reconstruction (Birowo, 2009). Further Birowo (2009) reveals, apart from being a medium of information, deliberation and communication, ARRnet has also been operationalised to undertake issues such as trauma healing, entertainment and to educate community members to bounce forward.

Community radio in Bangladesh acts as a critical tool for early warning information and listening to hazard-related programs as part of disaster preparedness to lessen cyclone-induced economic damages (Ahsan & Khatun, 2020). Thus the unique features of broadcasting content in local language, based on crucial issues and local values have increased the “comprehensibility, information clarity, and reliability” of the emergency warning messages delivered by community radios, which has helped vulnerable people of Bangladesh to take adequate measures for safeguarding themselves from the cyclone (p. 11).

In India, during the 2004 Indian Ocean tsunami, community radio played a significant role to reduce panic created by shocking stories and offered victims a platform to express their grief and needs through community radio. It focused on the urgency to provide relief material for disaster survivors, informing them about the tsunami and post-disaster measures and delivering

area-based information. Even though its coverage was limited to one geographical area, the role played by community radio during emergency caught the attention of several top officials and the Government of India's information and broadcasting department (Sreedher, 2005).

As per latest report, India has 338 community radio stations across various parts of the country (MIB, 2021). Out of those a number of stations are set up in relatively disaster-prone areas of India, addressing the information and communication needs of the vulnerable communities through relatively democratic, participatory processes and horizontal communication structures. Several community radio stations in Uttarakhand, Tamil Nadu, Andhra Pradesh, and others have become a significant intervention in the mountainous range or coastal belt where the latest information and communication technology is yet to reach (Chndramouli, 2019; Parker, 2019; Sen, 2020; Kapoor, 2020). There are 20 community radio stations in different parts of Odisha that are presenting and conducting public debates on their local issues (FCRS, 2022).

5.4. Odisha and Cyclones

The Odisha state, located in the eastern part of India, has historically been prone to several natural disasters, including floods, droughts, cyclones, hit-waves, endemic and epidemic diseases. The state's geographical position and topographical characteristics are relatively more responsible for climate-related risks and natural disasters. It is located at the head of the Bay of Bengal with 480 km of coastline and several peninsular rivers such as Mahanadi, Brahmani, Baitarani, Rushikulya, Birupa, Budhabalanga, and Subarnarekha, including its tributary flowing through the state, which makes it acutely vulnerable to regular natural disasters like floods and tropical cyclones. Documentary evidence on a comparative analysis of world sea surface indicates that

risks and vulnerability associated with cyclone storms and offshore inundations are relatively higher and distressing along the East Coast of India (Sahoo & Bhaskaran, 2019).

The tropical cyclone has many names based on geographical origins, i.e. Typhoon, Hurricane, Katrina and Willi-Willi (Padilla & Jett, 2021). It is an intense circular storm that forms at the warm sea surface and contains low atmospheric pressure, high-speed wind and heavy rains. On the Indian coast, among the four maritime states situated on the coast of the Bay of Bengal, Odisha seems to have become a favourite destination for a tropical cyclone. Most of the storms formed in the Bay of Bengal intensify twice a year, after the departure of monsoon, in October-December and before monsoon arrives in April-June (Govt. of Odisha, 2019). The cyclones often landfall in coastal regions Balasore, Kendrapara, Jagatsinghpur, Ganjam, Puri and Bhadrak districts. The state has been facing an average of four to five cyclones every year; out of them, one-two intensified into a severe cyclonic storm. Mohanty, (2021) mentions, nearly 35 percent of the cyclonic storms that occur and cross the eastern coast of India, have affected Odisha, and the associated storms largely affected the coastal districts.

In October 1999, two subsequent severe cyclonic storms battered two different parts of the Odisha coast. The first hit southern parts of Ganjam district between October 17-18, and second one after ten days, known as 'Super Cyclone' battered eastern parts on October 29-30. In the super cyclone, maximum wind velocity reached 270-300 kmph in the core areas of Paradeep, Jagatsinghpur, Bhadrak, Jajpur, Keonjhar, Balasore and Mayurbhanj. It ravaged all the coastal districts, claimed 10,000 human lives, more than 0.35 million kutcha (temporary) houses collapsed, millions of livestock were lost, numerous villages were washed away, around 2.5 million people were marooned, and an estimated USD 1.35 billion worth of property was damaged (Govt. of Odisha, 1999). Before the 1999 super cyclone, the state witnessed several severe cyclonic

storms from the mid-19th century to the end of the 20th century. The state experienced 12 intense cyclones on an episodic basis, three of them equalised with super cyclones later, 1940, 1971 and 1999, which caused irreparable losses to the state.

A tropical cyclone *Phailin* hit Gopalpur in Odisha', categorised-4 (Saffir-Simpson's five categories of scale) on October 16, 2013, which is one of strongest storms with maximum sustained 3-minutes gale of 200-210 kmph at the core areas of Ganjam, Puri, Chilika and Khurda. The cyclone Phailin contained high winds, and torrential rains that reached 300 mm at several places – ravaged millions of kutcha houses, uprooted trees, flooded thousands of hectares of cropland and damaged physical infrastructure including bridges, electric poles and mobile towers. It crippled around three million livelihoods in 171 blocks of eight districts, resulted in 44 casualties and generated economic losses of an estimated value of USD 700 million in the state. Recalling the fury of the super cyclone, the state government, with the help of disaster rapid action force (state as well as national units), evacuated more than one million people from the vulnerable zone 36 hours preceding cyclone landfall as a preparatory measures – the largest emergency evacuation carried out within the stipulated time (Govt. of Odisha, 2013).

The next year, about the same time as cyclone Phailin, on October 12, 2014, Very Severe Cyclonic Storm (VSCS) *Hudhud* struck at the east of Visakhapatnam in Andhra Pradesh and later moved towards Nepal. It caused hefty rainfall with a strong gale of 170 kmph leading to two casualties and large-scale infrastructure damage in southern Odisha. In the years subsequent to 2013 and 2014, several other severe cyclonic storms struck the Odisha coast, such as *'Titli'* in 2018*, 'Fani'* and *'Bulbul'* in 2019*, 'Amphan'* in 2020 and recently cyclone 'Yaas' in 2021. According to a Down to Earth report (2001) the frequent occurrence of cyclonic storms over the centuries has made the state 'disaster capital of India' which causes massive fatalities, substantial

property damage, migration, socio-economic instability, and disrupts the smooth functioning of a community or societal progress.

5.5. Yaas Cyclone and Role of State Communication

After the Super Cyclone of 1999, several needs assessment analyses were carried out across the coastal districts of Odisha by the state government with the support of different public universities/institutions (i.e., IIT Kharagpur, IIT Bombay). The immersive studies suggested that the provision of adequate shelter houses in the disaster-prone areas and speedy and robust communication networks/infrastructure within state are the critical needs to alleviate disaster risks. In the month of December 1999, after two months of the Super Cyclone, the state government carved out an autonomous institution named Orissa Disaster Mitigation Authority (OSDMA) vide Revenue and Disaster Management Resolution on 28 December 1999 to address the prevailing crisis in the state (Govt. of Odisha, 2021). The role of the OSDMA included building social capital and material infrastructure in the state to reduce the potential adverse effects of a risk and hazard – preparation for risk management – efficiently responding to and recovering from a disaster or crisis (Govt. of Odisha, 2019).

Infrastructure denotes the system and mechanism needed for community life to function smoothly. In the realm of disaster management, infrastructure is granted as ‘lifelines’ and plays a major role in implementing disaster mitigation programs. Any inadequacy of infrastructural support raises possibilities of vulnerabilities and hinders post-disaster management activities (Mallick et al., 2011).

As part of infrastructural development, the state currently has 879 multipurpose shelter houses built in disaster-prone areas by OSDMA with monetary grants from several international

aid agencies (out of total 879 shelter houses, 65 were constructed by Red Cross Society of India) (OSDMA, 2021). Besides this, school buildings are being designed and constructed in a way that they could be used as shelters (Patra, 2021). The state branch of the Indian Meteorology Department (IMD) is located at Bhubaneswar, capital of Odisha. It is deployed with modern satellite communication and advanced technologies to observe atmospheric moments, carry out weather forecasting and deliver early warning information across the state. The state has set up a fool-proof communication network named Early Warning Dissemination System (EWDS) to bridge the prevailing gap in disseminating risk warning up to the last mile or community level (OSDMA, 2021). Also, the state has provided government officials with more authority to expedite disaster risk reduction activities across the state.

Therefore, much progress has been observed in the structures and strategies of emergency management in the aftermath of the Super Cyclone of 1999 (Patra, 2021). Throughout the last few emergencies, especially during the severe cyclonic storm, starting from Phailin in 2013 to recent cyclone Yaas and Jaawad in May and December 2021 respectively, Odisha deployed the entire state and national machinery to expertly manage the impending disaster. The mass evacuation before a catastrophe, well-functioning disaster risk reduction systems, civic engagement and governments' handling of cyclones were occasionally appreciated by the United Nations and others (Senapati, 2013).

The Global Forecasting System of the National Centres for Environmental Prediction, USA and the India Meteorological Department had predicted one week in advance, a strong storm called 'Cyclone Yaas' likely to form over the north Andaman Sea and the east-central Bay of Bengal. It was to reach close to Odisha and Bengal by the Morning of May 26, 2021 (Sangomla, 2021). Based on scientific calculations, the forecasting institutions predicted the cyclone to pack

winds up to 185 kmph and could intensify further into a very severe storm. On the verge of an impending cyclone Yaas, IMD (including national and state branches) issued risk alerts to Odisha and Bengal for May 25, 2021 and onwards. All the institutions and actors of the identified areas where the cyclone was likely to make landfall were issued alerts and preparedness messages were circulated over different media platforms, including new and traditional.

As part of readiness for rescue and evacuation, both the state and union government deployed ODRAF, Fire Services teams, Indian Army, navy, coastal guards and NDRF across identified locations of Odisha and West Bengal with adequate equipment (i.e., tower lights, generator sets, inflatable boats, electric-cutter, walky-talky, satellite phone etc.). The Indian railways cancelled several trains from different zones heading towards Bhubaneswar, airlines operations and shipping services were cancelled. Several advisories were issued to ensure electricity supply at hospital and vaccine centres for the possible power outage. A mass evacuation was carried out in Odisha – as many as 500,000 people were evacuated from the low lying areas of Kendrapara, Jagatsinghpur, Bhadrak and Balasore districts. Since the state had handled severe cyclone *Amphan* amid the global pandemic COVID-19 in March 2020, to ensure social distancing and COVID protocol, the number of cyclone shelter houses had been doubled and separate isolation rooms were arranged inside the shelter house for infected patients (Senapati, 2021). All the way, the regional as well as national media, including electronic and print media, transmitted warning alerts and preventive information at the mass level about vulnerable areas and made people aware about the preparedness measures.

3.6. The Yaas Cyclone and the Role of Community Radio

The two community radio stations, Radio Namaskar and Radio Bulbul are situated in areas that are disaster-prone and have taken on the obligation to work with and involve vulnerable communities as well as to make communities resilient for climate-induced risks or hazards. These CRSs facilitate the practice of media that engages vulnerable people and builds trust between institutional actors and the community. Also, they, enhance community connectedness and local capacities for achieving disaster and climate-related sustainability. The two radio stations are designing and broadcasting programmes at the grassroots level, based on local needs of communities.

Radio Namaskar is located in Konark of Puri district (internationally famous for its Sun temple). It is the first community radio station of Odisha operated at 90.4 FM and started broadcasting on February 10, 2010 – owned, managed and run by 'Young India' a non-profit organisation, which engages local community and volunteers in the larger process of social change. Radio Namaskar currently airs 18 episodes and special programs in Odia language (Telugu content are aired during emergencies only), and 80% percent of the total programme comes from the community itself (Radio Namaskar, 2021). Here is a description of different types of programmes:

> Local self-governance; Human rights/Minority & Dalit rights; Right to food/education/information; Gender equity; Societal Peace; Survival indigenous trade and culture; Disaster management etc. (Radio Namaskar, n.d. "Signature Programmes", para. 1)

Radio Bulbul, located in Bhadrak district of Odisha, started broadcasting in 2011, managed by 'DISHA', a partner organisation of the Digital Empowerment Foundation, New Delhi. The

organisation aims to enhance the digital capacities and the ICTs skills among women and school-going children (minority communities). The content is designed and broadcast in both Odia and Hindi languages, and is related to minority issues, agriculture, commerce, and disaster management (DEF, 2021).

It all started in 2010, when several areas of 'Gop NAC' (Notified Area Council), under Puri district were hit by floods due to a breach on Kushabhadra River embankment. Owing to the disruption of electricity and television networks, many villages remained disconnected for a few days from the reach of district administration or local government. This is the juncture when Radio Namaskar became significant in disaster intervention; locating the flood victims, conducting rescue and search operations, connecting people with family and friends, distributing relief materials, and making the voices of flood victims reach local authorities. In any of disaster preparedness process, the vulnerable deprived sections, women, children and elderly must be prioritised. The two stations, Radio Namaskar and Radio Bulbul, means augmenting their local media structure, a local sphere of information access and queries, and enhancing community-led capacity building in their respective periphery throughout the past few disasters – starting from severe cyclone Phailin to Yaas.

The early warning information and preparedness alerts delivered by the state administration during the cyclone Yaas (and other disaster situation) was inadequate and did not reach several vulnerable communities especially, fishing community and people who were living in the low-line areas, due to shortage of suitable infrastructure. Also, there were issues of unwillingness to accept government advisory and timeliness of messages received. Since both the radio stations are grounded in community, and have built good familiarity with daily practices, hence their information content was considered more reliable and exclusively reached.

During the cyclone Yaas, the two CRSs designed their communication strategies – they broadcast live warning alerts on 23 May (two days earlier to landfall), when it was a few hundred kilometres away from the Paradeep coast. The information alerts including the current location, expected wind speed and landfall area, and COVID-19 health advisories at shelter houses were updated over multiple formats such as broadcasting news, narrowcasting the recorded audio at a community gathering, and postings over different social media platforms like Facebook pages, Twitter handles and WhatsApp groups. While narrating the variety of programme formats and content, Mr Mohammed Niyaz, founder of DISHA Foundation opined, "We developed a mobile application called 'Radio Bulbul' for both iPhone and Android users, and it is freely available in 'Google Playstore' and Apple app store, and all the live programmes can be accessed from any parts." (Interview, Over Phone)

In the cyclone alert programmes, the district officials and specialists outside the NGOs also appeared in live programmes to assist them. Besides that, leaders from communities and disaster survivors/victims of vulnerable communities participated in radio programmes/talk-shows to share understanding, previous experience/memories, convey messages, and precautions to be taken for an impending emergency. The types of programmes and contents that the two stations delivered are mentioned below:

- Disaster warning (emergency alerts and rescue and evacuation advisories)
- Availability of nearest shelter houses
- Keeping essential items before rescue (documents, important contact, dry foods)
- Administration messages for relief/aid/support and rehabilitation.

Language remains a significant barrier for accessing official announcements and information for the migrant communities. In the Konark area, 10,000 fishing communities, mostly Telugu-

speaking people, have migrated from the neighbouring state of Andhra Pradesh. Radio Namaskar airs programmes in Telugu language targeting the fishing communities. The stations invited he children of fisher folks in live programmes to convey to their parents about taking precautionary measures, and to request them not to venture into the sea.

Since the Radio Namaskar is the first community radio in Odisha, it has built a close relationship with the community and wide networks with other community radio stations across different states. While narrating the relationship with other CRSs, Mr Andaz, as the station manager said, "We often collect or exchange program contents with 'Radio Alla' of Kakinada 90.8 FM of Andhra Pradesh. On our request, they design cyclone alerts and prepare content in Telugu language focusing on the information needs of the fishing community." (Interview, Puri)

One of the main challenges is empowering and enhancing coping mechanisms and resilience among women communities during disasters. Across the world and in the Asian subcontinent too, men and women experience disaster differently. The women are considered passive recipients of relief and financial assistance and are bounded by social and customary norms affecting their ownership of technological devices as well as decision-making capacities even on matters related to their physical outfits. These pose significant challenges for women participation/engagement in disaster risk reduction. In disasters such as Gujarat Earthquake (2001), the tsunami in Tamil Nadu (2004), Super Cyclone in Odisha (1999), Bihar Flood (2005) etc. many women lost their lives.

Radio Namaskar has created 72 listener groups led by women in different villages of Konark, covering various day-to-day and contentious women's issues. They have trained women volunteers from the community who contribute content like interviews, discussions, and stories

for upcoming programs and provide feedback for previous programs. At the same time, Radio Bulbul stresses the capacity building of women communities (focused on minorities) through improving technological skills and addressing the digital divide.

In response to cyclone Yaas, these two CR stations, sent risk alerts to women listeners groups on a priority basis. The station staff and volunteers keep in touch with them through alternative modes of communication (i.e. over phone calls, social media, personal visits and programs narrowcasting). “Another critical initiative of enhancing women’s engagement in the CRs is that if women are informed and empowered, they take care of the family members. Hence, various workshops are organised at the community level, especially to train women in disaster preparedness, rehabilitation, rescue and trauma healing, social production activities, and home-based economic activities following a disaster” said Rojalin, a women station manager of Radio Namaskar (Interview, Puri).

The two CRSs mobilised more than a population of 5,000 in the several parts of the low lying areas of Bhadrak and Konark. They summarise, “in the aftermath of a disaster, scarcity of foods and basic amenities remains an important factor for the community. It is equally important how quickly they will generate revenues.” The CR stations of Konark and Bhadrak have given in-house training to vulnerable communities over the years about how to prepare kitchen garden for (cultivation of daily-need vegetables), conservation of natural seeds, tree plantation, livelihood generation and climate-sustainable cultivation. Experts (agriculture scientist) are occasionally invited in the station for helping the agriculture-related queries.

On inquiry into the post-disaster initiatives, the CRSs talked about various activities such as identifying beneficiaries for relief and aids from government sources or multilateral agencies,

assessing immediate needs of communities, bridging the gap between officials and communities and gauging the information needs of different categories of communities (i.e. young masses, old age and children). Following the path of disaster intervention of Radio Bulbul and Radio Namaskar, several other community radios such as Radio Baliapal in Balasore district, Radio Swaraj in Jajpur and Radio Upkar in Keonjhar, added disaster risk reduction activities into their programming.

3.7. Conclusion

Discourses in Indian disaster research have largely ignored the exploration and importance of communicative practices in disaster risk and climate change. A myriad of literature generated mainly focuses on an external, materialist and objective oriented reality –emphasised by various types of 'assessment' studies (Arora, 2018). In the different international frameworks, institutional actors are conferred myriads of responsibilities for alleviating the disaster risks and operationalising post-disaster management activities. International agencies, national governments, and local administration have emphasised building disaster resistance infrastructure and social capital to achieve global sustainable goals (MHA, 2019). As an obligatory act, the Union and state governments deploy the latest cyber technology and media ecosystem to disseminate crucial and updated risks or hazard alerts for the well-being of citizens. As a normative function of mainstream media, it contributes to society by sharing information uniformly and as a medium is unable to reach diverse segments of the population.

A local community is more likely to respond and bounce-back from a disaster; if it has access to reliable information to act collectively. Communities must be secure and develop their own capacities, infrastructure, resources, and communicative ecosystem to alleviate climate

vulnerabilities. Community radio endows a platform where ordinary people and marginalised communities, through daily media activity, contend their right to communicate and active citizenship (Malik, 2020). Taking the lead in empowerment of marginalised communities, CRSs adopt disaster risk reduction approaches centred on vulnerable sections of society. However, the state has not appropriately acknowledged the need of community radios in the list of emergency tool-kits and risk reduction policies (Harvey, 2011). Also the licensing application process in India is lengthier and regulations bounded.

Although community radio cannot restore the losses and give direct financial assistance to the disaster victims, it can boost community connectedness, community conciseness, and collective action for coming out of the crisis. Like in other parts of the globe, CR stations of Odisha have come to the forefront in order to augment disaster risk reduction activities and spearhead disaster resilience culture across the state. First, their proximity to the community helps deliver the most reliable/trusted information on time as a preparedness measure. Second, they bring local actors and communities on a platform where both parties share ideas, dialogues and measures on emerging issues related to emergencies. Third, instead of being operationalised during an emergency, CR stations mobilise communities to build local-based emergency response solutions and take long term measures to become resilient communities. Lastly, the main aim of the two radio stations is to engage women communities in disaster readiness and empower them for safeguarding their households.

When we talk of the crucial role of CRSs in building resilience communities, the infrastructure resilience of CR stations in disaster-prone areas remains questionable. In the last few severe cyclonic storms, the gale speed reached 200 kmph, which abruptly pummelled the physical infrastructure – the tower of community radio was not spared. The transmission tower of Radio

Namaskar was severely damaged during Cyclone Phailin and Fani. However, government and donor agencies must come forward to extend their support and there should be a policy framework for restoring transmission towers and damage control.

Chapter-6

Conclusion: ICTs and the Rise of Digital Humanitarians

Human progress and disasters can't be understood separately, they are both interrelated, and are two sides of the same coin. Most climate scientists agree that climate change and global warming are the main reasons behind the increase in the intensity and frequency of natural or climate-related disasters. The rising human-induced disaster, epidemics and pandemics are other components added to the disaster bucket list. Over the years, certain occurrences of hydrological disasters (floods, cyclones, and tsunami) around the globe, especially in the South-Asian context, have cost thousands of human lives and huge economic losses. This thesis studies cyclone management in Odisha, an Indian state, and what role ICTs play in emergency response, especially from a communication perspective. Every year, one or two severe cyclones strike Odisha, sometimes during the arrival of the monsoon and post-monsoon seasons. Cyclones are associated with windstorms and heavy rainfall; sometimes, heavy to very heavy rain causes floods in low-pressure areas.

At the time of writing the conclusion of this thesis, several northern districts of Odisha state were facing the flood situation due to heavy rain caused by a deep depression over the Bay of Bengal. A total of 0.96 million people (as officially declared) from more than 251 villages of Balasore, Jajpur, Mayurbhanj and Bhadrak were affected due to the north Odisha floods (NDTV, 2022). The IMD issued several risk alerts earlier, mentioning a deep depression formed over the Bay of Bengal, and also sent emergency warnings to respective district authorities after continuously monitoring the atmospheric movement. The chief minister of Odisha undertook an aerial survey of the flood situation and directed the Special Relief Commissioner (SRC) to take care of disaster victims at the emergency zone. For the rescue and evacuation, more than 58 teams

comprising personnel of NDRF, ODRAF, and fire services were deployed in Mayurbhanj and Balasore districts. Also, spontaneous volunteers, such as the Panchayati raj department, women's self-help groups and others were engaged in the evacuation process.

As mentioned earlier in this thesis, the Government of Odisha sent various risk alerts over multiple platforms, including television, SMS, social media platforms and WhatsApp groups. The idea behind issuing risk alerts is to communicate important messages and updated information to the most vulnerable citizens and engage response authorities. The state also relentlessly works to deploy the most advanced information technologies and communication infrastructure over the most susceptible parts of the state to lessen the risk of disaster. Since the 1999 super cyclone, the Government of Odisha realised that real-time information and the development of communication infrastructure is a critical need for emergency management, and could contribute toward building resilience. Thus, in current development, on September 21, 2022, the Government of Odisha decided to invest INR 400 crores to strengthen the state's disaster management capacity with advanced technologies and intensive training of engaged authorities.[15]

As innovations are evolving at a rapid pace, it is high time that administration should focus more on including various 'Big Data' technologies to improve emergency prediction and relief efforts. Since we are in the digital age and a networked society, data is looked upon as a source of information; information as a source of knowledge; and knowledge is a source of power (Hibini &Shaw, 2014). Thus, in order to empower communities in the face of an emergency or disaster, it is essential to disseminate real-time risk maps and updated information to vulnerable citizens and concerned stakeholders at all levels. The current advancement of Big Data Analytics (BDA) and

[15]https://www.moneycontrol.com/news/economy-2/odisha-to-invest-rs-400-crore-to-boost-disaster-management-capacity-9214471.html

the Internet of Things (IoT) shows a new direction to the citizens as well as disaster management authorities to obtain cutting-edge assistance and improve insights for advanced and timely decision-making.

Keeping this notion of disaster response mechanism and following a cyberpragmatic approach, the concluding chapter of this thesis has four sections following the introduction. The first section highlights the important aspects of all the chapters in the thesis. Since the research is an in-depth critical review of ICTs-led disaster management activity in Odisha, this part also brings forth the various insights and learning gathered from each thematic chapter. The following two sections endeavour to fathom and explain the greater relevance of the study by offering an extended analytical approach to thinking about and further comprehending the field of disaster management. With a focus on new modes and practices of ICTs, these parts take the theoretical insights of this research study further by focusing on more contemporary concepts for contextualising the research problem. Based on the learnings drawn during fieldwork and from the thematic chapters, these two sections dwell on a) ICTs and crowdsourcing activity; and b) the evolving area of digital humanitarians. As a wrap-up, the final section attempts to bring the thesis together with a few quick reflections.

6.1. Overview of the Thesis: Reflections from the Chapters

The overall question raised by this thesis is an investigation of mediated activity, especially digital – in emergency response and examining the role of different information and communication tools in a disaster. This research work specifically analyses the tools and applications of ICTs in the mediation of activity and communication with stakeholders and citizens

during cyclones. This thesis provides a comprehensive overview of the ICTs infrastructure created and processes adopted for disaster management during cyclones in the Odisha state in India.

The first chapter (Introduction) highlights the concerns of natural calamities and disasters with a short description of the world scenario as well as India, and the need for Information and Communication Technologies (ICTs) in the field of disaster communication. The chapter also focuses on the key functions of ICT tools and applications for disaster management interventions. It also sets the stage for this research by exploring the gaps in the field of disaster communication. The chapter also provides the major frameworks adopted in world conferences and the significant shifts that have occurred in disaster management policies and practices worldwide. It especially sheds light on the various policies, processes and practices initiated in the Indian context for handling the risks of disasters and emergencies. Moreover, it examines in detail the numerous difficulties associated with placing and using the ICT infrastructure in disaster-prone areas. Further, it presents the theoretical background that subsequently guides the thesis and supports the interpretation of field data.

The second chapter (Methodology) gives a detailed description of the research strategy, fieldwork, and data analysis techniques employed to complete this study. The data for this study was gathered through in-depth fieldwork conducted across the different disaster-prone areas of Odisha (for the case studies) as well as non-prone areas (including Odisha and Andhra Pradesh to get insights about cyclone Titli). Also, several kinds of data sets were collected, such as, different units of web pages, screenshots of mobile applications and digital platforms. During the fieldwork, people's responses were acquired through formal and informal interactions to understand their everyday experiences, observations and exchanges. In addition, the researcher did field-side participant observation in cyclone-hit areas, where several response and rehabilitation drives were

carried out. The observation sites included disaster-hit/affected places (after both cyclones), shelter houses, tower houses, regional information dissemination centres (IMD Offices), and assessment workshops. The researcher used several methods for data collection, and interviews were the primary method. The interviews were mostly conducted with government officials, institutional actors, and non-governmental workers regularly involved in emergency management activities. Apart from the interviews, relevant data was collected through on-site informal interactions, browsing the government's official documents, participant observation of selected events or activity systems, in-depth interviews, and focus group discussions.

The data analysis was carried out after an immersive reading and coding of in-depth interviews and FGD transcripts, field notes, visual and textual documents, and social media content to develop relevant themes and concepts. The coding procedure assisted in relating the codes and categories to the theoretical framework of the thesis as well as separating the content to develop the thematic chapters. Besides that, the relevant readings related to the theoretical and conceptual framework carried out during the review of literature immensely helped to analyse the data extracted from the fieldwork.

There are significant socio-political and infrastructural changes that occur following a disaster. The third chapter pulls together the various transformations that manifested after the great 1999 super cyclone in Odisha to respond to additional risks and hazards. The chapter gives an overview of the most important debates and discussions around ICTs in emergency situations and how they constitute relationships with humans in societal structure. The social transformation section brings together various ideas that advocate disasters as an opportunity to strengthen the social systems and alter response practices. The chapter is guided by the understanding gathered

from the scholarly works of Sorokin (1943), Barton (1969), Dynes (1987), Medina (2011), Guggenheim (2014), Aguirre et al. (2016), Mosel (2017), Solnit (2010), Hannigan (2010), and Beck (2006). The central argument drawn from the cited scholars is that a disaster results in a paradigmatic shift in how the social systems operate, leading to changes in human behaviour and societal structure towards a new/adaptive society. Also, it contends that disasters and change are interrelated, and a resilient community is a result of disasters or frequently occurring risks being borne by it. The politics of disasters and transformation trace the larger arguments of 'disaster as producing politics' and 'politics producing disaster' which refers to the scholarly texts by Abney & Hill (1966), Rozario (2007), Klitzsch (2014), Scott (1976), Pelling & Dill (2014), Sobolev et al. (2012), Egorova & Cullen (2014), Le Billon & Waizenegger (2007), and (Hewitt, 1998). The larger debates of these scholars indicate that disaster impact and reconstruction reshape political systems and the governing space humans inhabit, and a disaster is a precursor to a robust political system. The chapter highlights the embeddedness of humans, disasters, and infrastructure. It highlights that infrastructure has dual natures: material and symbolic; the former indicates that as the safeguard against disaster, humans build material infrastructure or resilient infrastructure, and the latter helps to understand the collectiveness built and humans make meaning by performing on it. To support this argument, the various conceptual underpinnings were referred to, such as Sims (2007), Bhat (2020), Bowker and Star (1999), Star and Ruhleder (1996), Larkin (2008), Turner (2020), Edward (2001), Marvin and Graham (2001), Parks & Starosielski, (2015), Akhus (2002), and Granger (1999).

As the chapter delves deeper into the process and brings insights from the data to explain the transformation, it argues the 1999 super cyclone is a departure point from which the socio-political transformation and people's consciousness towards disaster response have been changed

into a new prospect. Based on the literature, the researcher pulls together various changes initiated by the Odisha state. Initially, as an organisational transformation, the state created an independent body called OSDMA in order to address the emerging crisis in the state as well as invest resources in disaster risk reduction capacities for other risks and hazards. Besides that, the state focused on capacity building and community empowerment programmes at the grassroots level. With the help of UNDP, the government of Odisha started a Community Contingency Plan (CCP) on a pilot basis in Balikuda Panchayat of Jagatsinghpur district. With the successful trial of CCP, it was extended to several coastal districts of Odisha. Later, many community-based volunteer groups (under Village Disaster Management Plan), such as the Cyclone/Flood Shelter Management Committees (C/FSMC), Apada Mitra Group (AMG), etc., were created at the community level to manage local knowledge systems and take up first-hand measures to prevent and save people from any forms of life-threatening conditions. Furthermore, the state collaborated with various non-governmental organisations and multilateral humanitarian agencies to work and build a resilient state and community.

As political transformation is the prime concern, the state has changed various policy frameworks and guidelines in advancing the National Disaster Management Act-2005. In a major political change, it transferred the various roles and responsibilities of each level of the government's hierarchy from the state authority to the panchayat level. It also conferred powers to the chairpersons, such as the Collector at the district level, the Block Development Officer at the block level, and the Sarapanch at the panchayat level, and instructed them to act based on what the situation requires. Moreover, in a recent development, the OSDMA has created an Inter-Agency Group (IAG) to maintain a check and balance between partner NGOs and government organisations. The infrastructural changes flag the various material and communication

infrastructures developed across India as well as Odisha for response to future risks or emergencies. During the last several years, more than 800 multipurpose shelter houses were built across the state. Also, school, college, and function hall buildings are designed in such a way that they can be used as citizens' shelters during any form of natural disaster. The shelter houses are equipped with a variety of tools and equipment that are necessary for rescue and response during a disaster. Additionally, community members associated with each shelter house were trained to use and maintain these instruments, which fosters a sense of ownership within the community. The state has established a robust communication system comprising the Early Warning Dissemination System (EWDS) network, telecommunication infrastructure, and media houses (including traditional and new media) in order to channelise risk and hazard warnings to the last mile. At the hyper-local level, especially in the most vulnerable areas, several community radio stations have been licensed and are functioning for the information and communication needs of the marginalised or vulnerable communities.

The fourth chapter draws on the analytical basis from the conceptual framework of Cultural Historical Activity Theory (CHAT). It focuses on subject-to-object relationships and tool-mediated activity in an emergency context. It analyses how human beings, considered subjects, are mediated by various tools and artefacts in specific contexts. The chapter cites the pioneer of the activity model Vygotsky (1978), who talks about 'mediated action', which he initially proposed to explain the pedagogy of human learning. This chapter is also based on various scholarly insights on the 'mediation of activity' by Leontiev (1978), Wertsch (1985), Nardi (1996), Yamagata-Lynch (2010), and Kaptelinin (2014), those who consider tools (physical or psychological) play a significant role in attaining an object. And the objects are differently perceived based on the needs of the moment. Through these readings, the study demonstrated how digital tools, i.e., the World

Wide Web, mobile phones and applications, and social media mediated the activities of risk warning, rescue and response, and relief activities during an emergency. The thesis argues the functions and characteristics of digital tools and applications change based on the socio-political environment—like how they act as intermediaries, network of networks, aggregators, and crisis mapping networks in the phase of emergency preparation and relief operations. Following the features of activity theory, it also argues that in some cases, the tools may not be engaged in any specific activity but may motivate users to do a specific activity.

While explaining the actors' (subject) roles within the activity system, the researcher refers to scholars like Engeström (1987/2015), Sam (2012), Star (2010), Asmolov (2016), Nardi (1996), Kaptelinin (1996), Kuutti (1996), Nyoni (2013), Heo and Iee (2013), and Er. and Lawrence (2011), who talk about how within the activity system the discursive practices are shared among various actors. Through insights generated from these scholars, it argues that the actors' roles also change over certain contexts based on the needs of the environment—like their different relationships with others as negotiators, intermediaries, and mediators in the phase of risk preparation and crises. The thesis argues that the relationship is sometimes considered cooperative and open, while contradictions arise between government actors and citizens in certain other circumstances. As suggested by Barton (1969), in the emergency environment, spontaneous volunteers play a role as intermediaries between humanitarian agencies and disaster survivors or victims, enabling the coordination of collective action with the community.

While examining the communication strategies and practices of community radios in their disaster communication in various disaster-prone areas of Odisha, the fifth chapter then studies the programmes and initiatives of Radio Namaskar of Puri and Radio Bulbul of Bhadrak for disaster

risk reduction planning and community mobilisation efforts. Despite the various measures taken up by the state, the services of ICTs and digital technologies have yet to reach several pockets of the country, especially some disaster-prone areas, due to various socio-political factors. In this context, community radios serve as dependable mediums for bridging information gaps by connecting with marginalised communities. The thesis contends that community radio plays a role as an intermediary between government officials and vulnerable communities. During the different phases of an emergency, officials are invited to the radio stations to convey disaster risk alerts and warnings to vulnerable citizens through the live-phone-in programme. It is also observed that the contents of community radio are prepared considering the diversity of the receivers. During cyclone Fani and Yaas Radio Namaskar aired programmes in Odia and Telugu languages to reach the migrant fishing communities. As suggested by Malik (2020), community radio is a platform for ordinary citizens and marginalised communities- to assert, through daily media activity, their right to communicate and active citizenship. Thus programmes produced by community radio discuss, prepare for, and generate grassroots-level initiatives for disaster response. In addition to disaster communication, the radio station involves people from vulnerable sections of society, such as women and the fishing community, in community resilience programmes. They provide skills and train women from the community in kitchen gardening, disaster resilience cultivation, and natural seed conservation techniques. Further, the researcher infers that since women are thought to be vulnerable to disasters, the Radio Bulbul of Bhadrak frequently engages with minority women groups to increase ICT literacy and access, generate, and share crucial information during the phases of an emergency.

The thesis, in all different aspects extensively discussed in the thematic chapters, has tried to explain the role of digital tools in emergency response and disaster communication in a complex

socio-political environment. In all the instances included in the chapters, various tools and applications of ICTs are highlighted that build relationships with multiple actors, and the actors refer to the citizens, who are the major entities of the activity.

The analysis of the thesis largely prioritised, apart from the instrumental role of digital technology in the emergency response, the relationships among actors in the case of an emergency or crisis in their particular environment. The various field of ICTs intervention are analysed indicate how tools are perceived to resolve tensions between actors, control users, and engage them.

The thesis attempts to explain the concerns and discourses related to ICTs in emergency response globally and in the Indian context; and then highlights various interventions of ICT-led disaster management activities at the grassroots level using the scholarship of tool-mediated activity and mediated communication. Building on the theoretical understanding of mediated relationships, the thesis also explores and analyses the relationships that users forged outside of the socio-political boundaries of the disaster-affected areas. These include diversified activities such as crisis mapping, mobilising resources, and preparing databases for reaching humanitarian goals. In doing so, the thesis advances the possibilities of weaving together the thematic areas of this research and point to some emerging thrust areas within the field of ICT and emergency management that may be investigated further as an academic inquiry topic. A few significant areas that emerge out of the discussions and analyses in the chapters of this thesis are ‘crowdsourcing’ and ‘digital humanitarians’.

6.2. Emergency and Crowdsourcing Activity

Taking advantage of the ubiquitous nature and collaborative features of ICTs, various initiatives have been created across the globe to increase citizens' participation in emergency management activities. New technologies have demonstrated a novel method of utilising large crowds or volunteers online. Also, using the internet and social media platforms in emergency operations opens up an avenue for communication during various phases of an emergency. The purpose of using new information technologies and specific platforms in emergency management is to enhance disaster response and channelise valuable information and communication within engaging agencies and citizens. All kinds of communication activities undertaken during an emergency are reflected upon in the chapters to explain the role ICTs play in mediating relationships between citizens and disaster response. Most studies on ICTs and the emergency management context have emphasised the instrumental role or administrative functions of new information technologies. However, throughout this thesis, an attempt has been made to delve deeper into the relationships that technologies mediate within the emergency context. The thematic chapters, try to analyse how citizens are using different tools and applications of ICTs during an emergency and generating an abundance of content or databases such as images, videos, audio, and text, relying on the features and flexibilities of technologies. All the databases are stored and/or shared across different platforms including online and offline, such as email, web applications and social media sites like Facebook, Twitter, WhatsApp, YouTube and public gatherings. Government institutions and non-governmental organisations have been using those databases to leverage rescue and response, cooperation, and delivery of relief materials to the affected communities by adopting multiple applications and crowdsourcing methods.

In the current context, crowdsourcing has become a potential platform for sharing spontaneous and real-time data when citizens face any form of emergency—it's a human-generated, decentralised contribution of information online. Crowdsourcing for a communication platform is widely used in various phases of disaster management (Harrison & Johnson, 2016). In the general terms 'crowdsourcing' can be understood as "an online, distributed problem-solving and production model' that uses the collective intelligence of online communities" to achieve a particular organisational objective (Brabham, 2013, p. xix). Through crowdsourcing platforms, the online users, or crowd, are free to participate in a goal-oriented activity or they voluntarily generate content for a unique purpose. Asmolov (2016) defines "crowdsourcing as one of the most notable phenomena in relation to digitally mediated crisis response" (p. 241).

Here in the thesis, crowdsourcing indicates two major aspects relying on the functionality of the services. The concept of a 'crowd' reliant on digital technologies that analyses the role of users or collective actors in a digitally mediated emergency response context. The concept of 'sourcing' emphasises the activities of digital users in a particular situation (referring to the emergency context) and, more specifically, the digitally mediated mobilisation of user resources. Crowdsourcing does not refer to any specific platform but rather a digitally mediated practice that may completely rely on a specially designed platform or use other platforms as a vehicle, such as social media channels or blogs. The user's participation in the emergency response is varied. Often, a few types of users participate in the 'creation of different types of maps instantly', and the platforms used for that task are often called 'crowdsourcing' (Simon et al., 2015 cited as in Asmolov, 2016).

Harrison and Johnson (2016) underline that crisis crowdsourcing takes both active and passive forms. Active crowdsourcing is a unique platform created and operated by individuals of the impacted community, e.g., Ushahidi or Sahana. In the wealth of literature on the area, many scholars opine that in response to an emergency, several platforms were created around the world, e.g., Scipionus post-Hurricane Katrina, the 'map-mashup' during the 2007 Santa Barbara Wildfire. Those platforms were designed to enhance disaster response and resource allocation based on a real-time database of the disaster victims/survivors – it can be utilised further to connect and coordinate with responders. In recent years 'passive crowdsourcing' via social media has emerged as a tool to communicate important information during an emergency. Social media is increasingly used by civil society organisations as well as government institutions to gauge public sentiment and citizens' activity in an event (Harrison & Johnson, 2016). According to Alexander (2014), crowdsourcing is a collaborative practice that is founded on the premise that citizens are actual 'first responders,' while the platform enables the mobilisation of social capital in the form of people's knowledge, skills, networks, leadership, support systems, and so on. Looking at the relevance of the platform, Alexander sheds light on popular platforms like Ushahidi or Sahana. He underlines that these platforms are beneficial in the context where disaster management and response mechanisms have not been well developed and lack adequate resources. Ushahidi (www.ushahidi.com) is an open-source crisis mapping platform accessible in the countries of Kenya, Afghanistan, Haiti, and Mexico. It makes use of Web 2.0 technologies to incorporate data from many sources, including phones, web apps, emails, and social networking sites, in order to deliver instantaneous, up-to-date, and publicly available maps that in turn help humanitarian organisations to deliver relief aid and coordinate with them.

The work of OSDMA and several non-governmental organisations, retrieves databases from multiple sources and uses them for different purposes. One can find the prevalence of all these areas mentioned in crowdsourcing methods. As mentioned earlier, risk mapping institutions and government officials prepare maps showing where a disaster is likely to happen. The officials of IMD branches across the country and OSDMA in Odisha, have been working around the clock to monitor the risks and hazards. The crowdsourcing application helps the officials to a great extent to follow databases from the world's leading crisis mapping sources and deliver accurate information to the citizens within a short duration. Another challenging task of emergency preparation is delivering risk warnings or alert information to vulnerable people due to spatio-temporal constraints. The primary purpose of risk warning is to provide citizens with accurate information and different signals on the eve of an impending disaster. One possibility is to use big data and statistical algorithms to identify the exact location where different types of information should be sent. Additionally, it has been noticed that government organisations have used crowdsourcing methods to disseminate various risk alerts (depending on the severity) to citizens who reside in sensitive locations.

Moreover, compared to traditional modes of relief, leveraging crowdsourcing has various advantages. While mentioning the initiatives of the Government of Andhra Pradesh, K. Siva, Mandal officer of Palasa, said in the aftermath of cyclone Fani, the victims were requested to lodge complaints and queries as well as disaster losses to a toll-free number 1100 (known as *Prajale Mundulu* or People First), by entering their UIDAI/Aadhaar numbers. As soon as the declaration was made, they got thousands of phone calls from different parts of the disaster-affected areas, and the victims registered their needs and grievances on the portal. The database generated from

people's submissions was categorised by applying crowdsourcing methods for initiating rescue operations, rehabilitation processes, and allocation of relief aid to the most affected.

In the conventional mode of emergency management activity, citizens were conferred more responsibilities, such as performing rescues, administering first aid, and transporting victims to the hospital before professional response personnel arrived. Now, in the era of Web 2.0 and the proliferation of the internet, online forums have made it possible for individuals to exchange information and organise citizen-led actions beyond the geographical boundaries that often limit the impact of emergencies. The advancement of geographical information systems (GIS), the Global Positioning System (GPS), and other techniques, along with the rise of volunteered crowdsourcing networks, have made it easier for governments and citizens to collect location-specific data about where victims are stuck and about their current needs. Also, large-scale location data or geo-tagging data gathered from mobile phone devices have enabled creative approaches to tackle these challenges. Referring to mobile phone location data, Takahiro et al. (2022) remark that it "enables us to observe, estimate, and model human mobility dynamics at an unprecedented spatial-temporal granularity and scale" (pp. 1).

This thesis analyses how citizens use the various tools and applications of ICT for different purposes in their respective premises to deal with a particular situation. It has been noticed that the disaster victims of cyclones Titli and Fani have generated various live audio-visual contents on their mobile phones related to destruction and if they got stuck during landfall. Also, non-government organisations like Radio Namaskar and Radio Bulbul shared a lot of information through tweets and social media posts. As per the government officials of OSDMA, through crowdsourcing tools, they collected databases in different formats, including emails, SMS, mobile

applications, tweets, and other unstructured sources. Then, they did first-level analysis and summarised by creating clouds, trends, and using other filters. It helped them to categorise requests into the most urgent categories and group data into bins (such as the most often requested resources, like medical help, food, shelter, or people trapped). The relief organisations followed the same strategies the government applied for delivering aid on the most priority basis. Social media platforms, especially Facebook, have developed a unique feature following the frequent occurrence of disasters. When an emergency or disaster strikes in any location, users will receive a notification from Facebook asking '*if you are safe*.' The user has to do nothing more than click '*I am safe*' or '*Tell Friends You're Safe*' to instantly send a notification to the user's friends on the social media site. As per the Facebook platform website, when an emergency or destruction occurs, crisis mapping agencies alert Facebook. Following this, Facebook's safety check is also activated when citizens in the area post about the situation (Pitofsky, 2021).

The crowdsourcing method is becoming an emerging feature of ICTs and digitally mediated communication. The disaster-prone nations have attempted to integrate crowdsourcing techniques into their emergency management activities while dealing with large numbers of citizens and big data. Globally, several initiatives have been recorded earlier when emergency management officials and disaster-affected citizens produced location-based and real-time information on critical events. The Haiti earthquake of January 2010 and Hurricane Sandy of 2012 were the most recent examples when citizens generated a large amount of data through multiple social media channels. In India too, in the last few disasters, a huge amount of data has been generated by citizens, not only in Odisha but also in several parts of the country, such as cyclone Ockhi in Kerala 2017, Uttarakhand flood 2013, Maharashtra flood 2005 and recently the Assam flood in June 2022. During emergency times, social media has become an important channel for

citizens as well as government institutions to generate, store, and pass crucial elements. The database or big data shared across various web platforms, including social media, attracts global citizens to stand in solidarity with disaster-affected nations. It is transforming how humans prepare for, cope with, and understand humanitarian disasters. As a result, it gives rise to the notion of digital humanitarians.

6.3. Digital Humanitarians: A Step towards Global Humanitarian Action

Digital humanitarians is an emerging concept both in the field of emergency management and in the world of academia. It offers the riveting narrative of how mobile technologies, computer programmes, and massive amounts of digital data (big data) work in collaboration with a dedicated global network of new humanitarians prepared to provide assistance in disaster-affected regions in hours rather than occasional intervention (Meier, 2015). Volunteers and professionals from all around the globe unite online for disaster response activities as digital humanitarians. They have the will to change the world, and they succeed in doing so by quickly organising online in cooperation with global humanitarian groups. They analyse massive amounts of data as social media posts, SMS, and pictures from satellites and UAV (Unmanned Ariel Vehicle) in almost real-time to help relief operations throughout the globe. Digital humanitarians are providing a new dimension to the perspective of being a humanitarian. According to Meier, no prior expertise is required to become a digital humanitarian; all you need is a 'big heart and an Internet connection' (p.1).

The notion started in 2010 during the Haiti earthquake and was taken forward during the massive outbreak of the Ebola epidemic in West Africa. The new digital sources of information, from social media platforms to high-resolution satellite imageries, and the new platforms driven

by advanced computing, are propelling digital humanitarians ahead and shaping the future of disaster emergency response to new heights. According to Meier (2015), two critical events occurred in the mid-2000s that changed how we (humans) learn about and respond to disasters. First, a set of changes occurred within the international humanitarian system. Secondly, the quick advent of mobile technologies, the popularity of social media, and the ability to access big data in one place motivated people to do something innovative or humanitarian.

On January 12, 2010, a massive earthquake in Haiti devastated the island nation, claiming thousands of lives, injuring thousands more, and necessitating huge amounts of humanitarian aid. However, this response was noticed differently. Apart from the local communities and national government, many international communities joined together to help the victims. At the same time, a large number of digital volunteers worked together to identify the location of the people trapped in the rubble by texting for help. The volunteers created crisis maps (OpenStreetMap maps that pinpoint areas most affected by disasters and where people are in need of assistance) and mobilised thousands of people who were not in Haiti. Social media platforms were flooded with millions of tweets seeking help. The digital volunteers collected tweets based on geo-tag and created many dots on maps to reach out to the medical team and humanitarian groups. People across various parts of the globe spent relentless hours, some even days or weeks of their own time, helping people remotely, never meeting each other. Hundreds of volunteers were also trained online, mostly via Skype, and later mapped the damage and urgent needs reported from Haiti across multiple media outlets. Humanitarian organisations worked tirelessly to support search and rescue efforts, launch SMS lifelines, and send choppers and OpeStreetMap to rescue and post-disaster activity (Meier, 2015). Also, a massive campaign was carried out online by volunteers, asking friends and colleagues from other countries to help.

Following the humanitarian assistance in Haiti, thousands of volunteer networks worldwide emerged and participated online during disasters while advocating for a novel cause. Humanitarian networks addressed several key issues around the world, including human-caused crises, refugee issues, epidemics, and pandemics. They used automated mobile applications, social media platforms, Artificial Intelligence (AI), and crowdsourcing platforms for crisis mapping, crowdfunding, digital payment, collaboration, and providing real-time maps following a disaster. Across Europe and in Syria, Lebanon, Libya, and Turkey, various initiatives have been taken up for the rehabilitation and education of refugees (Menashy & Zakharia, 2019). In India, although digital humanitarian action is not pervasive and diversified, a lot of efforts are undertaken by the government and active citizens to help disaster-affected communities. For example, during cyclone Ockhi in Kerala, several volunteer groups were involved during rescue efforts; the victims who were stuck in risk zones were tracked and rescued through geo-tagging technique. Moreover, the people and government of Kerala were able to attract the attention of Indian citizens as well as NRIs to stand with the disaster victims and the state of Kerala. As a result, the Kerala government raised 120 crore rupees through crowdfunding and direct cash transfers from other states, philanthropic organisations, and individuals (Nidheesh, 2017). In India, during the COVID-19 outbreak, the PM CARES fund collected around 10,990 crore rupees till March 2021 through crowdfunding (Bureau, 2022).

After the devastating cyclone Fani wreaked havoc in Odisha, Bollywood stars have come forward to encourage their followers to contribute to the afflicted state. On the social media platform, the tweets and retweets by Raj Kumar Rao read “Donate as much guys. Let’s help rebuild Odisha after Cyclone Fani.” Others included: “For all of you who want to contribute and help Odisha, let’s do whatever we can to help” by Abhishek Bachchan; “Cyclone FANI has damaged

our state, not our spirit. Let Us Rebuild Odisha together" by Varun Dhawan; "Prayers for all in Orissa, Bhopal, Andhra Pradesh and West Bengal as the #CycloneFani approaches. Stay Safe and Strong" by Boman Irani. Thus twitter handles were used by celebrities to attract others to help the disaster-affected state. Subsequently, several philanthropic organisations, celebrities, and other state governments donate relief assistance through the CM-Relief Fund.

In 2012, the Digital Humanitarian Network (DHN), an international consortium, was created to "promote awareness of these new organisations, deliver a 'connecting service', and improve guidelines on how to work together" (History and Today, 2022). In the previous announcement, Microsoft declared it would invest 40 million USD in applying AI to the field of humanitarian action as part of a programme on disaster response and other emerging issues (human rights, children's issues, and refugee crisis) (Lerman, 2018).

6.4. Conclusion

This thesis closely studied an investigation of mediated communication, especially digital in responding to a disaster, and selected cases examining the role of different tools and applications in context of cyclone response. The research has been carried out with the broad theme of mediated activity, especially digital, in relation to disaster management. Although it is a study carried out by focussing on cyclones, the stories and insights it provides from the field linked with the broader thematic areas of mediated activity, the socio-political transformation caused by disasters, disaster communication, and community resilience associated with emergency management.

The thesis emphasises that, in addition to the functional aspect of ICTs in emergency response, examining the relationships among emergency response actors in their particular socio-political and physical environments is crucial. The insights, stories, and examples throughout the

chapters claim that the use of ICT tools and applications in emergency response considerably mitigates the tension that arises in a crisis context and help user's engagement. The findings are also beneficial to the field of sociology of disaster as they emphasise the role of ICTs in connecting various actors, coordinating spontaneous intermediaries and organising individual/collective action.

Moreover, this study also seeks to contribute insights into crisis communication. It underlines how the crisis can be lessened through efficient use of various ICT tool for informing affected people, emergency management, or understanding the risk. Also, it demonstrates how a crisis can be dealt in the context of mediated relationships between humans as subjects and crisis management as an object activity. Crisis communication isn't just about sending messages to get people to act in the way you want them to, but also about how digital artefacts help build the user's position within an emergency-related activity system.

This study also opens possibilities for future researchers to look into the role played by ICTs in response to disaster management in various parts of the country through the lens of mediated communication, especially digital tools and applications. The thesis considers that since climate change is frequent and leads to increasing intensity and frequency of natural disasters globally, this is a pertinent time for researchers as well as policy-makers to chalk out the needs of communication in the field of disaster management. The exponential growth of ICTs has changed the way humans used to see the world. It is also creating new opportunities to deploy AI, particularly in machine learning and crowdsourcing, in response to an emergency. So, one can take that as a departure point to study how AI constitutes different relationships with the users in response to a disaster.

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Appendix-1: In-depth Interview guide

Appendix- 1.1. In-depth interview guide for Government officials

1. What is the present structure of DM?
2. How did the structure or body of the DM come into force? What is the historicity of the process?
3. Who are the major stakeholders that are involved in the entire process of DM?
4. How to make a connection with the involved agencies/stakeholders, their assigned responsibilities, and the nature of connectivity?
5. Is there a network or link between stakeholders?
6. Does your organisation need any suggestion/support for other stakeholder participation in terms of decision making?
7. What are the strategies followed at the grassroots level?
8. What is the mechanism used in disaster-prone areas? How does it work?
9. What are the communication strategies that have been followed, especially for vulnerable people such as children, women, and elderly groups?
10. How is the organisation involved in action during various phases of disaster, and what is their process of involvement?
11. How does your organisation communicate with the involved agencies, and what are the major channels available for communication?
12. What role do community members play during preparedness and crises?
13. How do you engage community members in capacity building, empowerment, and participation?
14. What are the challenges faced in initiating communication strategies at the community level?
15. Who are the major players who successfully tackle the various challenges of disaster?
16. Apart from the disaster, how frequently do you keep in touch with other agencies of DM for updates on plans or strategies?

Technology Section

1. What are the communication tools used for DM?

2. How are the new communication tools helping in the various phases of disaster?
3. What information and messages are transmitted using new communication technologies?
4. What are the challenges you face while communicating over technology?
5. How can information be sent to a large number of people, especially in areas where disasters are likely to happen?
6. How do you use new communication tools (such as mobile, television information, or other things) during the disaster?
7. What are the ICT-led strategies being followed to communicate with vulnerable communities?
8. How do ICTs help with communication with the involved stakeholders?
9. How do social media help get information out there? What are the most popular services and what do they do?
10. How have ICT tools been helpful for preparedness (throughout the last disaster)?
11. What are the challenges you've faced in situating ICT infrastructure in disaster-prone areas?
12. How do you work at the grassroots level, especially in disaster-prone areas?
13. What are the special ICTs tools used during a crisis?
14. What are the contents the organisation generates to meet the demands of the people during a crisis?
15. Does this organisation generate ICT-led content for effective communication?
16. How ICTs make you reliable and convenient for information dissemination.
17. How do ICTs help to build informal networks and community groups among the stakeholders?
18. Do you use any tool or application, such as (WhatsApp, social media, etc., for communication?
19. What are the ICT tools being used by community members for community communication, meetings, or informal gatherings?
20. What are the factors influencing the community to provide quick responses?
21. How do organisations manage big data or information overload, especially in a crisis, in terms of the rescue and evacuation process?

Appendix- 1.2. In-depth interview guide for NGOs

1. Tell us something about your areas of engagement.
2. How long you are engaging with disaster management programme?
3. What measures are used at the grassroots level?
4. What procedure is employed in disaster-prone areas? How does it function?
5. What are the communication tactics that have been used for different vulnerable group, especially for the elderly, women, and other vulnerable groups?
6. What is the organization's process for becoming involved during the different stages of a disaster?
7. What are the main routes of communication accessible to your organisation and how does it communicate with the agencies involved?
8. What part do community members play in crisis situations and preparation?
9. How can you encourage involvement, empowerment, and capacity building among community members?
10. What difficulties arise while launching community-level communication strategies?
11. How do people helps in implementing disaster risk management programmes?
12. How frequently do you check in with other DM agencies for updates on plans or tactics when there isn't a disaster?
13. What are the challenges you face while communicating over technology?
14. How can information be sent to a large number of people, especially in areas where disasters are likely to happen?
15. How do you use new communication tools (such as mobile, television information, or other things) during the disaster?
16. How do you communicate with government official during different phase of disaster management?
17. What are the ICT tools being used by community members for community communication, meetings, or informal gatherings

Appendix-2

Appendix- 2.1. Focus Group Discussion Guide

A. Sample of FGD guide

Focus group Discussion
Date:
Time:
Place:
Welcome: Thank you so much for agreeing and coming here for this discussion. Introduction/Purpose of the interview: I am Manas Kumar Kanjilal, a Ph.D. student at the department of communication, SN School of Arts and Communication, University of Hyderabad, doing my doctoral research on disaster communication in Odisha, under the supervision of Dr. P. Kennedy. My study areas is disaster-prone/affected areas. In this connection I am seeking access to community based organisation/disaster affected people to participate in some of its activities, and conduct FGDs among you all as may be needed for my study. Purpose of the focus group: the reason we are having focus group is that we want to more about the cyclone response and your experience and activities around it. Ground Rules: a. We would like everyone to participate in discussion. b. There is no right or wrong answer. c. Every person's experiences and opinions are important. d. Speak up whether you agree or disagree. e. We want you to feel comfortable as your statement are not going to be misused.

f. We will tape recording the session.

Questions:

1. How many times you faced disaster (cyclone, floods or others)?
2. How do you get any risks alerts about upcoming cyclone or any catastrophe?
3. Do you used any ICT tools and applications (Mobile, internet, social media or WhatsApp etc.)?
4. Do you get any risks alerts on your mobile phone (via SMS, WhatsApp messages, social media post)
5. Does government officials/volunteers groups personally inform you before any impeding cyclone?
6. What are the communication strategies that have been followed, especially for vulnerable people such as children, women, and elderly groups?
7. How do social media help get information out there? What are the most popular services and what do they do?
8. How ICTs make you reliable and convenient for information dissemination.
9. What are the factors influencing the community to provide quick responses?
10. How do traditional methods helped during risk identification?
11. Tell us your experience during last disaster.

Date:

Place:

Appendix-3: Consent forms

Appendix- 3.1. Consent form for in-depth interviews

Participant Consent Form

Researcher Declaration

I am a Ph.D. student at the Department of Communication, Sarojini Naidu School of Arts & Communication, University of Hyderabad, doing my doctoral research on 'ICT interventions in Response to Disaster Management', under the supervision of Dr. P. Kennedy. Cyclone turned disaster is my case studies. It is in this connection I am seeking to access various initiatives of federal government, stakeholders, civil society, and community based organisation, and to interview you as may be needed for my research.

I would like to state that:

- Your identity will be kept confidential, unless otherwise stated. While using data for publication purposes, pseudonyms will be used, unless you have consented otherwise.
- The interview with you will be audio recorded, strictly for academic purposes. On your request, I will stop the recording at any time during the conversation. If you wish to say something off- the-record, I will switch off the recording device and will not quote that part of the interview.
- If you wish, you may request to see a transcript of the interview before I use its contents for publication.
- The data collected during my study will be used only for academic purposes.
- The data could be shared with my research Supervisor and/or doctoral committee members, as may be needed.
- The data will be stored at the Department of Communication, University of Hyderabad and will not be made accessible to any outsiders.
- The data collected and the findings of the research project may be published in academic platforms.

- You have the right to withdraw cooperation from the research project at any time, without having to face any consequences.
- Any photographs I may take during my study will be used strictly for academic purposes.
- If you have any further queries about my project, you may feel free to contact my research supervisor, Dr. P. Kennedy, Department of Communication, University of Hyderabad. kennedyp.uoh@gmail.com

Interviewee Consent

I have read and understood the above declaration by the researcher. I, therefore, give my informed consent to be interviewed for this study and to be photographed, as may be necessary.

Name: _____

Signature: _____

Date: _____

Place: _____

Appendix – 3.2. Participant Consent form for FGDs

Participant Consent Form for Conducting FGDs

Researcher Declaration

I am a Ph.D. student at the Department of Communication, Sarojini Naidu School of Arts & Communication, University of Hyderabad, doing my doctoral research on 'ICT interventions in Response to Disaster Management', under the supervision of Dr. P. Kennedy. Cyclone turned disaster is my case studies. It is in this connection I am seeking to access various initiatives of federal government, stakeholders, civil society, and community based organisation, and to interview you as may be needed for my research.

I would like to state that:

- Your identity will be kept confidential, unless otherwise stated. While using data for publication purposes, pseudonyms will be used, unless you have consented otherwise.
- The FGDs with you will be audio recorded, strictly for academic purposes. On your request, I will stop the recording at any time during the conversation. If you wish to say something off- the-record, I will switch off the recording device and will not quote that part of the interview.
- If you wish, you may request to see a transcript of the FGDs before I use its contents for publication.
- The data collected during my study will be used only for academic purposes.
- The data could be shared with my research Supervisor and/or doctoral committee members, as may be needed.
- The data will be stored at the Department of Communication, University of Hyderabad and will not be made accessible to any outsiders.
- The data collected and the findings of the research project may be published in academic platforms.

- You have the right to withdraw cooperation from the research project at any time, without having to face any consequences.
- Any photographs I may take during my study will be used strictly for academic purposes.
- If you have any further queries about my project, you may feel free to contact my research supervisor, Dr. P. Kennedy, Department of Communication, University of Hyderabad. kennedyp.uoh@gmail.com

Participant Consent

I have read and understood the above declaration by the researcher. I, therefore, give my informed consent to be interviewed for this study and to be photographed, as may be necessary.

Name: _____

Signature: _____

Date: _____

Place: _____

Appendix- 4: Pictures from the field

Titli affected sites in Gajapati district

Formal discussion with seaside communities

Fisheries repairing boat after Titli

FGDs with Totagumuda Villagers

Fisheries carried mobile phone

Radio Namaskar's Initiatives during cyclone Yaas

Community prepardness for cyclone response

State's intervention for disaster risk reduction

Filed side FGDs during different phases

a. Cyclone shelter house

b. Shelter house meghaphone

a. Visit to Pallisarathi

b. Radio Namaskar visit

Joint Needs Assesment Workshop Bhubaneswar

Appendix-5

Publication

Media Asia

Routledge
Taylor & Francis Group

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rmea20

Media and marginalized communities during the COVID-19 pandemic in India

Manas Kumar Kanjilal, Aniruddha Jena & Ram Awtar Yadav

To cite this article: Manas Kumar Kanjilal, Aniruddha Jena & Ram Awtar Yadav (2021): Media and marginalized communities during the COVID-19 pandemic in India, Media Asia, DOI: 10.1080/01296612.2021.1980674

To link to this article: https://doi.org/10.1080/01296612.2021.1980674

Published online: 28 Sep 2021.

Appendix-6

Presentations at Conferences

Appendix- 6.1. Presentation-1

Tampere University

IAMCR TAMPERE 2020

IAMCR

This is to certify that

Exploring Potential of Communication Infrastructure Theory in Disaster Risk Management: A Study on Cyclone Fani in Odisha, India.

by

Manas Kanjilal

was presented as an Online Conference Paper within the programme of the Emerging Scholars Network Section (ESN) at the annual conference of the International Association for Media and Communication Research, IAMCR Online 2020, hosted by Tampere University, 12-17 July 2020.

Nico Carpentier
President - IAMCR / AIECS / AIERI

Kaarle Nordenstreng
Chair - Local Organising Committee

Appendix- 6.2. Presentation-2

Appendix- 6.3. Presentation-3

IAMCR BEIJING 2022

清華大學 Tsinghua University

IAMCR

THIS IS TO CERTIFY THAT

Disaster Communication and Community Radio: The Case of Cyclone Yaas in Odisha, India

BY

Manas Kanjilal and Kanchan K Malik

was presented as an Online Conference Paper within the programme of the Community Communication and Alternative Media Section at the annual conference of the International Association for Media and Communication Research, IAMCR Online 2022, hosted by Tsinghua University - China, 11-15 July 2022.

Nico Carpentier
PRESIDENT - IAMCR / AIECS / AIERI

Changfeng Chen
CHAIR - LOCAL COMMITTEE BEIJING

ICTs and Disaster Management: An Analysis of Cyclone Preparedness and Response in Odisha, India

by Manas Kumar Kanjilal

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	reliefweb.int	

9	Internet Source	<1%
10	"Disaster Risk Governance in India and Cross Cutting Issues", Springer Science and Business Media LLC, 2018 Publication	<1%
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