

UC Irvine

UC Irvine Electronic Theses and Dissertations

Title

Social Media During Slow Crises

Permalink

<https://escholarship.org/uc/item/8bj7218c>

Author

Sharma, Vishal

Publication Date

2019

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA,
IRVINE

Social Media During Slow Crises

THESIS

Submitted in partial satisfaction of the requirements
for the degree of

MASTER OF SCIENCE

in Informatics

by

Vishal Sharma

Thesis Committee:
Professor Bonnie Nardi, Chair
Professor Bill Tomlinson
Assistant Research Professor Matthew Bietz

2019

DEDICATION

To

My advisor, Professor Bonnie Nardi, for without her constant support, encouragement, and
guidance none of this would have happened

and

my parents for their constant support throughout
this journey

TABLE OF CONTENTS

LIST OF FIGURES	IV
ACKNOWLEDGMENTS	V
ABSTRACT OF THE THESIS	VI
CHAPTER 1: Introduction	1
1.1 Thesis Overview.....	5
CHAPTER 2: Related Work	6
2.1 Social Media During Activism	6
2.2 Social Media During Crisis	9
2.2.1 Social Media During Sudden and Visible Crisis	9
2.2.2 Social Media During Slow Crisis	11
CHAPTER 3: Background	12
3.1 The Lake Bellandur Incidents.....	12
3.2 The Cauvery Dispute	14
3.3 The Rally For Rivers Campaign.....	16
CHAPTER 4: Methods	19
CHAPTER 5: Findings	21
5.1 Celebrities’ use of Social Media to Raise Awareness & Foster Participation	21
5.2 The Public’s use of Social Media to Raise Awareness & Foster Participation.....	27
5.2.1 Non-residents’ use of Social Media in Civic Engagement	29
5.2.2 Misinformation on Social Media during Crises.....	33
5.3 The Government’s use of Social Media to Raise Awareness & Foster Participation.....	38
5.4 Abating Slow Crises	43
CHAPTER 6: Discussion	48
CHAPTER 7: Conclusion And Future Work	53
REFERENCES	54
APPENDIX	66

LIST OF FIGURES

Figure 3.1: Bellandur Lake on fire on the evening of 16th February 2017 (Bhasthi, 2017).....	13
Figure 3.2: The Cauvery River Basin (Elumalai, Brindha, & Elango, 2017).....	14
Figure 3.3: Poster of the Rally For Rivers campaign	17
Figure 5.1: Kiran Mazumdar Shaw tweet on the Lake Bellandur incident of catching fire.....	22
Figure 5.2: Rashmika Mandaan photoshoot and tweet on the Bellandur Lake pollution.....	23
Figure 5.3: Tisca Chopra supporting the Rally For River campaign	24
Figure 5.4: A user tweeted to report the froth formation on the Bellandur Lake.....	29
Figure 5.5: Indian Prime Minister's tweet on Swachh Bharat Abhiyan	39
Figure 5.6: A user tweeted how the Bangalore City Police helped him during the Cauvery water dispute.....	42
Figure 5.7: Bangalore City Police tweet requesting people not to believe online rumors	43

ACKNOWLEDGMENTS

I would like to thank my advisor and the chair of the thesis committee, Professor Bonnie Nardi, who has constantly encouraged me to look for the new ideas emerging in the field of human-computer interaction and provided me an opportunity to explore them according to my interest. She was always available whenever I needed help or had questions about my research or writing. She consistently allowed this work to be my own but steering me in the right direction when she thought I needed it. Without her guidance and support, this thesis would not have been possible. As always, Thank you.

I want to thank Professor Bill Tomlinson whose work in collapse informatics and in information and communication technologies for sustainability encouraged me to select the topic of my thesis. I also want to thank Professor Matthew Bietz who has always encouraged, guided and motivated me throughout my years of study and research at UC Irvine.

Thanks again to the chair and committee members for reading this thesis. I am gratefully indebted to them for their valuable comments that improved the quality of this work.

Finally, I must express my very profound gratitude to my parents for providing me with unfailing support and continuous encouragement throughout my years of study. This accomplishment would not have been possible without them. Thank you.

I would like to thank the University of California Irvine's Council of Research, Computing, and Libraries for providing me with the grant to conduct this study.

ABSTRACT OF THE THESIS

Social Media During Slow Crises

By

Vishal Sharma

Master of Science in Informatics

University of California, Irvine, 2019

Professor Bonnie Nardi, Chair

Slow crises are dispersed over time and space. Their effects accumulate gradually but end catastrophically. The topic of slow crises has been scarcely touched by the crisis informatics community and human-computer interaction community more broadly. In this thesis, I present a qualitative study of social media use by different stakeholders—celebrities, the public, and the government—to raise awareness and foster participation during the slow crisis of water pollution and scarcity in Bangalore. I conducted 30 interviews with residents and non-residents of Bangalore to examine how they verify the credibility of information shared on social media during a crisis. Social media facilitate communication between the public and the government and facilitate the participation of non-residents in civic activities, otherwise difficult offline. I investigate how social media provide opportunities to raise awareness and foster participation in slow crises that are prevalent worldwide such as climate change and extinction of species. Although this study focuses on the slow crises, its findings can also inform research in crisis informatics and other domains of HCI such as digital democracy and social computing.

CHAPTER 1

Introduction

Human-computer interaction (HCI) and crisis informatics researchers have studied social media in raising awareness and fostering participation during crises that are sudden, visible, and need immediate attention, such as natural disasters such as earthquakes and floods (see (Nagar, Seth, & Joshi, 2012; Palen, Starbird, Vieweg, & Hughes, 2010; Vieweg, Hughes, Starbird, & Palen, 2010; Yates & Paquette, 2010; M. H. Zaber, Nardi, & Chen, 2017; M. Zaber, Nardi, & Chen, 2018)). The many studies of crisis informatics we have are useful and interesting, but they are not especially relevant to crises that are long-term, persistent, and inconspicuous such as climate change, what I refer to as “slow crises”. In this study, I analyze the use of social media to raise awareness of slow crises of water pollution and scarcity in Bangalore. The dramatic growth in mobile phone and internet use in India (Gnanasambandam et al., 2012; N. Kumar, 2014), particularly in Bangalore, has facilitated various stakeholders—celebrities, the public, and the government—to use social media to raise awareness and foster participation during a slow water crisis in Bangalore. The water problems are not dramatic and do not call for a rapid response. They are dispersed over time and space. These problems aggregate gradually and eventually cause socioeconomic, political, and environmental issues, often difficult to resolve (Hanjra & Qureshi, 2010).

Bangalore, the capital of the Indian state of Karnataka, has experienced tremendous economic growth (Aithal, 2013; Sudhira, Ramachandra, & Subrahmanya, 2007). From a “pensioner’s paradise” in the pre-independence era (Goldman, 2011), Bangalore has become the “Silicon Valley of India” (Saxenian, 2001). Its population has increased from 4.13 million in 1991 to 9.58 million in 2014 (Jamwal, Bejoy Thomas, Lele, & Srinivasan, 2014). To accommodate the increase in population, the authorities converted most of the land covered with vegetation and bodies of water to buildings—apartments, corporate campuses, tech parks, and shopping malls (Goldman, 2011). Consequently, the number of lakes in the city

with utilizable water reduced from 261 in 1961 to 16 in 2001 (Mehtani, 2017). Figure 1.1 shows the increase in urban settlements and the decrease in vegetation and bodies of water from the years 1973 to 2012.

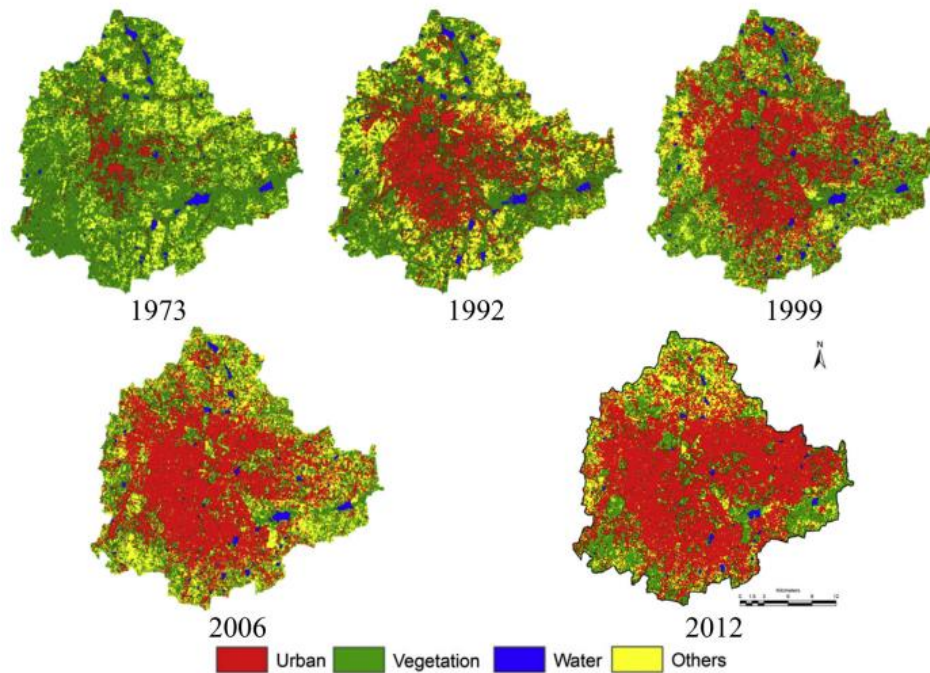


Figure 1.1: Land use dynamics of Bangalore (Bharath, Vinay, Chandan, Gouri, & Ramachandra, 2018)

During urbanization, lack of proper planning and law enforcement led to sewage and industrial waste disposal into the bodies of water, polluting and deteriorating their quality and thus making their water unfit for consumption. For example, Ulsoor Lake has become a dumping ground for garbage and sewage water (Mehtani, 2017). With the depleting and deteriorating surface bodies of water, Bangalore started exploiting groundwater at a rate higher than the rate of its recuperation, resulting in a decline in the groundwater level (Mehtani, 2017), causing water scarcity. The government, faced with providing proper infrastructure to meet water scarcity and pollution, mandated rainwater harvesting, wastewater treatment and reuse, and the revival of lakes (Jamwal et al., 2014; Manasi & Umamani, 2013). However, all these measures failed because of the lack of proper regulation

and law enforcement (Nandini, Bheemappa, Vijay Kumar, & Raghavendra, 2013; Ramachandra & Aithal, 2016; Visser, 2015).

Over the past decade, the slow crisis of water pollution and scarcity has caused the Bellandur Lake incidents and the Cauvery water disputes. Lake Bellandur, one of Bangalore's biggest lakes, gained national and international attention in 2015 and again in 2017 because of the increase in industrial waste disposal resulting in massive froth formation on its surface as well as episodes of "catching fire" (Abraham, 2018; Visser, 2015). As internal sources of water degraded and depleted, Bangalore started importing water from external sources such as the Cauvery River (Sudhira et al., 2007). The Cauvery is a perennial river that originates from the Western Ghats in Karnataka and flows through the states of Kerala and Tamil Nadu. The river supplies 60% of Bangalore's water. The increase in imported water aggravated the century-old dispute between the states of Karnataka and Tamil Nadu, resulting in protest, violence, and imposition of a curfew in parts of Bangalore (Manasi & Umamani, 2013). During the curfew, the people of Bangalore used social media to stay updated. "The Twitter handles of Bengaluru City Police and Bengaluru Traffic Police were [used to help] city residents and [to soothe] their safety related anxieties" (Bose, 2016). The Isha Foundation, in collaboration with the Indian Ministry of Environment, raised public awareness about river water depletion by organizing a campaign called Rally For Rivers (Zachos, 2018). The campaign used social media, meetings, rallies, phone calls, text messages, and advertisements. In this study, I analyze the use of social media by celebrities, the public, and the government during the Lake Bellandur incidents, the Cauvery water dispute, and the Rally for River campaign.

I build my definition of slow crises on Nixon's (2011) and O'Lear's (2016) concept of "slow violence" and on Glantz's (1998) concept of "creeping environmental change". Nixon (2011) defines slow violence as "a violence of delayed destruction dispersed across time and space...that occurs gradually and out of sight... neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales ... [for example] climate change." O'Lear (2016) emphasizes that slow

violence “focuses attention on latent, gradual, and invisible negative externalities related to mis- or abuse of environmental resources and ecosystems... [and] is embedded within the concerns of both environmental and climate justice and highlights the need for transparency and inclusion in decision making processes pertaining to the use and allocation of environmental resources and the handling of industrial waste.” Glantz (1998) defines creeping environmental change as “an appreciation of slow moving, cumulative, and usually irreversible degradation resulting from dominant priority structures and power dynamics” (O’Lear, 2016). For this study, I define a slow crisis as an interaction between natural conditions and sociopolitical processes that is dispersed over time and space and whose effects accumulate gradually but end catastrophically (see (Swyngedouw, 2013; Utz, Schultz, & Glocka, 2013)). I used the word crisis instead of violence to associate my work to that in crisis informatics and to disassociate it with the general definition of violence which is “armed conflict or intentional direct destruction” (O’Lear, 2016). Although a crisis is an unexpected, sudden, and non-routine event that demands immediate attention, judgement and decision (see (Seeger, Sellnow, & Ulmer, 1998)), I intentionally used the oxymoron, slow crises, to create a productive tension.

A key motivation for this study is the scale of climate-related problems. More than 200 million people are vulnerable to sea level rise (Nicholls & Tol, 2006), and 800 million people in the developing countries are vulnerable to food shortages (Parry Martin, Rosenzweig Cynthia, & Livermore Matthew, 2005). 15.1 million people have forcefully migrated and another 300 million may migrate by 2050 because of climate change (Gemenne, 2011). Around 2.76 million people will likely suffer from the water crisis by 2050 (Arnell, 2004). It is crucial to raise awareness and foster participation to abate slow crises that are usually (but not always) caused by uncontrolled economic growth. However, the research within and outside HCI has scarcely touched on how awareness is raised and how stakeholders participate in slow crises. To the best of my knowledge, this is the first study in HCI to explore the role social media plays in a slow crisis, that of water pollution and scarcity.

I ask the following questions:

RQ1: How did different stakeholders—celebrities, the public, and the government—leverage social media to raise awareness and to participate during the slow water crisis in Bangalore?

RQ2: What are the opportunities for social media to raise awareness and foster participation in abating the slow crises prevalent across the globe?

I investigate social media use through an empirical examination of tweets and Facebook posts as well as interviews with the people of Bangalore. This study has multiple contributions: (a) to understand how social media facilitate information dissemination to raise awareness of a slow crisis; (b) to understand how social media foster participation during a slow crisis; (c) to understand the use of social media to verify the credibility of the information shared during a slow crisis; and, (d) to critique the way we approach and conduct research in HCI, promoting reflective HCI (see (Dourish, Finlay, Sengers, & Wright, 2004; Stolterman & Croon Fors, 2008)). This study also informs research in crisis informatics and other HCI domains such as social computing more broadly.

1.1 Thesis Overview

The remaining part of the thesis is organized as follows: Chapter 2 provides a literature review that focuses on social media use during activism and crisis, relevant to the work presented in this thesis. Chapter 3 gives basic information about the incidents that occurred during the slow crisis of water scarcity and pollution in Bangalore, needed to understand the findings. Chapter 4 provides details about the methods that I used to conduct the research. Chapter 5 presents the findings. Chapter 6 discusses the opportunities of social media, and digital media more broadly, during the crisis and in sustainable development. Chapter 7 concludes the work and provides direction to future work.

CHAPTER 2

Related Work

The work presented in this thesis aligns closely with social media use during activism and crisis. I briefly discuss related studies in these two areas.

2.1 Social Media During Activism

Activist research demonstrates that social media foster activism in three ways (Eagleton-Pierce, 2001; Lynch, 2011; Marmura, 2008; Sullivan & Xie, 2009; Van Laer & Van Aelst, 2010; Wulf, Misaki, Atam, Randall, & Rohde, 2013): (1) by facilitating information dissemination; (2) by facilitating instantaneous and inexpensive communication; and, (3) by facilitating organization and coordination during activism; evident during the Arab Spring. Wulf et al. (2013) report the use of social media by activists to raise their voices without the fear of getting arrested, prosecuted, or worse. Even though the government of Egypt took strict actions to limit social media use by reducing its speed, activists found different ways to use social media to fuel the fire of activism. Some used pseudo names while others used proxy servers to hide their identities (Wulf et al., 2013). Slow internet speed hindered uploading and sharing of the information regarding activism. Activists sent the information to their peers in other countries asking them to upload and share it on social media. Traditional media, such as, Al Jazeera used the content posted on social media to raise awareness and to gain national as well as international attention (Wulf et al., 2013). Women also used social media to express their opinions and to participate in activism, otherwise discouraged offline (Tufekci & Wilson, 2012).

In India, people have extensively used social media to expand their social connections and participate in activism (see (Ahmed, Jaidka, & Cho, 2017; N. Kumar, 2014; Subramanian, 2014)). Kumar (2014) and Rangaswamy et al. (2013) note that despite many social,

infrastructural, and technical barriers people from low-resource communities use social media for self-empowerment, acquiring new skills or literacies by connecting with the global community. In 2009, a group of women called themselves “Consortium of Pub-going, Loose and Forward Women” launched the “Pink Chaddi” campaign on Facebook to protest against the attack on women in the pubs in the city of Mangalore (Subramanian, 2014). More than 30,000 people joined the Facebook group and supported the campaign. In 2012, following the Nirbhaya rape incident in which a 23-year-old woman was beaten, gang-raped, and tortured in New Delhi, people used social media, demanding justice for the victim (Ahmed et al., 2017). The hashtags “#Nirbhaya” and “#India’s daughter” became a global event.

Against the optimistic accounts of some commentators, others argue that online activism is not always successful (R. Kumar & Thapa, 2015; Lim, 2013; Lynch, 2011). Lim (2013) argues that “Social media activism has a tendency for being fast, thin and many. In other words, online campaigns emerge each minute and often quickly disappear without any trace.” Lynch (2011) says when it comes to expressing their demands, the leaderless online activists “are far less effective at articulating specific, nuanced demands in the negotiation process which follows success.” Many events gained attention without the assistance of social media (see (Gladwell, 2010)). For example, Gladwell (2010) reports that during the 2009 Iranian presidential election protests, against the popular claim of many journalists, Iranians never used Twitter for activism. He notes that Twitter was used outside Iran, only by the people in the West. Golnaz Esfandiari (2010) added:

“It’s time to get Twitter’s role in the events in Iran right ... Simply put: There was no Twitter Revolution inside Iran ... people on the ground in Iran simply scrolled through English-language tweets post with tag #iranelection ... Through it all, no one seems to wonder why people trying to coordinate protests in Iran would be writing in any language other than Farsi.”

Other commentators argue that the success of activism is not dependent entirely on social media. The Arab Spring happened during the presence of the internet, so many believe that

the internet alone facilitated and fostered the revolution. However, the movements were successful because in addition to social media presence they had a strict leadership, hierarchy, structure, public participation, and mainstream media attention (see(Alterman, 2011, 2011; Mejias, 2011; Morozov, 2013; Sullivan & Xie, 2009; York, 2011; Zuckerman, 2011)). Wulf et al. (2013) underline that the amalgamation of new and traditional media, i.e., social media such as Facebook and Twitter and television channels such as Al Jazeera, facilitated and amplified the Egyptian revolution. Starbird and Palen (2012) notice that online activists also participated in “on the ground” activities such as street protests, meetings, organizing events, and reporting updates on social media during the protests. Nabil Dajani (2012), a media professor, argues that during the Arab Spring, social media contributed only to amplify the protests and to connect people, but “folk and traditional” transmission of messages through music, storytelling, Friday’s sermons, and in-person communication brought real change. York (2011) says: “I am glad that Tunisians were able to utilize social media to bring attention to their plight. But I will not dishonor the memory of Mohamed Bouazizi—or the 65 others that died on the street for their cause—by dubbing this anything but a human revolution.”

Both the sides, one that embellishes the agency of social media, the other diminishes it, have contrasting opinions on social media use during activism. Within the ambit of this uncertainty, the role of social media in activism has been the question intriguing many, including me. While the work, here, in this thesis, does not directly address activism, social media to raise awareness and foster participation during activism provide opportunities for its use during slow crises. It is within this discussion that my study attempts to analyze the role of social media during the slow crisis of water pollution and scarcity in Bangalore.

2.2 Social Media During Crisis

Crisis informatics scholars have extensively discussed the use of social media during sudden and visible crises such as earthquakes (Miyabe, Miura, & Aramaki, 2012; Starbird & Palen, 2011), floods (Starbird, Palen, Hughes, & Vieweg, 2010), fires (Glaser, 2007; Sutton, Palen, & Shklovski, 2008; Vieweg et al., 2010), wars, and terrorist attacks (Cheong & Lee, 2011; De Choudhury, Monroy-Hernández, & Mark, 2014). However, the use of social media in slow crises has been the subject of a smaller, but still substantial, body of work in the domain of crisis informatics such as episodes precipitated by erosion (M. H. Zaber et al., 2017), disease outbreaks (Hellmann, Maitland, & Tapia, 2016), resource scarcity in refugee camps and slum settlements (Pei & Nardi, 2019; Sabie, Salman, & Easterbrook, 2016).

I discuss studies that investigate social media use during sudden and visible crises because they are consistent with my research and allow me to associate the definition of slow crisis within the literature and empirical research in crisis informatics. Then I provide details on the slow crisis studies that support the work presented in this study.

2.2.1 Social Media During Sudden and Visible Crisis

Social media use during sudden and visible crisis dates back to 2004 in response to the Indian Ocean Tsunami when an “electronic bulletin board was set up and moderated for 10 days” (Imran, Castillo, Diaz, & Vieweg, 2015). In 2005, when Hurricane Katrina struck the United States, people used blogs and online forums for emergency response, to connect with family and friends, and to seek information (Procopio & Procopio, 2007; Shklovski, Burke, Kiesler, & Kraut, 2010). In 2007, people used Twitter to gather, seek, share, and report information during the severe Southern California Wildfires (Sutton et al., 2008). Students used Facebook to learn if their friends were safe during the Virginia Tech school shooting (Palen, Vieweg, Liu, & Hughes, 2009; Vieweg, Palen, Liu, Hughes, & Sutton, 2008). Myspace was used to organize and spread information during the Sichuan earthquake (Qu, Wu, & Wang, 2009). Ever since, affected and concerned populations as well as the government have

repeatedly used social media to provide relief (Imran et al., 2015; Procopio & Procopio, 2007; Shklovski et al., 2010), to check hospital availability (Starbird, 2013), to coordinate medical responses (Sarcevic et al., 2012), to communicate with others, including victims (Cobb et al., 2014), and to become aware of the crisis and its repercussions (Palen, Anderson, et al., 2010; Sutton et al., 2008).

Starbird and Palen (2011) studied the role of “digital volunteers”, an informal response community usually formed by the people at the time of a crisis, during the 2010 Haiti earthquake. Others have studied digital volunteers’ contributions to emergency response efforts and found that these volunteers monitor and respond to social media queries, create and update digital maps, and help to coordinate relief (Boehmer, 2010; Denis, Hughes, & Palen, 2012; Norheim-Hagtun & Meier, 2010; van Gorp, 2014). Although digital volunteers’ activities may help professional emergency decision makers, the information that digital volunteers generate needs to be checked for its credibility (Hughes, 2012), validity (Coyle & Meier, 2009), and trust (Tapia, Bajpai, Jansen, Yen, & Giles, 2011), often difficult to assess in real-time. The US Congressional Research Service reported the high administrative cost required to use social media restricts its use during emergencies (Lindsay, 2011):

“The number of personnel required to monitor multiple social media sources, verify the accuracy of incoming information, and respond to and redirect incoming messages is also uncertain ... Responding to each message in a timely manner could be time-consuming and might require an increase in the number of employees”

However, no set of rules are defined to check the credibility of the information on social media. It’s in this context, that in this study I investigate how people verify the credibility of information shared on social media during crises.

2.2.2 Social Media During Slow Crisis

More broadly, and in contrast to our work, studies in crisis informatics on slow crises have not focused on the gradual aggregation of slow crises, but the cataclysmic end of the crises. For example, digital humanitarian efforts during Ebola disease outbreak (Hellmann et al., 2016), social media use during Zika virus outbreak (Gui, Kou, Pine, & Chen, 2017), emergency response of infectious disease outbreak (Li & O'Hara, 2009), and episodes precipitated by erosion (M. H. Zaber et al., 2017).

Crisis informatics researchers reported the challenges that people and the government face during slow crises. Hellman et al. (2016) stress that even though a disaster causes an adverse impact, once it is over the response effort is straightforward. However, slow crises such as disease with a viral growth rate “continues to grow at exponential rates, making the response effort more dynamic and difficult to gauge and plan for simply because it isn't over yet” (Hellmann et al., 2016). Gui et al. (2017) emphasize that during a disease crisis, information is partial, conflicting, uncertain, and ambiguous based on which people have to make a quick decision that may lead to grave repercussions (see also (Villa, 2016)). Li and O'Hara (2009) note that infectious disease outbreak can cause social and environmental disruption as well as can have significant economic consequences. For example, equine influenza in Australia cost several billion dollars (Li & O'Hara, 2009). Zaber et al. (2017) highlight that riverbank erosion in Bangladesh resulted in impoverishment, material loss, and forced mass displacement (see also (M. Zaber et al., 2018)).

Soden et al. (2014) observed: “[J]ust as robust community emergency management plan need to include activities in the period between disasters to effectively mitigate future risk, so too must the obligations of information systems research and development also extend to the long periods prior to disasters.” It is in this vein, the work presented in this thesis, investigates multiple outbreaks and the time in between during the slow water crisis.

CHAPTER 3

Background

To understand the context of this study, basic information about the incidents that occurred during the slow water crisis in Bangalore is needed. I briefly discuss the Lake Bellandur incidents, the Cauvery water dispute, and the Rally For River campaign. Much of this information may be unfamiliar to many of the readers and will be useful in interpreting the findings.

3.1 The Lake Bellandur Incidents

Bellandur Lake is one of the biggest lakes in Bangalore, comprised of 890 acres (Bhasthi, 2017; Chandrashekar, Babu, & Somashekar, 2003). Rapid urbanization has converted the lake from “being a natural ecologically healthy [l]ake to an artificial reservoir of domestic sewage and industrial effluents” (Chandrashekar et al., 2003; Pattusamy, Nandini, Vijay Kumar, & Bheemappa, 2013). Abraham (2018) notes that around 40% of Bangalore’s untreated sewage (~70 million gallons) flows into the lake on a daily basis. She argues that the public, the industries, and the constructors dump garbage, toxic chemical waste, and construction debris into the lake (Abraham, 2018).

The disposal of garbage, industrial waste, and sewage in the lake resulted in massive toxic froth formation that caught fire in the year 2015 and again in the year 2017, making national and international headlines as well as threatening resident’s health (Abraham, 2018; Bhasthi, 2017; Visser, 2015). In 2017, at the time of the incident, a resident living next to the lake reported to the Indian newspaper, the Times of India (BR, 2018):

“The fire started around 10:30 am on Friday at the Yemlur side of the [l]ake, We had warned the Bangalore Development Authority to take measures to contain pollution levels in the water

body to ensure something like this does not happen again (pointing to the similar incident in 2015), but clearly nothing was done. Fire tenders were present at the spot, but they said they couldn't enter the lake."



Figure 3.1: Bellandur Lake on fire on the evening of 16th February 2017 (Bhasthi, 2017)

Even though strict measures were taken by the government to curb the disposal of waste and sewage into the lake, studies show that the condition of the lake has not improved much (see (Nandini et al., 2013)). One of the reasons behind the poor condition of the lakes in Bangalore is that they are not monitored by a single governmental body (Lele & Sengupta, 2018). The lacking consensus among the governing authorities results in a lack of proper regulation and lack of proper law enforcement, causing pollution of the bodies of water in Bangalore (Nandini et al., 2013).

3.2 The Cauvery Dispute

The Cauvery is a peninsular river that flows in the southern part of India. It originates from the Western Ghats and covers a distance of 497 miles. The River flows through the states of Karnataka, Kerala, and Tamil Nadu and discharges into the Bay of Bengal (Ghosh & Bandyopadhyay, 2009) (see Figure 2.3). The Cauvery River is the main source of irrigation in the states of Karnataka and Tamil Nadu (Anand, 2004).

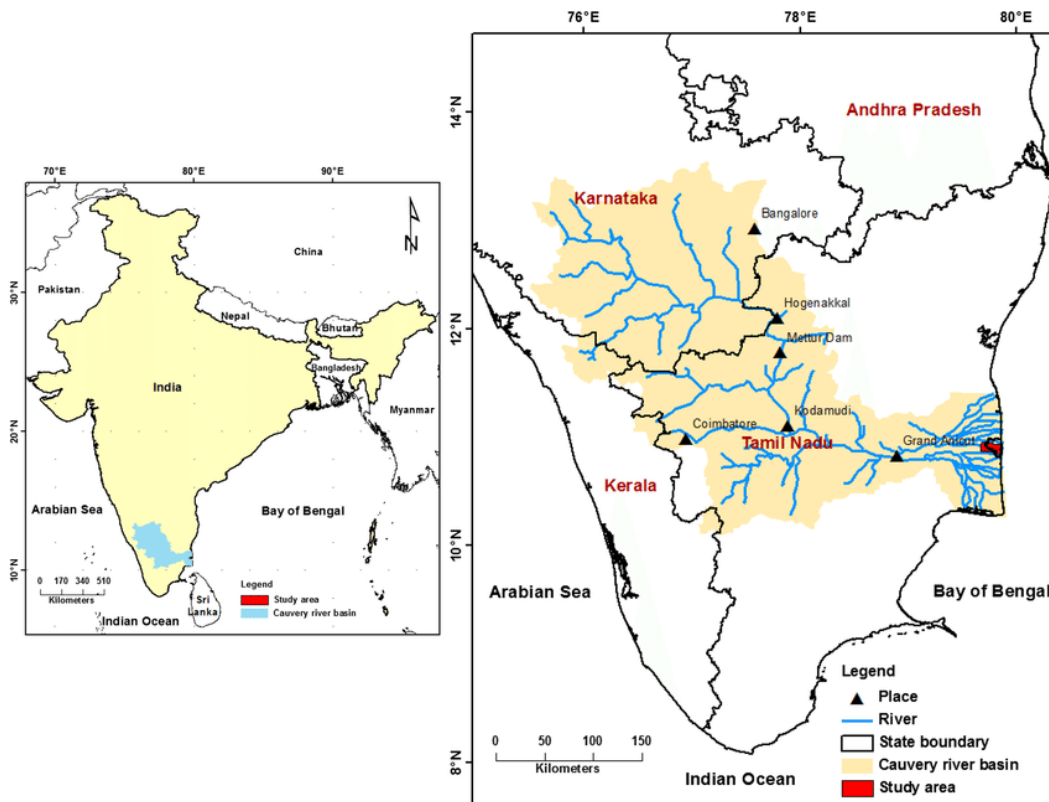


Figure 3.2: The Cauvery River Basin (Elumalai, Brindha, & Elango, 2017)

Since 1892, the Cauvery water sharing between the states of Karnataka and Tamil Nadu has caused several disputes (Anand, 2004). At the end of the 19th century, the Kingdom of Mysore, present Karnataka, ruled the upper riparian area and Madras Presidency, present Tamil Nadu, ruled the lower riparian area (Anand, 2004; Ferdin, Görlitz, & Schwörer, 2010). From 1831 to 1881, when both the empires were under British rule, they defined the water

sharing policy. However, after 1881, the Kingdom of Mysore transferred back under the Maharaja's (King's) administration (Anand, 2004) started using more water for its development than defined in the policy. The Madras kingdom retaliated which led to the formation of the 1892 Agreement (Anand, 2004). According to the agreement, the Kingdom of Mysore agreed not to construct any new irrigation reservoirs without the consent of the Madras Presidency (Anand, 2004). However, later both the states defied the agreement and constructed dams which led to the formation of another 50-year long agreement in 1924 (Anand, 2004).

In the 1970s, when the 50-year-long agreement ended, Karnataka argued that the expired water sharing agreement was in favor of Tamil Nadu because it was under the British administration at the time of the agreement (Anand, 2004). Tamil Nadu pleaded that the agreement was foundational to its development and, if not followed, will cause detrimental impacts on the livelihoods of thousands of its people (Anand, 2004).

The long-standing disagreement between the two states over the Cauvery water sharing caused several inter-state disputes. The disputes aggravated when Bangalore's dependency on the Cauvery water increased due to the dramatic increase in its population. From 1991 to 2013, the amount of water that Bangalore imported in a day increased from 453 million liters to 1360 million liters (Jamwal et al., 2014). In 2016, the dispute led to riots and imposition of curfews in parts of Bangalore ("Karnataka erupts in anger over SC order on Cauvery," 2016). In 2018 (after I conducted this study), the Supreme Court of India delivered its final verdict on the centuries-old Cauvery water dispute, allocating more water to Karnataka and forming the Cauvery Water Management Authority ("Cauvery Water Dispute," 2018). The court emphasized that Bangalore, suffering from water scarcity, must be given priority.

3.3 The Rally For Rivers Campaign

Depending upon the source of the river, the Indian river system is classified into two groups: Himalayan rivers and Peninsular rivers (Acharyya & Shah, 2007). As the name suggests, Himalayan rivers originate from the Himalayas and Peninsular rivers originate at much lower altitudes mainly from the Western Ghats (Kaminsky & Long, 2011).

Although the origin and flow areas are different for the Himalayan and the Peninsular rivers, both suffer from the reduction in water discharge (Council, 2012; Kaminsky & Long, 2011). Global warming causes glaciers to melt at a higher pace, a phenomenon known as glacier retreat (Council, 2012; Orlove, Wiegandt, & Luckman, 2008). There is enough scientific evidence that emphasizes if glacier retreat continues at the current pace, the glaciers of the Himalayan region will dwindle in size, affecting the water supply in the Himalayan rivers (Council, 2012). Peninsular rivers, mainly rain-fed rivers, are drying up because of the scarcity and uncertainty of rain for several months of the year caused by climate change (Lal & others, 2000). The Godavari, India's largest peninsular river, has shrunk by 20 percent, the Kaveri by 40 percent, the Krishna, and the Narmada by 60 percent, leading towards desertification of 25 percent of Indian land (Gupta, Kao, & Dai, 2012). According to the Organization for Economic Co-operation and Development report by 2030, India will have only 50 percent of the water needed for its survival (www.oecd.org).

The Isha Foundation's Rally For Rivers campaign was an effort in the direction of making people aware of the river water depletion disaster that India is facing and to propose a comprehensive river rejuvenation plan, the "Revitalization of Rivers in India Policy Proposal", to the Indian government. The river rejuvenation plan included a proposal of maintaining a substantial number of trees for at least one-kilometer wide border alongside the rivers (Chronicle, 2017). Trees will make the soil porous by absorbing rain and holding rainwater, therefore, releasing water into the river gradually throughout the year.



Figure 3.3: Poster of the Rally For Rivers campaign

India, being a democratic country, required a consensus and support of its citizens to implement a policy. The Isha Foundation, through the Rally For Rivers campaign, urged the Indian public to give a call to a specific number and then terminate it before the recipient answers so that a caller cannot be charged (even if a caller has a prepaid plan), popularly known as giving a missed call in India where prepaid plans are common and charge the caller only if the call is answered. By giving a missed call the citizen pledge their support for the cause (Chronicle, 2017). The campaign used the internet as one of their mediums to stimulate public awareness. Consequently, more than 160 million people supported the campaign (Zachos, 2018). On 2nd October 2017, the Isha foundation proposed to the Government of India the ‘Revitalization of Rivers in India’ policy (Zachos, 2018). The central government under the National Institution for Transforming India created a team having secretaries from water resource, environment, agriculture, urban development, drinking and sanitation, and rural development ministry “to [examine] the suggestions in detail and come out with an action plan to revitalize rivers across the country” (Mohan, 2017). The governments of the state of Maharashtra, Chhattisgarh, Punjab, Karnataka, and Gujarat

signed a memorandum of understanding with the Isha Foundation to support the campaign. At the time of the study, the work on implementing the proposal into policy was underway.

CHAPTER 4

Methods

I conducted a field study in Bangalore from July to September 2018. I recruited participants through snowball sampling, personal contacts, and posted recruitment messages on Facebook. I interviewed 30 people including eight women and 22 men. Participants ranged in age from 24 to 60. 17 participants were non-residents of Bangalore and 13 participants were residents. The non-residents were living in Bangalore for more than the last four years. All the participants have either experienced, witnessed or come to know about the slow water crisis through digital or mainstream media. 22 participants worked in IT firms, three were graduate students, two were on sabbatical (from IT jobs), one was a healer and a volunteer, one was retired, and one was searching for a job.

I interviewed participants in-person. 29 interviews were conducted in the English language and one was conducted in "Hinglish", a mix of Hindi and English. English is one of the official languages of India, as is Hindi (Azam, Chin, & Prakash, 2013). In Bangalore, a significant number of people can understand and converse in English (Pani, 2009). Each interview took about 45-90 minutes. Interviews were audio recorded, transcribed, and anonymized. Names used in this study are pseudonyms. I asked participants about the reasons behind the water problems, what actions people and the authorities have taken and how they have leveraged digital technologies in raising awareness, and what they think are the responsibility of the government and people to abating the problems. I conducted interviews until I observed the repetition of thoughts and ideas (Strauss & Corbin, 1998).

I studied Facebook and Twitter posts analyzing the hashtags such as #Bellandur #savebellandurlake, #RallyForRivers, #CauveryIssue, and #CauveryProtests used at the time of the Lake Bellandur incidents, Rally For River campaign, and Cauvery water disputes. I followed a grounded theory approach (Strauss & Corbin, 1998) for analyzing the

interviews. The whole process of analysis took around one month. All the categories and themes have emerged during the analysis. I first read through the data, performed preliminary coding at the sentence level, and iterated multiple times. I grouped the preliminary codes into codes after multiple iterations. I used codes such as “raising awareness”, “disseminating information”, “ripple effect”, “continuous awareness”, “initiatives”, “media bias”, and “rapid urbanization”. Then I grouped the codes into higher level categories such as “celebrity posts”, “public posts”, “government posts”, “incentivization”, “information verification”, and “call to action”. I formed higher-level themes and found quotes that clearly expressed the feelings and ideas of our participants on the topics that I present in Findings. The different stakeholders’ perspectives—residents and non-residents, employed and unemployed, retired as well as students—were all considered, providing validity of the work.

CHAPTER 5

Findings

I discuss the use of social media by celebrities to raise awareness and to foster participation during the slow crisis of water scarcity and pollution in Bangalore. Social media posts by celebrities gained more attention and made a larger pool of people aware of the crisis. Participants compared public participation in traditional media to social media and reported how social media facilitate non-residents' participation in civic activities. They highlighted that sharing of misinformation on social media increases at the time of a crisis and described how they verify its credibility. I analyze the government's use of social media to raise awareness and foster participation during the slow crisis. The participants associated the water problems to a larger issue of uncontrolled economic growth. They suggested ways such as distributive development and providing incentives to the public to abate the slow water crisis.

5.1 Celebrities' use of Social Media to Raise Awareness & Foster Participation

In India, celebrities, including sports and TV stars, play a significant role in shaping ideologies, imaginations, aspirations, and popular culture (Pandian, 1989). It is a common sight to see temples dedicated to film and sports stars by their deferential fans (Sridhar, n.d.; V, 2016). For example, Sachin Tendulkar, the famous Indian cricketer, is deified as a sporting God or cricket God in India (Ezekiel, 2012). Marketing research shows a high influence of celebrity branding "in which a celebrity uses his or her status in the society to promote a product, service or charity" (Patra & Datta, 2010; Surana, 2008). Srinivasan et al. (2013) note that "Usually, celebrities in the real world are also well-known and admired on social media, and are also 'used' to promote causes and interests" (see also (Faina, 2012; Mangold & Faulds, 2009; McCracken, 1989)).

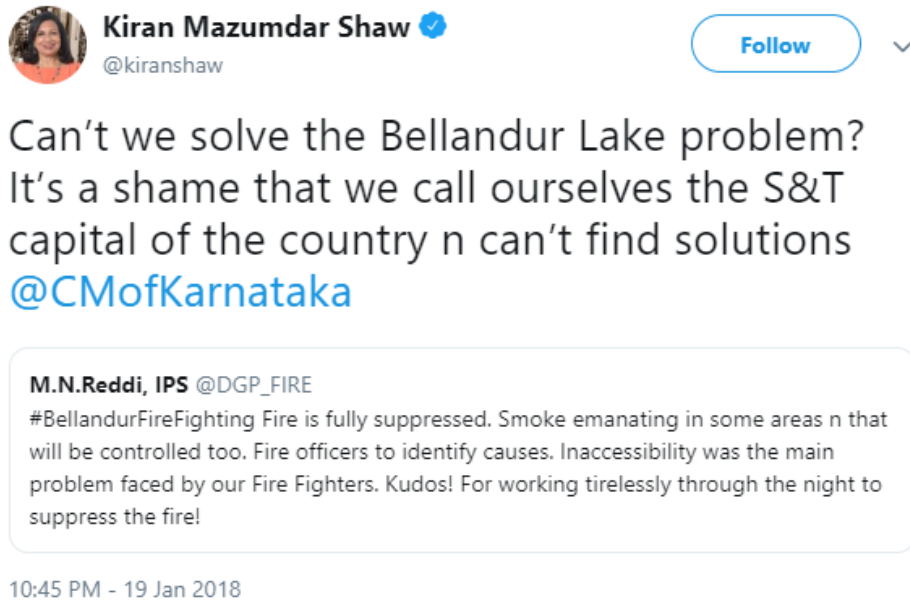


Figure 5.1: Kiran Mazumdar Shaw tweet on the Lake Bellandur incident of catching fire

Celebrities used social media during the Lake Bellandur incidents and the Rally For River campaign to raise awareness, of both the public and the government, and to foster participation. For example, Kiran Mazumdar Shaw, a prominent entrepreneur, tagged the Chief Minister of Karnataka and tweeted “*Lake On Fire: Bengaluru Drivers Swerved, Firemen Stunned--shocking apathy n serious neglect @CMofKarnataka.*” Figure 5.1 shows another tweet from Kiran Mazumdar Shaw re-tweeting the tweet of the Director General of Police and questioning the state government to take actions against the incessant lake problems.

Indian actress Rashmika Mandanna did a photoshoot with Bellandur Lake to raise public awareness of the toxic froth formation on the lake. Figure 5.2 shows tweets from Rashmika sharing her photo shoot to raise awareness of lake pollution.

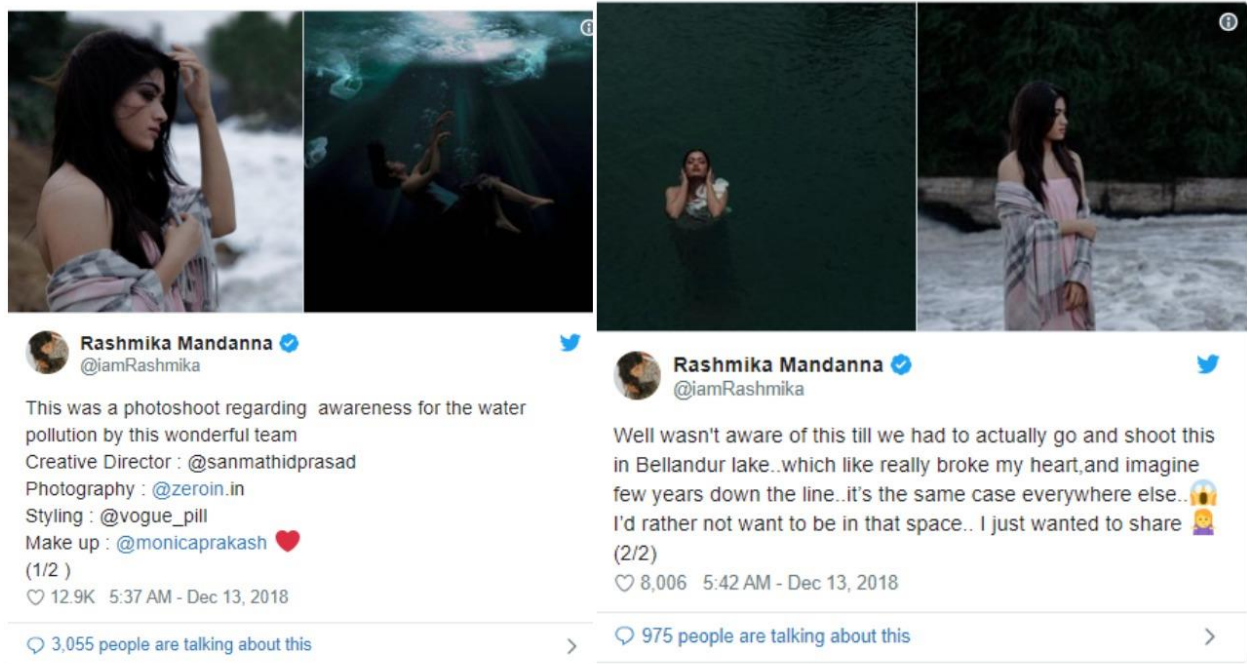


Figure 5.2: Rashmika Mandaan photoshoot and tweet on the Bellandur Lake pollution

The list of the celebrities that supported the Rally For River campaign is exhaustive including businesspeople such as Kiran Mazumdar Shaw, filmmakers such as Karan Johar, actors such as Juhi Chawla and Anupam Kher, cricketers such as Virender Sehwag, and music composers such as Shankar Mahadevan (Venugopal, 2017). Organizations such as Confederation of Indian Industry, Border Security Force, Indian Railways, Apollo Hospitals, Indigo Airlines also supported the campaign (Venugopal, 2017). The Economic Times reported that “This is perhaps for the first this many celebrities and influential people are coming together” (Venugopal, 2017).

Celebrities used social media to urge the public to support and participate in the Rally For Rivers campaign. For example, the famous Indian film director, Karan Johar, supported the campaign and tweeted: “A relevant and integral cause...all our love and support to @ishafoundation and @SadhguruJV for this integral way forward #RallyForRivers”. Preity Zinta, a Bollywood actress, urged people to support the campaign and tweeted “To save the Rivers of India I am supporting the #RallyForRiver. Pls, do the same. Give a missed call on 80009

80009 & show your support.” Figure 5.3 shows a tweet from Tisca Chopra, a famous Bollywood actress, supporting the Rally For River campaign.



Figure 5.3: Tisca Chopra supporting the Rally For River campaign

Salman Khan, a prominent Bollywood actor, shared a short video on Twitter urging his fans and followers to participate in the campaign. His tweet gained 0.2 million views, 40 thousand likes, and seven thousand retweets. In the video he said:

“Namaste, I am Salman Khan. The rivers of our country have taken good care of us for thousands of years, but it is sad that today these rivers are drying up quickly. These rivers are our and our country’s lifeline. No river, No us. So, to save the rivers and for saving us, I am campaigning for Rally For Rivers. To save our rivers, I am giving a ... [call on the number] 8000980009 [to pledge my support]. I request you to do so too.”

Not only Indian celebrities but international celebrities and organizations also supported the campaign. For example, the DiCaprio Foundation tweeted: *“Entire nation heads to save the rivers. Unprecedented campaign/inspiration for the world @SadhguruJV #RallyForRivers.”* Erik Solheim, the Executive Director of the UN Environment, after a discussion with Sadhguru, the founder of the Isha Foundation, at the Global Landscapes Forum, which is an international ecological platform, tweeted: *“Fascinating conversation with @SadhguruJV on*

‘planting trees in people’s mind.’ Increasing green cover, tree-based agriculture and private investment in irrigation are critical to saving our rivers!’

Participants that I interviewed emphasized the role of celebrities in raising public awareness of water problems in Bangalore. They reported that they got to know about the Rally For River campaign only when the celebrities posted about the campaign on their social media accounts. For example, Bharat, a 35-year-old man working as a senior software engineer in Reltio Inc., came to know about the Rally For River Campaign from Twitter and Facebook. He saw a lot of tweets from celebrities and retweets from his friends and acquaintances urging others to support and participate in the campaign. He said:

“I was not aware of the campaign but then I saw on Twitter and Facebook a lot of celebrities came in support [of the Rally For River campaign]. It was a simple campaign. You have to give a missed call on one particular number just to support them. There were few state governments and even people have started [participating in the campaign and] reacting to a terrible truth that we are getting deprived of basic necessities [, that of water].”

Ishaan, a 25-year-old man working as a security engineer at an IT firm in Bangalore, has been actively using social media for the last 10 years. He first saw Facebook posts by celebrities regarding the Rally For River Campaign. He said:

“When [the Rally For Rivers campaign] started one of the celebrities shared about [it on his social media account]. Actually, many celebrities shared about it. So, I got to know that something is happening. Then I saw the posters in the mall. Then I was able to relate that something big is happening. I was able to know that the people out there are trying to save our environment or there is some kind of effort going on. At least, if I was not able to participate actively, I tried my best to make others aware of this rally. I read about it and then I gave the missed call. It made me aware of the river water depletion that is happening.”

Surbhi, a 26-year-old woman working towards her master's in electrical engineering, highlighted that when celebrities tweeted about the Rally For River campaign, people acknowledged the urgency of the water problems and thus responded by supporting and participating in the campaign. She reported that celebrities, such as film and sports stars, do not belong to any political entity. They do not have any political agenda, so people trust them. She emphasized that Sadhguru Jaggi Vasudev, an Indian spiritual leader and the organizer of the Rally For Rivers campaign, does not belong to any political entity:

"Seeing the background of Sadhguru you trust the person. He is not into politics, so half the people do not blame that you are doing something political. It is because he is doing social service and national work. That is why many people joined him."

She further added that usually campaigns in India are started and promoted by the political entities. People hesitate to participate in these campaigns with political nature and agendas. However, she mentioned that the Rally For River campaign was started and promulgated by apolitical entities, including common people and celebrities, and *"that is why more than 160 million people participated and supported the campaign, making it one of the largest campaign in the history of mankind."*

Ishaan said:

"I follow a lot of celebrities on social media. Most of the people of our country, especially youth, see them as an inspiration. Look at Rajinikanth, he is such a big superstar and people adore him, not only in India but worldwide ... Celebrities do not have a political agenda and that's why people trust them. When they share some information or urge people to participate, most of the people participate because we know our participation is necessary that's why they are asking us to participate."

During the Bellandur Lake incidents and the Rally For River campaign, many celebrities through their social media accounts reported the incidents to the government and urged the

public to participate, resulting in pressurizing the government to take necessary actions and gaining public attention and participation towards abating the issues of water scarcity and pollution.

5.2 The Public's use of Social Media to Raise Awareness & Foster Participation

In the interviews, participants reported social media use by the people of Bangalore to disseminate information for raising awareness and encouraging participation to abate slow water crises. They compared the current situation to what it was 10 to 15 years ago when smartphones and the internet were expensive to afford by the public. They highlighted the launch of Jio, an Indian mobile network owned by Reliance Industries in the early 2010s. Jio provides internet services at a considerably lower price. The low internet prices created competition in the telecommunication market, forcing other network providers such as Airtel, Vodafone, and Idea to lower their internet prices.

Akshay, a 36-year-old leading a team of three software and two senior software engineers at Informatica, is a resident of Bangalore. Before his birth, his family migrated from a town in the state of Tamil Nadu to Bangalore in search of better job opportunities. He has been observing the changes that happened in the city from the last two decades. He said:

“Now most of the people have smartphones. Literally, everybody uses smartphones here [in Bangalore]. So, the message that we pass on spreads really very fast [through social media]. To [spread the information from one end] to another end, it has become very easy. Communication has become faster through social media. Similarly, when somebody wants to spread the news it would reach us much faster. I feel the distribution of information is better and faster now.”

Ramanujam, a 33-year-old man with a business degree and working in human resources at Reltio Inc., is a resident of Bangalore. Before the drop in the internet's price, he had access to the internet only through his office workstation. Only in the past six years, he started using

the internet through his personal devices such as smartphones and personal computers. He told me:

“Today, you do not see any people without a smartphone and without a Facebook account. Almost everybody in Bangalore has a smartphone and a social media account. So, it is easier for communication. So, if we want to get to the masses we need Facebook. If you see people who are active on Facebook, it is between the age 18-30. It is an easy way to connect and raise awareness.”

The easy access and affordability of the internet and smartphones have facilitated their public use for the disseminating information, contributing to raising awareness and fostering public participation.

The people of Bangalore used social media to participate in reporting and abating the Bellandur Lake incidents. When Lake Bellandur caught fire and toxic froth formed on its surface the people of Bangalore captured and shared the incidents on social media. They used Twitter hashtags, *#BellandurLake*, and *#savebellandurlake* to gain the attention of the government and the public. For example, a person tweeted *“Bangalore has an ignominious reputation now as the ‘City of burning lakes’ FROM ‘City of Lakes’.”* Another person tweeted *“There are 17 inlets into Bellandur Lake. All bring sewage water. These inlets need 2 be regulated. Now a free for all #savebellandurlake.”*

Figure 5.4 shows a tweet in which a person tagged the Chief Minister of Karnataka, reporting and requesting to take actions against the froth formation on Lake Bellandur. Within a few moments, the incident gained national and international attention through social media. The government acknowledged the posts and immediately took measures to abate the situation.



Figure 5.4: A user tweeted to report the froth formation on the Bellandur Lake

5.2.1 Non-residents' use of Social Media in Civic Engagement

A slow crisis is spanned over a few months or years or even decades, for example, climate change. As the crisis is stretched over time, migration of people happens. So, it is important to understand how migrated people participate in civic activities towards abating the issues caused by the slow crisis.

Interviewees who migrated to Bangalore, i.e., non-residents of Bangalore, reported that even if they want to participate in civic activities, it is difficult for them to connect with the local people and the local authorities offline because of differences in their cultures and languages. They emphasized that making connections with the local people as well as the government takes time. Thus, they usually wait patiently to make connections before participating in civic

activities. For example, Bharat told me about the problems he faced when he migrated to Bangalore. It was difficult for him to participate in the civic activities because he was a non-resident of Bangalore and does not know the local language to communicate with the people and the authorities. He said:

“If I go to the roads and protest who would listen to me. I feel like nobody would listen to me. If I start lecturing them about what needs to be done to solve the water problems, they might ignore me because I am not one of them and does not even speak their language.”

Shrey, a 40-year-old non-resident living in Bangalore from last 16 years, told me:

“Non-residents do not participate in civic activities because they do not grow up in the city... They even do not have any platform to raise their voice ... If you are in a city which is your hometown you know many people. Then you may have a platform or a group or a community that may help you to raise your voice ... [But for people who come from other places] even if they want to, they do not know what to do and whom to approach. Language is also a problem. I have been living here [in Bangalore] from last 15 plus years and I do not speak the local language. That is also an issue because if you have to interact with the local government or the local people you need to know their language.”

Participants who were non-residents reported that even local mainstream media, both print and electronic, do not facilitate them to participate in civic activities. The information production and sharing on these media are restricted to the local language. For example, print media such as newspapers allow a person to participate by submitting a letter to the editor or writing in people’s column only in the Kannada language. Same is true with the electronic media. Ishan, who is from the state of Punjab, does not know the local language of Bangalore. He said:

“I do not read or write the Kannada language [the local language of Bangalore]. It’s a completely different language. I am proficient in speaking and writing three languages: Hindi, English, and Punjabi. But I am illiterate when it comes to Kannada. All the local newspapers and media are in the Kannada language. Even if I want to participate in civic activities or report something to media or share my opinion, I cannot do that because I do not know the local language.”

Aarav, a 26-year-old man working as a senior software engineer, has been living in Bangalore from the last six years. He observed the limitation of traditional media to share opinions, spread information, and to raise awareness during the Bellandur Lake incidents. He told me:

“The common people, especially the non-local people, do not have access to the local TV channels or to the local news channels [directly] because [not everyone can share their opinions about the public issues] by going on the channels. Everyone cannot just go. Maybe one or two persons or representatives of the common people can go to the news channels. But that is it. That too they [the local people] would prefer a local to represent the public on these media platforms.”

However, social media provide a platform for the non-residents of Bangalore to participate in civic activities. Interviewees stressed that anyone can use social media to raise awareness and to contribute to abating civic problems. For example, Bharat, who is a non-resident of Bangalore, told me that social media helped him to connect with the local people and the local authorities as well as to participate in civic activities. Through social media, he made connections with the locals. Now he represents his locality and people consult as well as report to him about the civic issues that they face on a daily basis.

Sanam, a 40-year-old man, is on sabbatical from his job in an IT firm. At the time of the interview, he was volunteering at Seva Café, a volunteer-led organization that cooks and serves meals to people from the underprivileged communities in Bangalore. He emphasized that being a non-resident of Bangalore it was difficult for him to connect to people and to

participate in civic activities offline. However, social media empowered him to connect with the locals, to raise his voice, share his opinion, and to make himself heard. He told me that *"[On social media] you can raise your voice and say this is bad. That comment will also contribute. There are people who are always at an edge to decide whether something is good or bad, such comments probably helps them."* He further added that *"you can actually use the freedom of speech. You can actually raise your opinions. It makes a person feel like their opinion really matter ... [Social media] can be really helpful and can actually help you to move forward and also help you to make your society a better place to live by connecting you to others and participating in civic activities."*

Aarav, who is a non-resident of Bangalore, told me:

"If all the people, even the non-residents, want to contribute and share [their opinion], I think these [social media] platforms are very convenient. You can open Facebook or Instagram or Twitter from your mobile and you can share your opinion or share something live like people did when Bellandur Lake caught fire. Both the residents and non-residents participated in sharing and raising awareness during the fire on Bellandur Lake which a non-resident cannot quite possibly do offline."

Rajiv, a 40-year-old man with a bachelor's in computer science and a master's in business administration, is managing a software development team at Informatica. He lives in Whitefield which is situated at the eastern periphery of the city of Bangalore. He mentioned that people of Bangalore have created online forums based on their localities where both the residents and non-residents can participate and share their opinions. He said, for example, *"the people living in Whitefield, [have] ... created online citizen forums to improve their living standards, to discuss the issues that the people face, and to engage in civic activities."* He stressed the importance of social media in facilitating public participation and said: *"I know that [a single person] is not going to make a change, but I know [through social media a person] can contribute towards the change even if I am non-resident of Bangalore... [Social media facilitate] public participation in civic activities to policymaking."*

Social media has empowered non-residents to participate in civic activities and connect with the locals, otherwise difficult offline.

5.2.2 Misinformation on Social Media during Crises

Social media are often not considered as a credible source of information during crises (see (Utz et al., 2013)). People consider online newspaper and news websites more credible for information consumption (Schultz, Utz, & Göritz, 2011; Utz et al., 2013). Utz et al. (2013) studied the use of social media during the Fukushima Daiichi nuclear disaster. They highlight that people perceive information reported on newspapers, online and offline, more credible because “journalists fulfill[ed] an important gatekeeping function” and verified the information before reporting. However, social media lack information verification and thus are vulnerable to misinformation (Lin, Spence, Sellnow, & Lachlan, 2016). I found that during slow crises, social media are even more susceptible to misinformation or rumors because (1) no verification is performed by social media; and (2) misinformation is not easy to verify because of the lack of immediate and visible effect of a slow crisis.

Participants reported that they usually considered the information shared on social media during the slow water crisis as fake and thus did not share or repost it further without verifying its credibility. They emphasized that they verified the trustworthiness of the information by checking its source and cross-verifying it with other trusted online websites, such as government websites and news websites. Sanam has been using Facebook from the last six years. He rarely consumes news from other mainstream media. During the Cauvery water disputes and the Bellandur Lake incidents, Facebook was his main source of information. However, he stressed that on Facebook people also shared misinformation. So, he verified the information before sharing. He mentioned the procedure he followed to verify the credibility of the information:

“If my friend has shared your video [on social media] and you have shared from somewhere else, then I don't share my friend's video or yours. I check the source who uploaded it first

because sometimes people will add their own flavor and it gets distorted. If I really feel that the source is genuine and trustworthy only then I share the information further.”

Pawan, a 40-year-old man managing a team of five engineers at a software firm, has been actively using social media from the last five years. He used to believe all the information that people share on these platforms, thinking that nobody would share information without verifying it. However, at the time of the Lake Bellandur incidents, he witnessed that people shared rumors and misinformation. Since then he started verifying all the information. He said:

“I verify every news which comes on social media. I just do a Google search first. I used to [share or re-post] the information before. But of late I do not ... unless I verify it. When three or four trusted [news or government] sites give me similar content then I trust it and forward it.”

Priyanka, a 32-year-old resident of Bangalore, once saw a post “saying that there was an Alien found in one of the states in India which went viral” on Facebook. She searched for the information online and found on a news website that “it was actually a bear with a skin disease because of which it has lost hair. So, overall, [the bear] looked weird, but he was just a normal bear with a skin disease.” She further added that “not only this, people also shared misinformation during the Cauvery water dispute and when there was fire on Lake Bellandur without verifying it. I saw a post that the Lake Bellandur is on fire because it’s the doorway to the underworld. People have like literally believed and shared this information. I was surprised how such rumors are spread and actually become viral on social media.” She stressed that since then she verifies the information on social media before sharing. She told me: “I treat all news that is shared on [social media] as fake. Then I go and verify the authenticity ... [on] the internet, on Google by searching. Basically, I am saying that I do not believe everything that comes on social media.”

Saket, a 24-year-old man, created his Facebook account just two months before the Lake Bellandur incidents. He told me “[W]henver, I see a post it does not influence me much until I

do my own research and I am convinced by it. I cross-check the posts ... Sometimes you do not know if it is true or not. You just go to the portal and google it and check if it is the right stuff that I am reading.” He came to know about the water problems in Bangalore through social media. He cross-verified the information regarding the Lake Bellandur incidents of froth formation and catching fire before further sharing it on social media. At first, he did not believe that the information was true. However, he googled and found *“it was there all over the news websites.”*

Participants underlined that they cross-verify the information on social media by checking with their friends, family, or acquaintances who might be aware of the situation, have either witnessed or experienced it. For example, Dhruv, a 24-year-old resident of Bangalore, uses Facebook to stay up to date. At the time of the Cauvery water dispute, he verified the credibility of the information shared on Facebook by checking how people from his social circle reacted on the post. He said:

“I check the comments of my friends [who would be aware of the news] and how they have reacted on the post shared [on social media]. So, that generally gives me a widespread opinion about how many people trust the credibility of the information ... During the Cauvery dispute, I have many friends from Karnataka and Tamil Nadu. I discussed with my friends from both the states about their reaction to the dispute which gave a clear idea.”

Sujata, a 28-year-old working on her Ph.D. in civil engineering at the Indian Institute of Science in Bangalore, has been using social media from the last seven years. She lives in on-campus housing and has a strong friend circle. She is friends with Ph.D. students from other departments such as computer science, electrical engineering, and mechanical engineering. They all eat breakfast and dinner together in the campus cafeteria and discuss the ongoing news. She said:

“Through social media, a lot of myths are also being spread. People just post unverified messages as it happened during the Lake Bellandur incidents. But if people are little responsible

or if they are to cross-check the information before spreading it then it will be helpful. I try to google the information shared or talk to my peers to check if they have already verified [whether the information shared] is genuine or false.”

Sanam, who is a resident of the state of Maharashtra, has been living in Bangalore from the last 15 years. Whenever he sees the information of a crisis on social media he calls and verifies with his friends who would have experienced or witnessed the incident themselves, before further sharing the information, either online or offline. He told me about the water crisis in Mumbai and said:

“Whenever I get this kind of information [on social media] like this is happening I just call my friends and discuss with them ... For example, when there was a water crisis in Mumbai, we got worried [as] we have so many friends from Mumbai. Instead of simply posting that [on social media that] this is happening, I called [my friends who live in Mumbai]. Then they clarified that it is happening in a particular area, but the news [on social media] shows it is happening all over [the city].”

The participants that I interviewed reported that the information that is shared live on social media is usually credible and does not require a thorough verification. They emphasized that when the information is shared live its chances being untrue is minimal because it is produced in real time and thus it is unfiltered and unregulated. Aarav, has been using Facebook for information and news consumption from the last eight years, said:

“See, most of the videos shared live on the [social media] platforms come from common people ... they show the immediate effect without filtering. I think maybe videos as a post shared later on social media filter many things and are edited because of the pressure from the authorities or big industries. Common people can directly show whatever they record immediately on social media. It’s very rare for the information shared live to be a fake news.”

Shefali, a 26-year-old woman, has been actively using Facebook from the last 10 years. She told me about the Lake Bellandur incidents of forth formation followed by the incident of the lake catching fire. She emphasized that:

“These youngsters, what happens is, when they see something right or wrong, the first thing what they do is either go live or capture and put it on social media like they did when the Lake Bellandur was burning. They shared the live video of the lake and I myself saw fire on the lake. Then everyone around who is using [the social media] saw, shared it and then others get to know actual things that were happening.”

She reported about an incident that happened to her friend and how her friend used social media. She mentioned that her friend *“had a bad experience in using Uber here, in Bangalore. Through social media only I got to know about that, before going through news or something else, even though it was all over the local news.”* She further added *“Because what happens these days is, immediately we capture things. Before even reporting it to our parents or someone else, we first post it on social media and that is how people around us get to know. My friend made a live video, and we all saw how the uber driver harassed her. Now we can’t say that it was a rumor because it was a live video.”*

Participants used social media not only to stay up to date but also to raise awareness. However, they verified the information before further sharing it. They cross-verified the information with other online trusted websites and with people within their social circle. They reported that information that is shared live does not require cross-verification because it is produced and shared in real-time and can’t be regulated or altered easily.

5.3 The Government's use of Social Media to Raise Awareness & Foster Participation

Interviewees reported that the authorities have efficiently used social media to raise public awareness and to request public participation in the initiatives regarding abating the slow crisis, that of water scarcity and pollution in Bangalore, and in India more broadly. They emphasized that they came to know about such initiatives through the government officials' social media accounts. For example, Surbhi said that the Indian Prime Minister, Narendra Modi, *"Keeps on updating what he is doing and where he is going [on his social media] account."* She came to know about the government's Swachh Bharat Abhiyan (Clean India Mission), to clean Indian cities and bodies of water, through the Prime Minister's social media account. She said *"I came to know about the Swachh Bharat Abhiyan when the Prime Minister tweeted about it. I want to appreciate Narendra Modi on this. The Swachh Bharat Abhiyan which he started has actually done well and made people aware."*

Figure 5.5 shows a tweet from the Indian Prime Minister regarding the Swachh Bharat Abhiyan. 5,500 people re-tweeted and 23,000 liked the tweet. Bill Gates retweeted and said: *"The leadership of @narendramodi and the Indian government has played an important role in improving sanitation. Now is the time to build on the success of @swachhbharat."*



Figure 5.5: Indian Prime Minister's tweet on Swachh Bharat Abhiyan

Dhruv is working as an IT engineer in Cisco. He came to know about the Swachh Bharat Abhiyan through social media. He later joined a local initiative of the campaign where he along with six others cleaned the roads and bodies of water within and around his locality. After his team performed the cleaning activity, they clicked pictures and posted it on social media to raise further awareness. He said:

“The Swachh Bharat Abhiyan was very eminent on social media and it was clear that the government was trying to save Ganga and other rivers. That was one of the first actions that the government under the guidance of the new Prime Minister, Narendra Modi. The campaign did make a lot of noise and successfully raised public awareness. I would say that social media was the reason behind the success of the campaign.”

Participants highlighted that social media facilitate direct communication between the public and the government, often difficult offline. They reported that whenever people

encounter any civic problem, they post about it and tag the respective governmental body on social media. Usually, the government immediately acknowledge and take the necessary measures, abating the issue. Shambhoo, a 35-year-old leading a team in a software firm, has been volunteering from the last three years. The volunteering task includes reporting civic issues. He uses social media to report these problems. When he finds an issue, he tweets and tags the respective governmental body. He said that the government usually take actions towards solving the reported issues within 3-4 business days. He added:

“See that is the power of social media. You can be your own representative and tell the authorities what problems you are facing. The authorities usually resolve them, I think because they do not want others to see that somebody tagged them and reported an issue which was never fixed. I am not sure, but whatever the reason is, social media has made my life easier.”

Dhruv, who lives next to the Lake Bellandur, mentioned that after seeing public attempts to clean the lake, which was all over social media, the government also *“did the purification and now the lake is pretty clean. The government has instilled some purifiers in the lake to purify the water.”* He added: *“when the government stepped out to help the people, to clean the lake, it was really good to know that.”* He told me about an incident when an Indian lost his passport in the USA and tweeted and tagged the Indian Foreign Minister, Sushma Swaraj, requesting her to issue a new passport. She replied to the tweet consoling and ensuring that the new passport will be issued quickly. He said, *“I think that without social media that would have not been possible because you cannot contact [the government officials] easily.”* Social media has provided a direct communication channel between the public and the government, otherwise not possible offline. He added: *“There are so many issues which we face on a daily basis and we cannot physically go to the authorities and report them. But through social media, we can virtually report these issues as people did during the Lake Bellandur incidents.”*

Interviewees emphasized that the government has effectively used social media to raise awareness, however, they have failed to suggest how a commoner can contribute towards

abating the slow crisis. They reported that the government only post about the severity of the problems and the initiatives taken to control them. However, the government should also suggest the ways the public can contribute. For example, Dhruv said, *“On social media, there is only awareness that is being linked, but not the action. Awareness is there [on social media] to just make you aware, but you have to act on your own ... [the government officials and organizations] tell us the cause [the reason behind the water problems] ... [but they should tell us] what can we, as an individual do to stop this.”*

Sanam, who has volunteered in many initiatives, said:

“Spreading the solutions to deal with the issues are important. If someone is implementing the solution, then share that video on social media, how he failed, improved, and succeeded. Practical awareness should also be spread through social media that how the person struggle to implement a solution and after that what are the achievements. There is much more beneath the success. Instead of just showing the problems on social media we need to spread the solutions also. People need to know how to deal in such situations, how they can help to conserve the natural resources.”

Sanam emphasized that *“First, create awareness and when the people are ready then we have to show them the path.”* He told me that during the froth and fire incident on Lake Bellandur, he mostly saw the posts related to the initiatives taken by the government to manage the situation. He mentioned that *“there was barely any post on how a common person can participate in the initiatives. There is so much a common man can do. These problems are caused by us so they should tell us how we can participate and solve the issues.”*

The Bangalore City Police and the Bangalore Traffic Police used social media to help people when the curfew was imposed in parts of Bangalore because of the riots caused after the supreme court of India ordered the state of Karnataka to release water from the River Cauvery for Tamil Nadu’s use. Huffington Post reported that “a team of 14 people handled Bangalore police’s accounts on Facebook, Twitter, and WhatsApp” (Bose, 2016). The team

responded to all the queries regarding the situation in Bangalore and gave updates to the public about the situation. For example, Figure 5.6 shows a tweet by a user on how Bangalore police quickly answered his query and helped him to reach safely to his destination.

The people of Bangalore contacted the Bangalore City Police and the Bangalore Traffic Police to verify the credibility of the information that they heard during the curfew. For example, a user tweeted and asked “@BlrCityPolice Petrol stations will be closed for the next 3 days! Fact or rumor? Please update.” The Bangalore City Police immediately replied to the tweet and answered “Don’t blindly believe msgs circulating on WhatsApp. Any doubt, #Dial100/tweet2 @BlrCityPolice/WhatsApp9480801000.”



Figure 5.6: A user tweeted how the Bangalore City Police helped him during the Cauvery water dispute

Figure 5.7 shows another tweet from the Bangalore City Police requesting the citizens not to pay attention to the rumors or misinformation on social media.



Figure 5.7: Bangalore City Police tweet requesting people not to believe online rumors

5.4 Abating Slow Crises

Even though a lot of measures were taken by the local and national government to abate unsustainable water problems during the slow water crisis in Bangalore, the measures usually resulted in exacerbating the situation. Participants highlighted that the solutions taken abated only the immediate problem and ignored the actual cause behind the crisis. For example, Shefali, who lives near Lake Bellandur, told me about the incident of froth formation and the immediate measures that the government took to abate the issue. She said:

“Once [the froth formation on Lake Bellandur] was on social media, what happened was some higher authority came and they found some solution. They made sure that foam should not come out of the lake. It was even coming out of the lake to the road. They did something and satisfied the people for that moment. If now you go back and see [the industries] are still continuing their regular activities. All the chemical substances are going in the lake again.”

She highlighted that under the public pressure the authorities planted a mesh around the lake so that it prevents the froth from coming out. The mesh solved the immediate problem but did not stop the froth formation on the lake. She further added that *“I just want the people to know that putting a mesh [to solve the immediate problem] so that it protects the froth to*

come out of the lake is not something that you need to do. What is required is a proper plan and solution to stop the causes behind these issues.”

Utkarsh, a 24-year-old living in Bangalore from last four years, emphasized that to abate the froth formation on the lake, the government deployed wastewater treatment systems to clean the lake water. He emphasized that the authorities should try to fix the actual cause of the issue, that of uncontrolled disposal of industrial waste into the lake. He said:

“[When] we already know what causes the problem... the chemical waste... I feel like instead of cleaning the lake [we should] focus on the root cause. Who are the industries which are dumping their toxic waste into the lake? The government should tackle at the grassroots level rather than cleaning the lake because even if they clean it now, within a few months it will be in the same situation it was a few months before.”

Akshay has been following the Cauvery dispute from last 20 years. He stressed that the import of water from the Cauvery River to abate Bangalore’s problem of water scarcity is not a sustainable solution. He said: *“Just because [Bangalore] is the IT hub, they should not flow the entire [Cauvery] water for the growing population which they are doing now.”* He emphasized that the increase in dependency of Bangalore on the Cauvery water has worsened the condition for the other areas in the state of Karnataka and Tamil Nadu that are dependent on the River for agriculture. He mentioned that:

“They are providing less water to agriculture all along South India from Mysore to Bangalore stretch where there are so many agricultural lands. From this land, we get our food. They produce sugar, wheat, and rice. These three are basic food requirements. If these three are affected, we get inflation and all the other prices go up too.”

Interviewees highlighted that the concentrated development and the consequent population increase in Bangalore have aggravated the water problems. Aarav migrated from

Chandigarh, the capital of the Indian state of Punjab and Haryana, to Bangalore to work in a software firm. He said:

“The population has been growing in [the city] especially because more and more people are migrating from the villages to the urban areas and because of that per capita water is decreasing.”

Priyanka, who is a resident of Bangalore, mentioned that the area in Bangalore where her office is located *“has 50 odd companies on this road. It is just one road that I am talking about. There are five more new companies coming up in the next four to five months. And, each company attributed to 1500 people, on easy, at an average. This is just one road again. And we have reached a place where we have figured that we cannot commute through a normal road. So, we started with an intermediate ring road. As if that was not enough, we have an outer ring road and now we have an outer-outer ring road. So, I do not know how far we can go with this.”*

Shrey migrated from the city of Bhubaneswar, the capital of the Indian state of Odisha, to work in an IT firm because of the lack of IT industries in his state of residence. He told us that *“If I had something in Odisha, if Bhubaneswar was becoming an IT hub then [I would not have] migrated. Now what has happened is if I have to work in software, I have to either go to Bangalore, Hyderabad, or Chennai.”* He stressed about the problem of water scarcity in Bangalore and said:

“The population, if it is distributed, the strain on the resources, is less, but if you have a heavy concentration of people in one geographical location as we have in Bangalore then how many borewells will we build? ... See if I put here then 20 feet away somebody will put a borewell there the groundwater will finish rapidly.”

Participants reported sustainable measures to deal with the water problems in Bangalore. They emphasized the need to shift from concentrated to distributive development, i.e. both

the urban and rural areas should be developed equally in terms of infrastructure and job opportunities. They highlighted that adopting the model of distributive development may reduce the migration of people from rural to urban areas, causing a decrease in the over-consumption of resources in cities like Bangalore. Gaurav, who is from the state of Uttar Pradesh and migrated to Bangalore because of better job opportunities in the IT sector, told us:

“I came from a different state. We all came from different states and got settled in Bangalore. I do not want to blame anybody, but the development has centralized it in only one place. They focused on one particular city and one particular portion of the city. Inside that area, only the development is happening, and the population is coming. If the development is diversified, well planned, and well-distributed then it will be good. In a lot of states, there are no jobs in the city. That is why we have to come here, migrate, to another place. The distribution will be good in other perspectives also. People will not have to leave their homes. They can easily get a job in the places where they live.”

Girish left the city of Mysore, his hometown, 20 years back because of the lack of IT firms. He is now working as a director in a software firm. He said:

“If you raise the level of all the cities in terms of equal opportunities, migration might be less, and distribution of population will be there. I come from Mysore which is 150 km from Bangalore. If I had enough opportunity in Mysore. I would have probably stayed there.”

Interviewees highlighted that even though people are aware of the problem of water scarcity, they do not take actions to limit the wastage of water. They stressed that the authorities should offer incentives to the public to promote water saving practices until it becomes a habit. For example, Sujata said:

“I think here in this country incentivizing those who adhere to the laws and follows the norms will work best. You should incentivize the people who are doing something good. For example, limit the water usage to 80 liters per day per person. If you are saving water and using the water efficiently within the given quantity, then such families should be incentivized. Only with the monetary incentivization or maybe there is some other way of incentivizing people, people will be motivated to take up these things ... If you have a wastewater recycling unit in an apartment the taxes on that apartment should be low.”

Aditya, a 29-year-old man, has been living in Bangalore from the last 10 years. Last year, he visited China for an on-site project that was sponsored by his employer. He mentioned that:

“In China, I got to know that from last one year the Chinese government is following this plan where they monitor and rate their citizens. Like here we have Aadhar card and there is SSN in the USA, in China, they have something similar. For example, if someone is seen breaking a law then it will be marked and linked to your account. Then on the basis of that, the rating of that person will increase or decrease. According to that rating, the buying price will change. For example, if you have a good rating then the flights or the products that you buy will be cheaper for you.”

He highlighted that in India imposing similar law of providing incentives would help not only to solve the water problems but other unsustainable issues that require public participation. Other participants underlined that incentives are needed only in the beginning to reward people for their frugal resource consumption, limiting the overconsumption and wastage of resources. Later, once the frugal consumption becomes a habit, offering incentives can be stopped.

CHAPTER 6

Discussion

Even though slow crises are prevalent across the globe, they have been scarcely touched by the crisis informatics community. The crisis informatics literature has usually studied social media use during sudden, visible, and short-crisis, focusing on communicating with the relief team and the victims, and providing an emergency response (see e.g. (Cobb et al., 2014; Palen & Anderson, 2016; Starbird & Palen, 2011)). However, social media could also be used to raise awareness, to facilitate and foster public participation, and to verify the credibility of the information; pertinent during slow crises. With this study, I propose and lay the foundation to further explore and expand what I call “slow crisis informatics”, beyond assuming that it shares similar characteristics, motivations, challenges, and solutions to crisis informatics.

Although this study focuses on a slow crisis, its findings can also inform research in crisis informatics. Beyond the context of crises, a better understanding of social media is also applicable to other HCI domains where it is important to understand how information is spread, how users verify information, and how people communicate through social media such as computer-mediated communication, social computing, and human-computer interaction more broadly. The findings suggest that social media provide a platform for people to connect with others, including the government, and to participate in civic activities, otherwise difficult offline. For example, in the context of this study, the non-residents of Bangalore used social media to participate in civic activities. Use of social media to gain the attention of the government and requesting them to take actions provides opportunities for other domains such as digital democracy and direct democracy. This study may also help researchers by informing how to raise awareness and gain the support of various stakeholders in non-crisis events such as sporting events or sociopolitical initiatives.

Slow crises are gradual, inconspicuous, long-term, and persistent and thus they usually fail to gain attention. Zaber et al. (2018) argue that “[slow crises] do not prompt the scale of humanitarian intervention and media attention triggered by more dramatic and visible crises caused by typhoons or military conflicts.” My study found that, by contrast, during the slow water crisis in Bangalore the public and celebrities gained the attention of others, including the local and national government, using social media. Multiple posts on social media by different users forced the government to take immediate actions towards abating the issues of water scarcity and pollution.

This study showed that the government and celebrities have social capital and reach that are useful during a crisis. Usually, the information shared by the government and celebrities is considered urgent and important, and thus gain attention and participation of a larger pool of people. Information sharing by government officials and celebrities on social media was important to our participants. Yamini, a 26-year-old woman working as an IT analyst in Cisco, told me:

“There were many posts from the government and celebrities regarding the froth formation and fire on the lake. At least every other post [on social media] was related to the Bellandur Lake incidents ... After seeing similar posts, I realized that there is actually something going on. Usually, I ignore the post that is shared on social media if it comes only from the people, but after seeing posts from celebrities and the government, I believed that the issue is big and real. It made me think what I am doing about the issue and motivated me to participate.”

During slow crises, the government and the celebrities can be requested to share information to raise awareness and request public participation. For example, the environmental organization raising awareness of deforestation could request the government officials and celebrities to share information on their social media accounts. Other non-governmental organizations doing prosocial work and not having a well-established network and public outreach can also request them to spread their agendas and to ask for public support as well

as participation. Social media could also be designed to specifically facilitate information sharing by the government and the celebrities during the time of a crisis.

Research in crisis informatics demonstrates that during a crisis, social media is also used to spread misinformation that may jeopardize the measures taken by the government to provide relief, emergency response, and to communicate with others, including victims (see (Hughes, 2012; Vieweg et al., 2010)). The findings of my study suggest that during the slow water crisis, the people of Bangalore used different strategies to cross-verify the credibility of the information. The important factors to check the credibility of the information were trust in the information creator, live information sharing, and the opinions as well as reactions of those from a person's social circle. However, during a crisis, users usually suffer information overload while deploying these factors to verify the credibility of the information (see (Austin et al., 2012; Hiltz & Plotnick, 2013)). Instead of users verifying the credibility of the information, these factors could be embedded in the design of social media to foster credible information sharing before, during, and after the crisis. As we design social networking websites, we should ask the questions that with the expansion of the virtual world along with the expansion of its complexities, how can we foster credible information sharing and easy information verification? How can we embed the value of trust and credibility in the design of social networking websites? These are big questions and I hope the HCI research will contribute to study and act on.

In the context of this study, not only the users, but the government also participated in limiting the dissemination of misinformation by answering people's queries and doubts during the crisis. For example, the Bangalore City Police answered people's doubts through social media during the curfew followed by the Cauvery water dispute, limiting the spread of misinformation. Social media facilitated a communication channel between the public and the government, otherwise unavailable offline. It could be designed to provide a dedicated communication channel between the government and the public that can be leveraged during crises as well as non-crises events. This design implication could also be used to foster

digital democracy in which a regular and a dedicated channel to facilitate communication between the public and the government is crucial.

Social media also provide opportunities to foster direct democracy in which the people decide the policy implementation and not just the voted representatives. For example, the Isha Foundation used social media to gather public support to submit a policy proposal to the government of India. In a similar vein, the public can use social media to propose a policy. We already have similar platforms such as petition websites that public use to achieve political impact. However, petition websites are stand-alone sites and do not provide a dedicated medium to propose policy to the government as well as support the proposed policy. Social media could be used to propose policy and support it, gaining attention and support of a much larger pool of people. It can also be used by the government to know the public's opinion on policy. Thus, social media could be designed to facilitate a direct communication channel between the public and the government that can be leveraged by the government to know public opinion and by the public to propose policy.

Social media, as we know them, were not invented to be used during a crisis. They were primarily designed to facilitate communication and social networking. However, this study demonstrates that they were widely used by celebrities, the people, and the government during the slow water crisis. This process of "reinvention" where the technology's use is decided during its adoption by the user depending upon the activity and the situation provides implications to design other technologies that can be used for different purposes (see (Rogers, 2010)). Technologies for daily use could be designed so that during crises, when the resources are usually limited, they can be used for other than their regular purposes such as for empowering victims and facilitating relief.

It is difficult to understand and to provide evidence of the causes behind slow crises as they are spanned over time and space which might lead to their denial. For example, while climate scientists clearly associate climate change with anthropogenic unsustainable socioeconomic development (see (Ayers & Dodman, 2010)), the political entities, especially in America,

deny by calling it the “greatest hoax ever perpetrated against the American people” (Goldenberg, 2015). This climate change denial is because the repercussions of economic growth are subtle, gradual, and expanded over the temporospatial sphere, thus difficult to associate with the cause. To the contrary, the findings in this study show that the people of Bangalore associated the causes of several outbreaks such as froth formation and fire on the lake to a much larger cause, that of uncontrolled economic growth because of the multiple outbreaks and the use of social media that connected people, facilitated the sharing of opinions, fostered participation, and raised awareness. I argue that social media also provide opportunities to raise awareness and foster participation towards abating other slow crises such as climate change and the extinction of species; however, this may require a much extensive and a longitudinal study. I hope to see more research in crisis informatics that builds on and expands my work by exploring the use of digital technologies to raise public awareness and participation, crucial when slow crises such as climate change, food security, and extinction of species are prevalent worldwide (see (Bhadouria et al., 2019; Gemenne, 2011)).

No clear-cut solutions exist to develop sustainably (see (Nardi et al., 2018)). Existing approaches lack practicality and thus are not promising. Participants suggested decentralizing development and providing incentives to the public to abate the slow water crisis and to foster sustainable development. I believe that to develop sustainably and to limit the uncontrolled economic growth as well as its repercussions we require a fundamental change at the individual and societal level, including limiting overproduction and overconsumption of resources. The HCI community has a big role to play in driving this change. Shneiderman et al. (2002) say that “[HCI] is more than just technology... [it] can influence education, commerce, healthcare, and government.” We can also influence people and societies to implement the much-needed transition from overproduction and overconsumption to equal redistribution of resources. This is a big transition and one that requires further exploration.

CHAPTER 7

Conclusion and Future Work

I presented a qualitative study of social media use by different stakeholders—celebrities, the public, and the government—to raise awareness and foster participation during the slow crisis of water pollution and scarcity in Bangalore. I emphasized the significance of information dissemination by celebrities and government officials in raising awareness. Social media facilitate non-residents of Bangalore to participate in civic activities. I analyzed how users verify the credibility of information shared on social media at the time of crisis. I found that social media facilitate communication between the public and the government, reporting and abating issues caused by the slow crisis.

The cataclysmic but relatively inconspicuous slow crises are neglected in public discourse and policy, yet they are adversely impacting the lives of many across the globe. The future work should further explore and contribute to slow crisis informatics, investigating the role of digital technologies to raise awareness and to foster participation. I hope this study encourages reflection on designing technologies in HCI and evokes participation from HCI researchers and practitioners to contribute to as well as expand this work in slow crisis informatics.

REFERENCES

- Abraham, M.-R. (2018). Why Bangalore, India's Bellandur Lake Catches Fire: Water Pollution. Retrieved April 24, 2019, from <https://news.nationalgeographic.com/2018/02/bangalore-india-lake-bellandur-catches-fire-pollution/>
- Acharyya, S. K., & Shah, B. A. (2007). Arsenic-contaminated groundwater from parts of Damodar fan-delta and west of Bhagirathi River, West Bengal, India: influence of fluvial geomorphology and Quaternary morphostratigraphy. *Environmental Geology*, 52(3), 489–501.
- Ahmed, S., Jaidka, K., & Cho, J. (2017). Tweeting India's Nirbhaya protest: a study of emotional dynamics in an online social movement. *Social Movement Studies*, 16(4), 447–465.
- Aithal, B. H. (2013). *Modeling and Simulation of Urbanisation in Greater Bangalore, India*. 8.
- Alterman, J. B. (2011). The revolution will not be tweeted. *The Washington Quarterly*, 34(4), 103–116.
- Anand, P. B. (2004). *AN ANALYSIS OF THE CAUVERY RIVER WATER DISPUTE*. 42.
- Arnell, N. W. (2004). Climate change and global water resources: SRES emissions and socio-economic scenarios. *Global Environmental Change*, 14(1), 31–52.
<https://doi.org/10.1016/j.gloenvcha.2003.10.006>
- Austin, L., Fisher Liu, B., & Jin, Y. (2012). How audiences seek out crisis information: Exploring the social-mediated crisis communication model. *Journal of Applied Communication Research*, 40(2), 188–207.
- Ayers, J., & Dodman, D. (2010). Climate change adaptation and development I: the state of the debate. *Progress in Development Studies*, 10(2), 161–168.
- Azam, M., Chin, A., & Prakash, N. (2013). The returns to English-language skills in India. *Economic Development and Cultural Change*, 61(2), 335–367.

- Bhadouria, R., Singh, R., Singh, V. K., Borthakur, A., Ahamad, A., Kumar, G., & Singh, P. (2019). Agriculture in the Era of Climate Change: Consequences and Effects. *Climate Change and Agricultural Ecosystems: Current Challenges and Adaptation*, 1.
- Bharath, H., Vinay, S., Chandan, M., Gouri, B., & Ramachandra, T. (2018). Green to gray: silicon valley of India. *Journal of Environmental Management*, 206, 1287–1295.
- Bhasthi, D. (2017). City of burning lakes: experts fear Bangalore will be uninhabitable by 2025. *The Guardian*, 1.
- Boehmer, E. (2010). Coordinating efforts by Volunteer and Technical Communities for disaster preparedness, response, and relief. *Washington DC: Science and Technology Innovation Program, Woodrow Wilson International Center for Scholars*.
- Bose, A. (2016, September). How Bengaluru City Police Came Through On Social Media During The Cauvery Crisis. Retrieved April 24, 2019, from HuffPost India website: https://www.huffingtonpost.in/2016/09/15/how-bengaluru-policed-helped-through-social-media-in-times-of-cr_a_21472497/
- BR, R. (2018, January). Bellandur lake: Bengaluru's Bellandur lake catches fire again | Bengaluru News - Times of India. Retrieved April 30, 2019, from The Times of India website: <https://timesofindia.indiatimes.com/city/bengaluru/bengalurus-infamous-bellandur-lake-catches-fire-again/articleshow/62568519.cms>
- Cauvery Water Dispute: Latest news on Cauvery protest and Top stories on Cauvery board. (2018). Retrieved February 26, 2019, from The Times of India website: <https://timesofindia.indiatimes.com/topic/Cauvery-water-dispute>
- Chandrashekar, J., Babu, L., & Somashekar, R. (2003). Impact of urbanization on Bellandur Lake, Bangalore- a case study. *Journal of Environmental Biology*, 24(3), 223–227.
- Cheong, M., & Lee, V. C. (2011). A microblogging-based approach to terrorism informatics: Exploration and chronicling civilian sentiment and response to terrorism events via Twitter. *Information Systems Frontiers*, 13(1), 45–59.
- Chronicle, D. (2017, July 16). Sadhguru Jaggi Vasudev's River Sutra to give India water of life. Retrieved April 30, 2019, from Deccan Chronicle website: <https://www.deccanchronicle.com/nation/current-affairs/160717/sadhguru-jaggi-vasudev-river-sutra-to-give-india-water-of-life.html>

- Cobb, C., McCarthy, T., Perkins, A., Bharadwaj, A., Comis, J., Do, B., & Starbird, K. (2014). Designing for the deluge: understanding & supporting the distributed, collaborative work of crisis volunteers. *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 888–899. ACM.
- Council, N. R., & others. (2012). *Himalayan glaciers: Climate change, water resources, and water security*. National Academies Press.
- Coyle, D., & Meier, P. (2009). *New technologies in emergencies and conflicts: the role of information and social networks*.
- Dajani, N. (2012). Technology Cannot a Revolution Make: Nas—book not Facebook. *Arab Media and Society*, 15, 1–6.
- De Choudhury, M., Monroy-Hernández, A., & Mark, G. (2014). “Narco” emotions: affect and desensitization in social media during the mexican drug war. *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems - CHI '14*, 3563–3572. <https://doi.org/10.1145/2556288.2557197>
- Denis, L. A. S., Hughes, A. L., & Palen, L. (2012). Trial by fire: The deployment of trusted digital volunteers in the 2011 shadow lake fire. *Proceedings of the 9th International ISCRAM Conference*.
- Dourish, P., Finlay, J., Sengers, P., & Wright, P. (2004). Reflective HCI: towards a critical technical practice. *Extended Abstracts of the 2004 Conference on Human Factors and Computing Systems - CHI '04*, 1727. <https://doi.org/10.1145/985921.986203>
- Eagleton-Pierce, M. (2001). The Internet and the Seattle WTO protests. *Peace Review*, 13(3), 331–337.
- Elumalai, V., Brindha, K., & Elango, L. (2017). Regional and temporal variation in minor ions in groundwater of a part of a large river delta, southern India. *Environmental Monitoring and Assessment*, 189(7). <https://doi.org/10.1007/s10661-017-6006-3>
- Esfandiari, G. (2010). The twitter devolution. *Foreign Policy*, 7, 2010.
- Ezekiel, G. (2012). *Sachin: The Story of the World's Greatest Batsman*. Penguin UK.
- Faina, J. (2012). Twitter and the new publicity. *ETC: A Review of General Semantics*, 55–71.
- Ferdin, M., Görlitz, S., & Schwörer, S. (2010). *Water Stress in the Cauvery Basin, South India — How current water management approaches and allocation conflict constrain reform*. 18.

- Gemenne, F. (2011). Why the numbers don't add up: A review of estimates and predictions of people displaced by environmental changes. *Global Environmental Change*, 21, S41–S49. <https://doi.org/10.1016/j.gloenvcha.2011.09.005>
- Ghosh, N., & Bandyopadhyay, J. (2009). A scarcity value based explanation of trans-boundary water disputes: the case of the Cauvery River Basin in India. *Water Policy*, 11(2), 141–167. <https://doi.org/10.2166/wp.2009.017>
- Gladwell, M. (2010). Small change: Why the revolution will not be tweeted. *New Yorker*, October, 4, 42–49.
- Glantz, M. H. (1998). Creeping environmental problems in the Aral Sea basin. *Central Eurasian Water Crisis: Caspian, Aral and Dead Seas*. United Nations University Press, New York.
- Glaser, M. (2007). California wildfire coverage by local media, blogs, Twitter, maps and more. *PBS MediaShift*.
- Gnanasambandam, C., Madgavkar, A., Kaka, N., Manyika, J., Chui, M., Bughin, J., & Gomes, M. (2012). Online and upcoming: The Internet's impact on India. *Technology, Media and Telecom Practice*, Mc Kinsey and Company.
- Goldenberg, S. (2015, June 11). Republicans' leading climate denier tells the pope to butt out of climate debate. *The Guardian*. Retrieved from <https://www.theguardian.com/environment/2015/jun/11/james-inhofe-republican-climate-denier-pope-francis>
- Goldman, M. (2011). Speculating on the next World City. In A. Roy & A. Ong (Eds.), *Worlding Cities* (pp. 229–258). <https://doi.org/10.1002/9781444346800.ch9>
- Gui, X., Kou, Y., Pine, K. H., & Chen, Y. (2017). Managing Uncertainty: Using Social Media for Risk Assessment during a Public Health Crisis. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 4520–4533. <https://doi.org/10.1145/3025453.3025891>
- Gupta, H., Kao, S.-J., & Dai, M. (2012). The role of mega dams in reducing sediment fluxes: A case study of large Asian rivers. *Journal of Hydrology*, 464, 447–458.
- Hanjra, M. A., & Qureshi, M. E. (2010). Global water crisis and future food security in an era of climate change. *Food Policy*, 35(5), 365–377. <https://doi.org/10.1016/j.foodpol.2010.05.006>

- Hellmann, D., Maitland, C., & Tapia, A. (2016). Collaborative analytics and brokering in digital humanitarian response. *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, 1284–1294. ACM.
- Hiltz, S. R., & Plotnick, L. (2013). *Dealing with Information Overload When Using Social Media for Emergency Management: Emerging Solutions*. 5.
- Hughes. (2012). The Evolving Role of the Public Information Officer: An Examination of Social Media in Emergency Management : *Journal of Homeland Security and Emergency Management*. Retrieved April 27, 2019, from <https://www.degruyter.com/abstract/j/jhsem.2012.9.issue-1/1547-7355.1976/1547-7355.1976.xml>
- Imran, M., Castillo, C., Diaz, F., & Vieweg, S. (2015). Processing social media messages in mass emergency: A survey. *ACM Computing Surveys (CSUR)*, 47(4), 67.
- Jamwal, P., Bejoy Thomas, K., Lele, S., & Srinivasan, V. (2014). *Addressing water stress through wastewater reuse: Complexities and challenges in Bangalore, India*.
- Jennex, M. E. (2010). Implementing social media in crisis response using knowledge management. *International Journal of Information Systems for Crisis Response and Management (IJISCRAM)*, 2(4), 20–32.
- Kaminsky, A. P., & Long, R. D. (2011). *India today: an encyclopedia of life in the Republic* (Vol. 1). ABC-CLIO.
- Karnataka erupts in anger over SC order on Cauvery. (2016, September 13). *The Hindu*. Retrieved from <https://www.thehindu.com/news/national/Karnataka-erupts-in-anger-over-SC-order-on-Cauvery/article14636452.ece>
- Kumar, N. (2014). Facebook for self-empowerment? A study of Facebook adoption in urban India. *New Media & Society*, 16(7), 1122–1137. <https://doi.org/10.1177/1461444814543999>
- Kumar, R., & Thapa, D. (2015). Social media as a catalyst for civil society movements in India: A study in Dehradun city. *New Media & Society*, 17(8), 1299–1316.
- Lal, M., & others. (2000). Climatic change-implications for India's water resources. *Journal of Social and Economic Development*, 3, 57–87.
- Lele, S., & Sengupta, M. B. (2018). *From lakes as urban commons to integrated lake-water governance: The case of Bengaluru's urban water bodies*. 8(1), 22.

- Li, J., & O'Hara, K. (2009). Understanding distributed collaboration in emergency animal disease response. *Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group on Design: Open 24/7 - OZCHI '09*, 65. <https://doi.org/10.1145/1738826.1738838>
- Lim, M. (2013). Many clicks but little sticks: Social media activism in Indonesia. *Journal of Contemporary Asia*, 43(4), 636–657.
- Lin, X., Spence, P. R., Sellnow, T. L., & Lachlan, K. A. (2016). Crisis communication, learning and responding: Best practices in social media. *Computers in Human Behavior*, 65, 601–605.
- Lindsay, B. R. (2011). *Social media and disasters: Current uses, future options, and policy considerations*. Congressional Research Service Washington, DC.
- Lynch, M. (2011). After Egypt: The limits and promise of online challenges to the authoritarian Arab state. *Perspectives on Politics*, 9(2), 301–310.
- Manasi, S., & Umamani, K. (2013). Water conservation in urban areas: a case study of rain water harvesting initiative in Bangalore city. In *Knowledge Systems of Societies for Adaptation and Mitigation of Impacts of Climate Change* (pp. 303–328). Springer.
- Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons*, 52(4), 357–365.
- Marmura, S. (2008). A net advantage? The internet, grassroots activism and American Middle-Eastern policy. *New Media & Society*, 10(2), 247–271.
- McCracken, G. (1989). Who is the celebrity endorser? Cultural foundations of the endorsement process. *Journal of Consumer Research*, 16(3), 310–321.
- Mehtani, P. C. (2017). An Appraisal of Water Sustainability in Bangalore, Karnataka. In *Sustainable Smart Cities in India* (pp. 493–514). Springer.
- Mejias, U. (2011). The twitter revolution must die. *International Journal of Learning and Media*, 2(4).
- Miyabe, M., Miura, A., & Aramaki, E. (2012). Use trend analysis of twitter after the great east japan earthquake. *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work Companion - CSCW '12*, 175. <https://doi.org/10.1145/2141512.2141571>

- Mohan, V. (2017, December). Isha Foundation: Niti Aayog CEO-led group to study Isha Foundation's proposals | India News - Times of India. Retrieved April 30, 2019, from The Times of India website: <https://timesofindia.indiatimes.com/india/niti-aayog-ceo-led-group-to-study-isha-foundations-proposals/articleshow/62045210.cms>
- Morozov, E. (2013). Why social movements should ignore social media. *New Republic*, 5.
- Nagar, S., Seth, A., & Joshi, A. (2012). Characterization of social media response to natural disasters. *Proceedings of the 21st International Conference Companion on World Wide Web - WWW '12 Companion*, 671. <https://doi.org/10.1145/2187980.2188177>
- Nandini, N., Bheemappa, K., Vijay Kumar, M., & Raghavendra, M. (2013). Policy framework for conservation of water bodies in Bangalore. *International Journal of Advanced Research*, 1(4).
- Nardi, B., Tomlinson, B., Patterson, D. J., Chen, J., Pargman, D., Raghavan, B., & Penzenstadler, B. (2018). Computing within limits. *Communications of the ACM*, 61(10), 86–93. <https://doi.org/10.1145/3183582>
- Nicholls, R. J., & Tol, R. S. (2006). Impacts and responses to sea-level rise: a global analysis of the SRES scenarios over the twenty-first century. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 364(1841), 1073–1095.
- Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*. Harvard University Press.
- Norheim-Hagtun, I., & Meier, P. (2010). Crowdsourcing for crisis mapping in Haiti. *Innovations: Technology, Governance, Globalization*, 5(4), 81–89.
- O'Lear, S. (2016). Climate science and slow violence: A view from political geography and STS on mobilizing technoscientific ontologies of climate change. *Political Geography*, 52, 4–13. <https://doi.org/10.1016/j.polgeo.2015.01.004>
- Orlove, B., Wiegandt, E., & Luckman, B. H. (2008). *Darkening peaks: glacier retreat, science, and society*. Univ of California Press.
- Palen, L., & Anderson, K. M. (2016). Crisis informatics—New data for extraordinary times. *Science*, 353(6296), 224–225. <https://doi.org/10.1126/science.aag2579>
- Palen, L., Anderson, K. M., Mark, G., Martin, J., Sicker, D., Palmer, M., & Grunwald, D. (2010). A vision for technology-mediated support for public participation & assistance in

- mass emergencies & disasters. *Proceedings of the 2010 ACM-BCS Visions of Computer Science Conference*, 8. British Computer Society.
- Palen, L., Starbird, K., Vieweg, S., & Hughes, A. (2010). Twitter-based information distribution during the 2009 Red River Valley flood threat. *Bulletin of the American Society for Information Science and Technology*, 36(5), 13–17.
- Palen, L., Vieweg, S., Liu, S. B., & Hughes, A. L. (2009). Crisis in a networked world: Features of computer-mediated communication in the April 16, 2007, Virginia Tech event. *Social Science Computer Review*, 27(4), 467–480.
- Pandian, M. (1989). Culture and subaltern consciousness: An aspect of MGR phenomenon. *Economic and Political Weekly*, PE62–PE68.
- Pani, N. (2009). Resource cities across phases of globalization: Evidence from Bangalore. *Habitat International*, 33(1), 114–119.
<https://doi.org/10.1016/j.habitatint.2008.05.007>
- Parry Martin, Rosenzweig Cynthia, & Livermore Matthew. (2005). Climate change, global food supply and risk of hunger. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360(1463), 2125–2138.
<https://doi.org/10.1098/rstb.2005.1751>
- Patra, S., & Datta, S. K. (2010). Celebrity Endorsement in India–Emerging Trends and Challenges. *Journal of Marketing & Communication*, 5(3).
- Pattusamy, V., Nandini, N., Vijay Kumar, M., & Bheemappa, K. (2013). Water quality studies of Bellandur Lake, Urban Bangalore, Karnataka, India. *International Journal of Advanced Research*, 1(4), 77–82.
- Pei, L., & Nardi, B. (2019). We Did It Right, But It Was Still Wrong: Toward Assets-Based Design. *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*, 1–11. <https://doi.org/10.1145/3290607.3310434>
- Procopio, C. H., & Procopio, S. T. (2007). Do you know what it means to miss New Orleans? Internet communication, geographic community, and social capital in crisis. *Journal of Applied Communication Research*, 35(1), 67–87.
- Qu, Y., Wu, P. F., & Wang, X. (2009). Online community response to major disaster: A study of Tianya forum in the 2008 Sichuan earthquake. *2009 42nd Hawaii International Conference on System Sciences*, 1–11. IEEE.

- Ramachandra, T., & Aithal, B. H. (2016). Bengaluru's reality: towards unlivable status with unplanned urban trajectory. *Current Science*, 110(12), 2207–2208.
- Rangaswamy, N., Challugulla, G., Young, M., & Cutrell, E. (2013). Local pocket Internet and global social media. Bridging the digital gap: Facebook and youth sub-stratum in urban India. *International Conference on Social Implications of Computers in Developing Countries*.
- Rogers, E. M. (2010). *Diffusion of innovations*. Simon and Schuster.
- Sabie, S., Salman, M., & Easterbrook, S. (2016). Situating shelter design and provision in ICT discourse for scarce-resource contexts. *Proceedings of the Second Workshop on Computing within Limits*, 15. ACM.
- Sarcevic, A., Palen, L., White, J., Starbird, K., Bagdouri, M., & Anderson, K. (2012). Beacons of hope in decentralized coordination: Learning from on-the-ground medical twitterers during the 2010 Haiti earthquake. *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work*, 47–56. ACM.
- Saxenian, A. (2001). *Bangalore: The Silicon Valley of Asia*. 33.
- Schultz, F., Utz, S., & Göritz, A. (2011). Is the medium the message? Perceptions of and reactions to crisis communication via twitter, blogs and traditional media. *Public Relations Review*, 37(1), 20–27.
- Seeger, M. W., Sellnow, T. L., & Ulmer, R. R. (1998). Communication, Organization, and Crisis. *Annals of the International Communication Association*, 21(1), 231–276. <https://doi.org/10.1080/23808985.1998.11678952>
- Shklovski, I., Burke, M., Kiesler, S., & Kraut, R. (2010). Technology adoption and use in the aftermath of Hurricane Katrina in New Orleans. *American Behavioral Scientist*, 53(8), 1228–1246.
- Shneiderman, B., Card, S., Norman, D. A., Tremaine, M., & Waldrop, M. M. (2002). CHI@ 20: fighting our way from marginality to power. *CHI'02 Extended Abstracts on Human Factors in Computing Systems*, 688–691. ACM.
- Soden, R., Budhathoki, N., & Palen, L. (2014). Resilience-building and the crisis informatics agenda: Lessons learned from open cities Kathmandu. *ISCRAM*, 339–348.

- Sridhar, V. (n.d.). Hero-worship scales new heights in India. Retrieved April 18, 2019, from <https://www.aljazeera.com/news/asia/2014/03/hero-worship-scales-new-heights-india-201432032645330523.html>
- Srinivasan, M., Srinivasa, S., & Thulasidasan, S. (2013). Exploring celebrity dynamics on Twitter. *Proceedings of the 5th IBM Collaborative Academia Research Exchange Workshop*, 13. ACM.
- Starbird, K. (2013). Delivering patients to sacré coeur: collective intelligence in digital volunteer communities. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 801–810. ACM.
- Starbird, K., & Palen, L. (2011). “Voluntweeters”: self-organizing by digital volunteers in times of crisis. *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems - CHI '11*, 1071. <https://doi.org/10.1145/1978942.1979102>
- Starbird, K., & Palen, L. (2012). (How) will the revolution be retweeted?: information diffusion and the 2011 Egyptian uprising. *Proceedings of the Acm 2012 Conference on Computer Supported Cooperative Work*, 7–16. ACM.
- Starbird, K., Palen, L., Hughes, A. L., & Vieweg, S. (2010). Chatter on the red: what hazards threat reveals about the social life of microblogged information. *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*, 241–250. ACM.
- Stolterman, E., & Croon Fors, A. (2008). Critical HCI Research: a research position proposal. *Design Philosophy Papers*, 1.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*. Sage publications Thousand Oaks, CA.
- Subramanian, S. (2014). *From the Streets to the Web: Feminist Activism on Social Media*. Mumbai: Advanced Centre for Women’s Studies, Tata Institute of Social Sciences.
- Sudhira, H. S., Ramachandra, T. V., & Subrahmanya, M. H. B. (2007). Bangalore. *Cities*, 24(5), 379–390. <https://doi.org/10.1016/j.cities.2007.04.003>
- Sullivan, J., & Xie, L. (2009). Environmental activism, social networks and the internet. *The China Quarterly*, 198, 422–432.
- Surana, R. (2008). The effectiveness of celebrity endorsement in India. Retrieved July, 26, 2014.

- Sutton, J. N., Palen, L., & Shklovski, I. (2008). *Backchannels on the front lines: Emergency uses of social media in the 2007 Southern California Wildfires*.
- Swyngedouw, E. (2013). *The Non-political Politics of Climate Change*. 9.
- Tapia, A. H., Bajpai, K., Jansen, J., Yen, J., & Giles, L. (2011). *Seeking the Trustworthy Tweet: Can Microblogged Data Fit the Information Needs of Disaster Response and Humanitarian Relief Organizations*. 10.
- Tufekci, Z., & Wilson, C. (2012). Social media and the decision to participate in political protest: Observations from Tahrir Square. *Journal of Communication*, 62(2), 363–379.
- Utz, S., Schultz, F., & Glocka, S. (2013). Crisis communication online: How medium, crisis type and emotions affected public reactions in the Fukushima Daiichi nuclear disaster. *Public Relations Review*, 39(1), 40–46.
- V, S. (2016). Top 10 Celebrity Temples in India Maintained by Fans/Worshippers -... [2016]. Retrieved April 18, 2019, from FeedZig website: <http://www.feedzig.com/10-celebrity-temples-india/>
- van Gorp, A. F. (2014). *Integration of Volunteer and Technical Communities into the Humanitarian Aid Sector: Barriers to Collaboration*. 10.
- Van Laer, J., & Van Aelst, P. (2010). Internet and social movement action repertoires: Opportunities and limitations. *Information, Communication & Society*, 13(8), 1146–1171.
- Venugopal, V. (2017). *Sadhguru Jaggi Vasudev: Celebs heed Sadhguru Jaggi Vasudev's call for saving rivers, to show up in big numbers at rally - The Economic Times*. Retrieved from <https://economictimes.indiatimes.com/news/politics-and-nation/celebs-heed-sadhgurus-call-for-saving-rivers-to-show-up-in-big-nos-at-rally/articleshow/60077949.cms?iframe=true&width=1000&height=500>
- Vieweg, S., Hughes, A. L., Starbird, K., & Palen, L. (2010). Microblogging during two natural hazards events: what twitter may contribute to situational awareness. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1079–1088. ACM.
- Vieweg, S., Palen, L., Liu, S. B., Hughes, A. L., & Sutton, J. N. (2008). *Collective intelligence in disaster: Examination of the phenomenon in the aftermath of the 2007 Virginia Tech shooting*. University of Colorado Boulder, CO.

- Villa, R. (2016). Zika, or the burden of uncertainty. *La Clinica Terapeutica*, 167(1), 7–9.
- Visser, N. (2015, May 19). India's Bellandur Lake Is So Polluted It Caught Fire. *Huffington Post*. Retrieved from https://www.huffingtonpost.com/2015/05/19/india-lake-pollution-fire_n_7315038.html
- Wulf, V., Misaki, K., Atam, M., Randall, D., & Rohde, M. (2013). 'On the ground' in Sidi Bouzid: investigating social media use during the tunisian revolution. *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, 1409–1418. ACM.
- Yates, D., & Paquette, S. (2010). Emergency Knowledge Management and Social Media Technologies: A Case Study of the 2010 Haitian Earthquake. *Proceedings of the 73rd ASIS&T Annual Meeting on Navigating Streams in an Information Ecosystem - Volume 47*, 42:1–42:9. Retrieved from <http://dl.acm.org/citation.cfm?id=1920331.1920391>
- York, J. C. (2011). Not Twitter, not Wikileaks: A human revolution. *Blog von Jillian C. York*, 14, 2011.
- Zaber, M. H., Nardi, B., & Chen, J. (2017). A Study of Hashtag Activism for Raising Awareness about Riverbank Erosion in Bangladesh. *Proceedings of the 2017 Workshop on Computing Within Limits - LIMITS '17*, 51–58.
<https://doi.org/10.1145/3080556.3080557>
- Zaber, M., Nardi, B., & Chen, J. (2018). Responding to Riverbank Erosion in Bangladesh. *Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS) - COMPASS '18*, 1–11.
<https://doi.org/10.1145/3209811.3209823>
- Zachos, E. (2018, March). Yogi Sadhguru's Rally for Rivers Aims to Clean the Ganges, Other Indian Waters. Retrieved April 24, 2019, from <https://news.nationalgeographic.com/2018/03/rally-for-rivers-un-world-water-day-sp/>
- Zuckerman, E. (2011). The first Twitter revolution? *Foreign Policy*, 14(January).

Appendix

Interview Questions

I conducted semi-structured interviews having open-ended questions. The following list of the interview questions is not exhaustive as I asked questions based on the interviewees' responses.

Social Media Questions

1. What is the role of social media in your daily life?
2. What social media platforms do you use? Is there any specific reason behind using only these platforms?
3. What kind of information do you often see on social media?
4. How do you verify the information shared on social media?
5. What kind of information do you share or post on social media?
6. How often do you use social media?
7. What positives and negatives effects does social media have in your life?

Slow Water Crisis in Bangalore

1. Are you a resident of Bangalore?
 - a. If not, how long have you been living in Bangalore?
 - b. If not, from which state and city have you migrated?
 - c. If not, why did you migrate to Bangalore?
 - d. If not, are you looking forward to staying in Bangalore?
 - e. Would you prefer living in Bangalore or your hometown? Why?
2. Could you share your experience of living in Bangalore?
3. What civic problems you or the public face in the city?
4. What are the reasons behind these problems?
5. How do you deal with the problems?
6. What measures the government has taken to abate the civic issues?

- a. Were the measures successful?
 - i. If yes, could you please share some examples?
 - ii. If not, why did the measures fail?
7. What is the status of water availability in Bangalore?
8. Are people aware of the water problems in Bangalore? If not, how can we make them aware?
9. Could you please share your views on the Bellandur Lake incidents of froth formation and catching fire?
 - a. What was the public reaction?
 - b. How did the government solve the issues?
10. Could you please share your opinion on the Cauvery water dispute?
 - a. What is the dispute?
 - b. What are the public views about the dispute?
 - c. Why is Bangalore dependent on the Cauvery River?
11. Have you heard about or participated in the Rally For Rivers campaign?
 - a. If yes, how did you get to know about the campaign?
 - b. If yes, how did you participate?
 - c. If yes, how did you make people aware of the campaign?
 - d. If no, what do you think are the important factors to raise public awareness about a campaign like the Rally For Rivers?
12. What do you think should be the measures taken by the state and central government towards abating water problems?
13. Is there anything else that you want me to know?