

# Responding to Riverbank Erosion in Bangladesh

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## ABSTRACT

In this paper, we examine riverbank erosion in Bangladesh, a crisis that affects millions of people, but has largely been overlooked in the ICT4D and crisis informatics literature. Through a two-month field study in four districts of Bangladesh, we explored how people managed the impacts of erosion. Our study reveals that riverbank erosion resulted in material loss, forced migration, and social displacement. Victims faced many challenges but received little institutional support. We combined the ethnographic field study with an online social media study to present a holistic picture of the activities of crisis response. In the field sites, we observed that ICT use was limited to phone calls because the internet was inaccessible. However, our analysis of online social media activity in two nearby regions revealed strong Facebook activism. Activists used Facebook to raise public awareness about riverbank erosion and push for political change.

## CCS CONCEPTS

• **Human-centered computing** → **Field studies; Empirical studies in HCI;**

## KEYWORDS

Crisis; ethnography; social media; riverbank erosion; Bangladesh; Crisis Informatics

### ACM Reference Format:

Maruf Zaber, Bonnie Nardi, and Jay Chen. 2018. Responding to Riverbank Erosion in Bangladesh. In *COMPASS '18: ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS)*, June 20–22, 2018, Menlo Park and San Jose, CA, USA. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3209811.3209823>

## 1 INTRODUCTION

An estimated 200 million people are vulnerable to sea level rise and coastal erosion [45]. These crises disproportionately affect the most vulnerable populations who have few resources, low rates of literacy, and little access to technological infrastructure [28, 70, 71, 76]. In this paper, we study communities in Bangladesh affected by riverbank erosion through an observational study, interview study, and analysis of online Facebook activism. We report on the challenges that affected populations faced and identify opportunities for supporting these communities through ICTs.

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COMPASS '18, June 20–22, 2018, Menlo Park and San Jose, CA, USA

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ACM ISBN 978-1-4503-5816-3/18/06...\$15.00

<https://doi.org/10.1145/3209811.3209823>

Riverbank erosion is an endemic natural phenomenon that occurs in Bangladesh. The vast floodplains of the three major river systems—the Padma, Brahmaputra-Jamuna, and Meghna—have made Bangladesh one of the most vulnerable countries in the world to flood and riverbank erosion. Yet riverbank erosion, which affects millions of lives, is relatively invisible. It is not a topic of mainstream media interest and receives insufficient attention from the government. On any given day, erosion does not constitute a disaster calling for rapid response nor a dramatic event eliciting a news story. However, erosion, in aggregate, causes tremendous social, economic, and psychological damage. Eventually, livelihoods are destroyed, houses washed away, and communities torn apart.

Despite its relevance and scope, erosion is surprisingly overlooked in both the ICT4D and crisis informatics literature. To the best of our knowledge, the most closely related ICT4D literature to erosion-induced migration is in the context of refugee camps [60, 75] and migration data analysis [7]. Crisis informatics has documented self-organizing community participation surrounding crisis events through social media [50, 54, 69], but similar activation of online participation is often sparse at the margins of society and technological access. Marginal communities are less able to deploy technologies to make their problems visible and voices heard in an ever-digitizing world. The dual impact of the lower visibility of these crises [46, 72], combined with their occurrence in marginalized populations, offers a challenge for research.

In this paper, we describe the local context of our study, outlining the geopolitical landscape of Bangladesh. We then discuss our interviews with migrants who relocated due to riverbank erosion and with potential migrants who were still living in erosion-affected areas. Then we examine an instance of online Facebook activism focused on two erosion-affected areas. We compare the results of these two different segments of the research, i.e., the field interviews and the text analysis of the Facebook posts.

From our field study, we found that riverbank erosion resulted in material losses, forced migration, and social displacement. Government relief was minimal at best. Study participants relied on familial and social networks to cope with the impacts of erosion. Technology use was mostly limited to phone calls. Internet access was rare. Participants' voices and concerns were generally unheard by the general public and the organizations responsible for helping. In contrast, our online investigation revealed a community working together to combat the problem through political activism. Our findings highlight the opportunity afforded by online social media and potentially other ICTs for political change.

## 2 RELATED WORK

Our work aligns most closely with crisis informatics and social media activism in the Global South. We briefly discuss related studies in these two areas.

## 2.1 Crisis Informatics

Crisis informatics has a venerable history, going back, arguably, to Charlotte Linde's 1988 CSCW paper on police helicopter missions [39]. This category of research primarily examines time-bounded crises of relatively short duration. For example, Ley et al. [35] studied how multiple agencies responded to a large power outage in Germany. Li and O'Hara [36] discussed emergency response in infectious animal disease outbreaks in Australia. In an early study, Heath and Luff [26] described transportation crises such as vehicle breakdowns and the discovery of suspect packages on the London Underground. Other scholars have studied firefighting [18], emergency response call centers [52], and "digital humanitarians" [66].

Some researchers (even when their empirical work engages short time horizons) are beginning to discuss the longer time frames that will be needed for at least some future research. For example, Hellman et al. studied disease outbreaks [27], noting that certain crises do not resolve quickly: "When one considers the basic nature of...disease epidemics as opposed to natural disasters and other breakdowns of civil infrastructure, disease events tend to be more protracted." Soden et al. [62] observed: "[J]ust as robust community emergency management plans need to include activities in the periods 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."

A prominent vein of research in crisis informatics considers the use of social media during crises [2, 57, 60, 75]. Vieweg and Palen [69] analyzed Twitter posts during a flood and a fire in the US. Another focus is on geospatial elements of crises such as GIS systems [63], mapping volunteers [21], scaling mapping efforts [49], and map biases [55].

Relatively few works in the crisis informatics literature consider contexts in the Global South. However, Semaan and Mark [61] studied how Iraqi citizens made computing infrastructure usable as they recovered from war-time breakdowns. Soden et al. [62] conducted a survey of schools and health facilities in the Kathmandu Valley to prepare for disasters such as earthquakes and floods. Schmitt et al. [60] and Xu et al. [75] studied forced migration, exploring technology distribution and mapping in refugee camps.

## 2.2 Social media and political activism in the Global South

Internet use in the Global South is increasing. A survey by the Pew Research Center estimated that about 54% of this population has access to the internet [53] though many barriers remain. Wyche and Schoenebeck's study in rural Kenya found that social media use was constrained by unreliable electricity, uneven resource distribution, and the cost of computation [74]. Other factors affecting internet use included low literacy and lack of previous experience with digital technology (see also [59]). Users were aware of social media but were reluctant to use the applications because they "didn't know much about [social media]," "did not know how to use [the tools] effectively," or lacked technological "know-how" [74]. Other studies have found similar patterns of limited use of social media in the Global South [5, 73]. Our study in Bangladesh includes people

who face many of the same internet access challenges described in previous work.

Despite current practical limitations, social media's potential for democracy, citizenship, empowerment, governance, and information diffusion in the Global South is enormous. Lim's investigation of the activism of Indonesian Twitter users showed that social media enables diverse and networked activity which in turn affords greater social and cultural participation [38]. Lindgren reported that Twitter played a role in the 2011 Libya uprising [40]. "Protesters [using Twitter] in Egypt and Tunisia were able to quickly form spontaneous and effective social movements, while similar attempts to form movements in Libya collapsed into civil war" [40]. This finding reminds us of the importance of the wider context of social media activity and that we must not be overly techno-deterministic about what social media, on its own, can do [40].

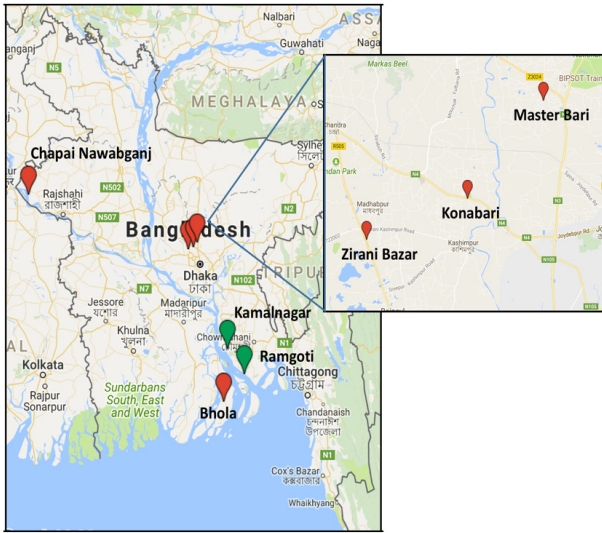
Rangaswamy et al.'s ethnography of young, low-income internet users in urban India revealed how, despite many infrastructural and social obstacles, Facebook use on mobile phones helped "transform...self-perception [and] expand...social connections and life chances" [56]. Kumar [33] reported that users with diverse interpretations of online technology were able to navigate social and technical barriers to better integrate themselves into the global online community (see also [9]). In research on Egyptian activism, Tufekci and Wilson emphasized the role of technology in supporting new political voices of marginalized persons [67]. Pal and Gonawela studied growing social media use among political elites in low- and middle-income countries [48].

## 3 BACKGROUND

Bangladesh is situated in the easternmost corner of South Asia. With an area of 147,610 square kilometers (about the size of Greece), it is home to around 171 million people [8], making it one of the most densely populated countries in the world. Administratively the country is divided into 64 districts, each of which consists of multiple sub-districts, locally referred to as "Upazilas." Economically, Bangladesh ranks 146th in GDP per capita, but growth is currently at about 7% a year, primarily from the ready-made garment industry.

While Bangladesh has made progress in reducing poverty [3], improving women's rights, and in other important areas, it is challenged by widespread corruption [29], rapid population growth (the fertility rate has declined but the population is young), deteriorating infrastructure, and vulnerability to an array of environmental challenges including cyclones, flooding, earthquakes, and sea level rise [4]. In Bangladesh, an estimated 2,000–3,000 kilometers of riverbank are susceptible to chronic erosion [30]. Land loss wreaks havoc on the rural agricultural economy and is responsible for an estimated \$500 million loss annually [47]. But the most widespread outcome of riverbank erosion is internal migration, both temporary and permanent [44].

Culturally, rural Bangladeshi society is close-knit at the village level. Permanent migrants often reappropriate social bonds with peers and extended kin in urban areas [32]. Urban migrants work at jobs such as rickshaw puller, garment worker, servant, waste picker, and day laborer. Some become street beggars. People who were previously self-sufficient farmers or small business owners often become impoverished after migrating to urban areas [44, 58].



**Figure 1: Locations of study areas. Field study locations are marked by the red pins and study areas with online activity are marked by the green pins. Courtesy: Google Maps**

Digital technology use in Bangladesh is constrained by lack of access to electricity, the internet, computers, and mobile phones, as well as lack of technical knowledge and sometimes basic literacy. These circumstances are similar to those examined in other developing countries (e.g., [12]), particularly in rural areas [37]. In contrast to developed countries where infrastructure costs are invisible, even applications such as Facebook are a luxury due to cost [74]. Illiteracy inhibits mobile use [13]. Although 40% of Bangladeshis have mobile phones, penetration is lower in rural areas. In our field study of rural and urban Bangladesh, internet use was almost completely absent.

## 4 METHODS

We began with a field study conducted in five erosion-affected communities in four districts of Bangladesh: Dhaka, Gazipur, Chapai Nawabganj, and Bhola (Figure 1). We conducted the research from May–July, 2016. Though we found little use of digital technology, we learned of a small but significant occurrence of “hashtag activism” among Facebook users native to two erosion-affected Upazilas, i.e., Ramgoti and Kamalnagar. These Upazilas are close to Bhola in our field study. We collected Facebook data from June 2016–February 2017.

### 4.1 Field Study

We conducted 26 interviews. When recruiting participants we chose only those who identified riverbank erosion as a reason for having migrated or who were considering migrating due to riverbank erosion. We began with a few participants known to the first author and then used snowball sampling. The urban migrants were selected from three communities with many migrants: Konabari, Zirani Bazar, and Master Bari, situated 45km, 40km, and 48km from Dhaka’s city center, respectively. These outskirt areas have

large migrant communities because living is cheaper and it is easier for migrants to find employment compared to the city center. We interviewed 16 migrants (nine male and seven female).

In Chapai Nawabganj, located in the northern part of the country on the banks of the Padma River, we interviewed five migrants (see Figure 1). In Bhola District, located in the south-central part of the country by the lower Meghna River, we interviewed five people who were thinking about migrating but had not yet done so. In Chapai Nawabganj and Bhola, we interviewed only one female participant in each locale because it is difficult to recruit female subjects in these conservative rural areas. In future work, we will focus on balancing the sample to the extent possible.

Interviews were conducted in participants’ homes in their native language, Bengali, by the first author who is a native speaker. Participants’ jobs included small farmer (someone who typically owns a small amount of land or rents land from others), day laborer, vegetable retailer, cobbler, garment worker, fisherman, and street vendor. Eight participants had no formal schooling and only two had education beyond high school. The rest had education from primary school to high school. Ages ranged from 23 to 65. Two participants were unwilling to disclose their ages. We shared many informal conversations with our study participants as well as observing them, their homes, and their locales.

Participants received compensation of 300 Bangladeshi Taka (\$5), equal to approximately a day of income. Two participants expressed discomfort at receiving a monetary incentive. We offered them small gifts instead, which they accepted. Semi-structured interviews lasted about half an hour on average. In the interviews, we first asked participants about demographic information and their experience with riverbank erosion. For those who had migrated, we inquired about their migration process, problems, and work life after migration. For those considering migration, we asked about preparations for possible future moves and their willingness to migrate. Finally, we investigated digital technology usage among all participants. We continued to conduct interviews until we felt that we were reaching topic saturation [64]. Each session was audiotaped with participants’ permission and later translated into English. Our field observations and interviews resulted in 125 pages of materials.

### 4.2 Facebook Study

We were informed of an occurrence of hashtag activism on Facebook by a friend of the first author who knew of our interest in issues related to riverbank erosion in Bangladesh. The informant was a native Bangladeshi based in Dhaka. The Facebook posts focused on riverbank erosion in Ramgoti and Kamalnagar, two Upazilas in the Lakshmipur District, near our study areas in Bhola. We searched Facebook posts set to “public.” We also analyzed Bangladeshi news media with respect to riverbank erosion. While Twitter is heavily identified with political activity in the research literature, Facebook is more popular among Bangladeshi Internet users than Twitter and other social media. This pattern holds globally. Recently, Facebook had 2 billion monthly active users (June, 2017) [11] while Twitter had 332 million monthly active users (January 2016) [19].

Facebook introduced the hashtag feature in 2013. Hashtags facilitate topic-oriented communication just as they do on Twitter [16]. We collected Facebook posts beginning with three hashtags:

#savekamalnagar, #saveramgoti, and #savelakshmipur. We generated additional hashtags (#kamalnagar, #helpkamalnagar, #megnariver, #rivererosion, #saveKamalnagarRamgoti, #rivererosionIn-Bangladesh) by iteratively collecting new hashtags from posts with one or more relevant keywords until we compiled an exhaustive list. A post was considered relevant if it included information about riverbank erosion in Kamalnagar, Ramgoti, and/or Lakshmipur, or pictures, videos, news articles, or blog posts related to riverbank erosion in these areas.

For each post, we archived the text, images, videos, external URLs, comments, geolocation information, and timestamp. Individual users' posts and public Facebook pages were collected. For each user, we collected publicly available demographic information including current location, age, education, and profession. Almost all the posts were written in Bengali, the native language of the posters. Posts originally in English are so noted. The hashtags were in English even if the post was in Bengali, ensuring reach to a wider audience. Bengali posts in this paper were translated by the first author.

We omitted duplicate and irrelevant posts through manual screening of the data, consistent with the practice of other researchers studying social media (e.g., [69]). The corpus contained 159 unique Facebook posts from individual users or by pages. We identified five pages and seven groups that posted about riverbank erosion related to Ramgoti and Kamalnagar. We also identified three online newspapers—Banglanews24, lakshmipur24, and coastalbangladesh—that published relevant news articles. Banglanews24 is a nationwide news outlet and the other two are local.

### 4.3 Data Analysis

We applied an open-ended study design inspired by grounded theory to analyze data from the field study and the online texts [64]. The field notes, interview transcripts, and Facebook post transcripts were thoroughly scrutinized for broad themes and then iteratively coded using grounded theory methods to find emergent themes [65]. The materials were coded using an online qualitative analysis tool called Dedoose [22]. Analyzing the qualitative data required several iterations of reading, coding, and summarizing to connect the themes that emerged [23]. We engaged in formal discussions about the themes after reading the data and collectively converged on interpretations, making sure each point was well supported in the data in multiple places to ensure the validity of the findings.

## 5 FINDINGS

We first report findings from the interviews and observations, then the online portion of the study.

### 5.1 Organizational Responses to Riverbank Erosion

Broadly speaking, institutional response to riverbank erosion can include (1) aid at the point of immediate disaster such as food, medicine, clothing, and money, (2) engineering interventions such as building riverbank protection dams, dredging riverbeds, and spreading temporary layers of boulders to ward off erosion, and, (3) facilitating alternative economic arrangements such as helping people find new jobs when they relocate. In the early 1990s, Haque et al. reported that in Bangladesh, government and NGO response to

riverbank erosion focused on structural engineering measures [25]. This situation persists—institutional response from national and regional governments, NGOs, and local political groups is primarily limited to infrastructural support such as building dams, with far too little aid in the way of food, medicine, and job relocation.

We observed infrastructure measures such as riverbank protection and river flow control in parts of the Chapai Nawabganj and Bhola districts. However, these measures were often considered insufficient by our participants as regular maintenance was not carried out. Participants reported that they received some food relief and micro-loans during flood events but that it was extremely minimal. Only 11 of our 26 participants reported that they received immediate aid of any kind from government or non-governmental organizations, usually in small amounts of consumable goods (e.g., rice, oil, cloth, dry food, medicine), and occasionally small sums of money, no larger than 2,000 Taka (\$25 USD). Our participants considered these quantities insufficient. As one participant said:

*"We didn't receive any help. Some guys from Dhaka came to our village once. The only thing they did was take some photographs of the affected areas. In one rainy season, we received some dry food from a local NGO. That's all. We didn't get any aid which would really help us to be rehabilitated."*

Humanitarian aid from the government is distributed by Union Councils, the smallest rural local government unit in Bangladesh. These "Union Parishad" councils have an elected governing body of one Chair and twelve Members, one of whom is responsible for distributing relief in the local area.

Relief notification is an ad hoc process, often inefficient and devoid of formal protocols. We did not hear of any institutional use of digital technologies such as mobile phones, computers, or internet during the relief distribution process. Usually alerts are announced in a common village meeting place or at the local Union compound. Our participants reported that they generally relied on peers and family members to relay alerts either face-to-face or via mobile phone. This informal information propagation often missed people who needed help. One participant told us, for example, that relief goods were brought to the local market of his village without prior notification, and that those who were absent were left out.

Relief goods were often disbursed on a first-come-first-served basis. There was perceived corruption and nepotism in the relief and infrastructure building process in our study areas. For example, two participants reported that they did not receive relief because they were not socially connected to their Union Parishad Member. One told his story:

*"We didn't receive any substantial help from anyone. After erosion, some villagers received lump-sum amounts of money from the Member of our union. Hearing that, we also went to his place but only to hear that nothing is left for us. He was extremely unfair with us. People who were rich, who didn't endure much loss, received multiple relief slips, whereas they were supposed to receive one slip per family at best. The Member distributed the slips with corruption and nepotism. A few days later, we received about 10Kg of rice. You can very well understand that this help is no match for our loss."*

We observed little formal support for relocation. Only one participant, in Chapai Nawabganj, mentioned receiving a low-interest micro-loan from a local NGO, which he used to invest in his retail business and to purchase a piece of land in an adjacent locality.





Figure 2: A group of migrants in Konabar, Bangladesh

## 5.2 Community Support in Response to Riverbank Erosion

In the face of limited institutional interventions, our participants relied on community-based and ad hoc collaborations within their personal social networks of friends, family, neighbors, and co-workers to manage responses to riverbank erosion, especially when temporary or permanent relocation occurred. Study participants told us that their typical response was to gather belongings such as furniture, utensils, electronics, and building materials, before the flooding precipitated by riverbank erosion, and migrate to a temporary location when flooding occurred. Longer-term preparations included building houses with materials easily disassembled for swift retreat, and buying or leasing lands nearby in advance of potential relocation. Over time, they migrated to distant places less prone to riverbank erosion in search of better opportunities for their livelihoods.

Collaboration was motivated by a sense of belonging to the community, by altruism, and sometimes business opportunity. Our participants reported that immediate retreat during floods or land loss caused by erosion involved finding a suitable place for building temporary shelter either on their own lands, on other people's lands through leasing or squatting, or on government land. Informal contracts between land owners and affected families were sometimes established through social connections. One participant explained,

*"Look, we have to have land to build a house. We didn't own any land in distant places. You can build a temporary house even if you don't own land, but you have to know the owner of the land. For example, let us suppose I have lost my house to erosion. I then relocate my belongings to higher land near my living place. I then contact the owner and ask him to lease that piece of land to me. Usually, the agreement is renewed on a yearly basis. Every year I have to pay a certain amount of money to him. Almost everyone here has been affected by erosion. Therefore, people are sympathetic to each other. So the leasing culture is very much widespread in our village."*

Another form of collaboration was sharing relief notifications. People talked face to face, called each other on their phones, or held community meetings. One participant said,

*"In our village everyone knows everyone. So if anything of substantial importance happens everyone would know."*

This assertion describes the most common method of transmitting information, but as we have seen, it does not always work, and sometimes people are left out. Most people we interviewed reported receiving help from friends and family during the migration process. Among the 16 migrants we interviewed, 15 had migrated to places where they had relatives or friends. One migrant said,

*"We have about 150 families here who are from Sirajganj District. ... Before we moved here, I knew some guys from my village who had migrated here and were making good incomes. They encouraged us to migrate here."*

None of our participants received any support from the government or NGOs in finding a job or accommodation, or in obtaining information during resettlement. By contrast, all 16 migrants received some form of help from family and friends, including shelter, food, loans, and job references. One participant told us,

*"We first moved to [my brother-in-law's] house as we had no other place to go. We stayed there for a week. Fortunately, I managed to get a job in a garment factory shortly after I arrived in Dhaka. After I got the job, [my brother-in-law] helped rent a house for our own. The rent was 700 Taka per month. Now I live in a bit larger house and rent is 1,500 Taka per month."*

A key challenge of migration is the difficulty of securing a new source of income. Among our participants, 14 were blue-collar workers (e.g., ready-made garment worker, janitor, small retailer, cobbler, and rickshaw puller). Ten reported that they got their first job interview through family or friends.

## 5.3 Challenges of Forced Migration

Riverbank erosion damages the local economy with severe consequences for the livelihoods of those in affected areas. The rural economy of Bangladesh is dependent on agriculture, with 75% of the workforce directly or indirectly involved in agricultural occupations [1]. Agriculture of course becomes infeasible when people lose farmland and capital due to riverbank erosion. When forced to migrate, our study participants mostly made permanent moves in order to avoid having to deal with the experience again. The decision to migrate was not necessarily taken at the moment of an impending threat of erosion, but involved a long period of deliberation. Among the 16 migrants, 12 were affected by riverbank erosion more than once before they permanently migrated to urban areas.

Occupations of participants living on the outskirts of Dhaka city included one each: housewife, janitor, cobbler, and fruit retailer. Ten participants were ready-made garment workers, and two were unemployed. Many felt ambivalent about their new work arrangements. The occupational changes required new skills. Working conditions were sometimes worse than in farming. Work hours were longer, some work environments were unpleasant, and the work was monotonous. Our participants' social status declined. While 14 of the migrants reported making more money than when they were in their native villages, nine of them expressed dissatisfaction with their occupational activity. One participant discussed garment work:

*"The garment industry is not a good place to work, at all. The workload is much more intense compared to the payment. Often the supervisors reprimand us using inappropriate language. If I make a lot of 100 pieces [of clothing], there is a fair chance that one or two*



**Figure 3: A corn farm in Chapai Nawabganj near the Padma River**

*pieces are defective, but the supervisors won't just take this. They are too harsh with us. They even often call us 'liar' or 'thief'."*

Participants who had once had considerable status in their villages were sometimes abruptly marginalized when they had to accept lower status jobs upon relocation to urban areas. For example, one of the migrants who had been a labor union leader in a jute mill became a small retailer of fresh fruits in Master Bari, which earned him less respect from his new community. A participant who worked as a street cobbler in Zirani Bazar said:

*In my village, we had a leather business. We made good money. Here I have no permanent earning source. I sit beside a road and repair people's shoes. It is not a prestigious job at all."*

Some participants decided not to migrate, despite having lost property and land to erosion. They preferred to deal with the risks as they arose. One of our participants was a vegetable retailer and part-time fisherman in the Bhola District who had lost his land and property three times to riverbank erosion. He expressed unwillingness to migrate to an urban area:

*"I don't want to relocate to an urban area. How would we earn our livelihood there? Here, I know where to buy and where to sell vegetables. We can catch fish from the river. We graze our cattle in the grasslands." (See Figure 3)*

#### 5.4 Technology Use in Chapai Nawabganj and Bhola

Although technology use would help people find useful sources of information, lack of internet access poses obstacles. Government forecasting of flood and water levels of major river systems, for example, would be very useful for local residents. Information available in an online portal managed by the Bangladesh Water Development Board (BWDB) [10] was not accessible to our participants because they were not online. They were not even aware of such information.

The collaborations and acts of mutual aid participants discussed in Chapai Nawabganj and Bhola were not computer-mediated, but based on face-to-face communication and on existing social ties in personal social networks. In some cases, new social ties were

forged, as with the co-workers at the garment factories. The only digital component reported to us was the occasional phone call to find a place to build a temporary shelter, spread news about relief, search for jobs, or gain help in migrating to urban areas. Such phone calls supported the sharing of crucial information. For example, one migrant described mobile phone use in his job search:

*"I communicated with my friend before I migrated, over the mobile phone. I also used the mobile phone for job searching. I asked a guy to look for a suitable job for me. He gave me his contact number and I saved that number in my phone. Later, I called him to see if he had any update for me."*

3G coverage was available in our study areas in the outskirts of Dhaka. 2G coverage was available in the rural study areas in Chapai Nawabganj and Bhola. However, we found almost no internet based software use on phones or elsewhere. This absence was due to lack of internet-supported mobile phones, lack of technical knowledge, and illiteracy. One participant said,

*"I don't use the internet. Now it is the era of the internet though. I think I don't have the technical knowledge to use the internet. My phone doesn't have the internet option either."*

Another participant said,

*"My device supports internet, but I can't use it. I don't actually play around with my device. Basically, I'm so busy that I don't get much time to learn this stuff."*

Only one participant, in Chapai Nawabganj, owned a personal computer and had vocational training through an outsourced job in social media marketing. He used the internet. This participant reported posting pictures of the eroding riverbanks in his village on Facebook, but did not participate in deliberate activism, although certainly the pictures may have raised awareness.

#### 5.5 Online Activism in Ramgoti and Kamalnagar

Although we observed little digital activity in the field study, we nonetheless discovered hashtag activism in the Lakshmipur District, close to Bhola. We studied this activism to understand how riverbank erosion was being represented online. The activism focused on a small geographic region of Bangladesh in the Upazilas of Ramgoti and Kamalnagar. Most posters were native to Ramgoti and Kamalnagar, professionals or students living in urban areas such as Lakshmipur (the town), Dhaka, or abroad. However, some posters were based in Ramgoti or Kamalnagar. Posters were between the ages of 16-34, with education ranging from high school to college.

One poster whose native village was in Ramgoti, and who was educated in Dhaka, was living and working in Kashiwa, Chiba, Japan. He posted the following, in English, arguing that the government should take necessary steps to stop riverbank erosion in Ramgoti:

*"Government should take immediate step and allocate necessary funds to construct embankment in order to protect Kamalnagar and Ramgoti Upazila of Lakshmipur district from dangerous river bank erosion problem. #StopRiverErosion #SaveKamalnagar #SaveRamgoti"*

The posts we analyzed primarily contained two hashtags: #sav-eramgoti and #savekamalnagar. Some posts also contained #erosionLakshmipur. The rationale behind #erosionLakshmipur was



that Ramgoti and Kamalnagar are administrative parts of the Lakshmipur District, and, therefore, this hashtag would draw the attention of people around the District.

Posters used hashtags to attract the attention of their peers and others. For example, a college student in Lakshmipur described the hashtag as a way to reach government stakeholders responsible for carrying out riverbank protection measures. His post asked his friends to post photos or stories relating to riverbank erosion:

*"People of Ramgoti-Kamalnagar, I'm asking for your attention. This August 5, we all will post pictures of riverbank erosion in Ramgoti-Kamalnagar with slogans and draw the attention of people all over the country. I think in this way we can make our voices heard by the government. But you have to put hashtags in the posts. #saveramgoti #savekamalnagar. We have only one slogan—'Save us from the mighty Meghna.'"*

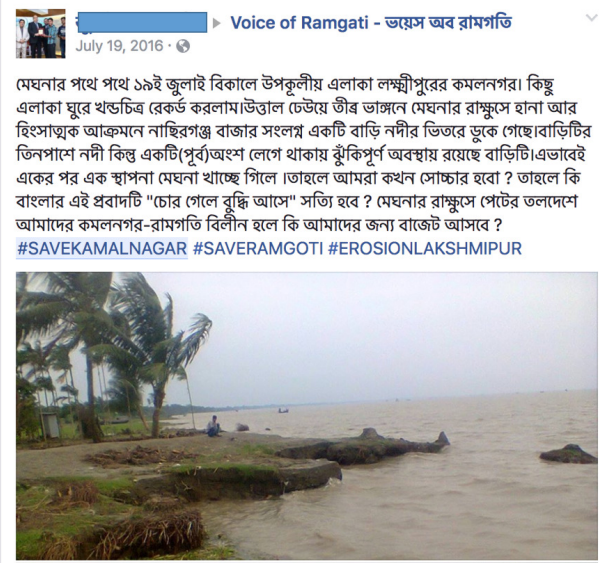
Many posters were learning to use the hashtag feature, and they used the prescribed set of hashtags because their peers suggested them. For example, a news article that featured hashtag activism quoted a local journalist who himself participated in hashtag activism on Facebook to demonstrate how to use hashtags for activist purposes:

*"Regarding how to use hashtags, a local journalist of Lakshmipur24, Mr. Sana Ullah Sanu informed us [journalists], 'Facebook, Twitter, Google+, Youtube you can put #ramgoti before or after your picture, status, or video. That's it. You don't need any extra knowledge for this.' He added that anyone can learn more about Ramgoti simply by clicking on the hashtag. To find out about Kamalnagar he simply clicks on #savekamalnagar. If you click #erosionLakshmipur you can learn about riverbank erosion in Lakshmipur district irrespective to Kamalnagar and Ramgoti."*

The majority of the posts contained images. Among the 159 posts, only 21 were text-only. Images included pictures of eroded riverbanks and damaged public infrastructure and private properties. Three posts contained videos. Posts included information about public and private property damage. Some posts reported damage to property of friends, relatives, and community members. For example, in Figure 4, a journalist working for a local newspaper, coastalbangladesh, collected photos to post on Facebook:

*"On the 19th of July, I visited some areas on the Meghna Bank and collected these pictures. The mighty streams of the Meghna have washed away a house compound near the Nasirganj Fish Market. The land is about to collapse into the river. People, one after another, are losing their properties in this way. When should we raise our voices? Will we have budget once the whole of Kamalnagar is gone? #savekamalnagar #saveramgoti #erosionlakshmipur."*

**5.5.1 Creating Awareness.** The primary objective of hashtag activism was to create awareness regarding problems of erosion in Ramgoti, Kamalnagar, and nearby areas in the Lakshmipur district. This was apparent from the posts themselves, which clearly stated their intentions. People considered public infrastructure to be insufficient and poorly maintained, as we had learned in the field study. They considered the government prone to corruption. Posters attributed insufficient institutional interventions to the negligence, inefficiency, and the corruption of local government. For example, this poster accused the locally elected Member of breaking an election promise:



**Figure 4: A Facebook post of an eroded riverbank in Ramgoti.**

*"Chronic erosion is taking away everything from us. Everything! Where is our due allocation? Where are our leaders who promised a lot before the election? What would our leaders have if we did not exist? Erosion is eating up approximately 1 square kilometer area every month. The more areas we lose, the more they lose legitimacy. This needs to stop."*

Posters noted lack of transparency in the riverbank protection initiatives. For example, one indicated that budget allocations for building dams were not well-articulated and that people should demand follow-up through Facebook posts:

*"As we all know, government has already allotted a huge amount of money to avoid #rivererosion of Kamalnagar. Now it's our duty to follow up and demand that the local administration take necessary steps as early as possible; otherwise, the situation can get worse and can severely damage our lives."*

Another poster explained why it was necessary to post about erosion within specific areas. He described social media as the only way to propagate news on riverbank erosion in Kamalnagar and Ramgoti:

*"Friends, many would ask what would happen if we post? Some of us have to raise our voices. At least then people will know about the problem. The rest depends on our government. But we have to speak for our rights. What other options do we have but to write in social media? #saveramgoti, #savekamalnagar"*

Many posts contained invitations to others to post pictures and stories on erosion using the prescribed set of hashtags. In some cases, posters mentioned peers by tagging them. For example, one poster tagged the following post with four of his Facebook friends:

*"I'm sharing this photo which I took three years ago in front of the Adalat Hospital. We used to play in this field. That is a memory now. This place is gone for good. Friends, what memories can you recall?"*

**5.5.2 Outcomes of the Online Activism.** There were three key outcomes of the activism. First, it was a call to get the government to pay attention to the issue of riverbank erosion. Second, broader online communities formed. Third, the posts stimulated some news coverage in mainstream media, formerly devoid of such coverage.

A key objective of the activism was to promote transparency in the government's riverbank protection infrastructure building process. At the time of the study, a large sum of money was committed by the government for building riverbank protection in Ramgoti and Kamalnagar. Activists wanted transparency in the spending of this money. Pictures, videos, and stories posted on Facebook generated information about the local context for the problem, raising awareness and drawing the attention of government officials. Activists considered the posts a successful intervention. One said:

*"I think people's posts in social media on riverbank erosion have been successful in drawing the attention of the government. #saveramgoti #savekamalnagar"*

A student in Ramgoti and a member of a Facebook group named "Ramgoti Bachao Chatro Songho" ("Save Ramgoti Student Union"), posted that the local Member of Parliament had agreed to meet a delegation from that group:

*"Friends, our MP has agreed to meet us on Friday evening. We will pitch the problems of riverbank erosion in our area and urge him to present the problem in the Parliament. Everyone please try to attend."*

According to the posts, the online activity was directly responsible for initiating involvement from the government to address riverbank erosion. For example, one post shared the following story:

*"This Monday (11-07-16) at 6.20 pm in the afternoon, our Honorable MP Mr. Al Mamun and a team of officials came to Ramgoti to visit erosion-affected areas. The MP had the opportunity to talk to people who were affected by erosion recently. He assured people he would initiate riverbank protection measures as soon as possible."*

The collective activities of hashtag activism resulted in the formation of several online communities concerning life in Ramgoti and Kamalnagar. During the initial phase of the activism, posters created a Facebook group "Hridaye Ramgoti" ("Ramgoti in Heart"), inviting others to discuss riverbank erosion. By February 2017, this group had 10,000 members. As the activism unfolded, gradually other Facebook groups and pages were created. We identified five related groups and nine related pages, including "Amader Ramgoti" ("Our Ramgoti"), "Lakshmipur Community", and "Ramgoti & komolnagar k nodir hat theke bachan" ("Save Ramgoti and Kamalnagar from Riverbank Erosion").

While individual posts were the foundations of the activism, these online communities provided more amplified voices and wider reach than individual Facebook users. Though initially tightly focused on riverbank erosion in Ramgoti and Kamalnagar, the groups gradually flourished as multi-purpose online communities. Members of the communities shared trivial and non-trivial aspects of life in Ramgoti and Kamalnagar. Posts included sharing news of political or civil activities, and information about government construction campaigns and relief and loan distribution. Posters reported damage to public infrastructure, job vacancies, and small crimes. They posted religious messages, questions about all kinds of things, the success stories of locals, and recreational memes.

A key success of the online activism was triggering news coverage in both local and national news media. We found several

articles after the hashtag activity began that directly referred to the hashtags used in the activism and quoted several participants. Within the relatively short time frame between June 2016 and February 2017, we identified seven news articles on riverbank erosion in Ramgoti and Kamalnagar in three online newspapers. These articles reported precise information on the erosion problem in Ramgoti and Kamalnagar, and sometimes the lack of government intervention. For example, one article, published in July 2017 in *Banglanews24*, reported that erosion disrupted transportation between Hajirhat and Kadirpondit Hat, two neighborhoods in Kamalnagar. Another article published in November 2016 in *Lakshmipur24.com* reported news of a land reclamation project for which the government had allocated 1,980 million Taka.

## 6 DISCUSSION

In our interviews in Chapai Nawabganj and Bhola we found pragmatic, localized responses to riverbank erosion and limited technology use. However, just across the Meghna River in Ramgoti and Kamalnagar, we discovered a vigorous campaign of hashtag activism aimed at bringing institutional attention to the issue. Whether online or offline, the absence of institutional resources forced people to work together to form collective community responses. In Ramgoti and Kamalnagar, access to social media allowed people to organize into a cohesive online community with productive results.

### 6.1 Voices from the Margins

In the crisis informatics literature, social media use during acute, short-duration crises is emphasized, focusing on messages sent to coordinate rescue and relief (see e.g., [17]). However, social media can also be used for other purposes pertinent to crises: to promote broad awareness, to build communities, effect political change, and give voice to marginalized people. Social media can provide an alternative channel for communication and discussion of topics that fail to prompt the attention of mainstream media and of government and non-governmental organizations. Hashtags used to index, order, and accumulate public dialog into coherent topical threads provide some ability to inject new voices into public discourse.

Though hashtag activism is new to Kamalnagar and Ramgoti, we observed significant impact. This impact was not in the usual social media sense of a post going "viral"—the activism certainly did not draw the attention of large numbers of Facebook users in Bangladesh—but impact in terms of reaching a targeted audience. The expressed objective of the hashtag activists was to reach stakeholders directly responsible for riverbank erosion prevention, mitigation, relief, and recovery. These concerns were reflected in the Facebook posts.

The offline communities we studied were unable to provoke government attention or mainstream media coverage. A small subset of community members who had access to digital technology and suitable skills became online activists on behalf of their communities. They broadcast information on riverbank erosion on Facebook—information that could not be found in mainstream media. These Facebook posters, although not usually personally victims of riverbank erosion (as they had moved to other areas), disseminated relevant information and drew the attention of the public as well as the government to the problems of riverbank erosion.



We want to emphasize that social media is not an easy solution, much less panacea, for crises in marginalized populations. In Bangladesh, only roughly 40% of the population of 171 million has access to the internet [15]. In our investigation, we observed almost no internet penetration in the study areas in Chapai Nawabganj and Bhola. Although 75% of our participants owned a mobile phone and all 26 participants had one or more family members who owned a mobile phone, only one participant reported using the internet on his device. Bangladeshi citizens often do not have access to electricity or computing infrastructure, especially in rural areas. Consequently, tools like social media, blogs, and mobile applications can be difficult to employ. But limited technology access does not necessarily mean no access. The few citizens with access possess the potential to at least partially fill gaps, as we saw with the activism in Ramgoti and Kamalnagar.

While some scholars worry about slacktivism [14, 31], it is not an inevitable outcome of the use of social media for political purposes, and we must be careful to contextualize social media activity in its broader framing, making sure not to rush to judgment about what social media can and cannot do. In the case we studied, people drew on long-standing social ties, often natal ones, and used social media to further develop and deepen those ties for socially constructive purposes.

## 6.2 Studying Crises in Marginalized Areas

What was achieved by the participants in our study was inspiring, and we could easily have missed it. Notably, the Facebook study was not started through an online investigation, but because we eventually discovered someone offline who directed us to the online activism. Before this, we had tried searching obvious hashtags like #erosion and #riverbankerosion but did not find relevant activity. The activism we uncovered was localized to specific areas, and it would have been hard to come up with pertinent hashtags without prior knowledge. Thus we relied on informal conversations, a method standard in anthropology, to guide us, simply by staying in touch with people in Bangladesh about the research.

A challenge for any fully online study of crises in marginalized areas is that we are likely to miss important phenomena because of the sparseness of the online data. Changes in the use of technology may be occurring, but it's not easy for researchers to locate them. Our findings are in some ways the opposite of typical themes characterizing social media research such as big data, viral stories, assemblages of multiple platforms, and phenomena that impress with their scale. Social media use in our case was just emerging and was limited. Where Dailey and Starbird found pervasive use of a "broad range of social media...with different platforms to meet the information needs of [different] audiences" during disasters [17], we found a small-scale local phenomenon on a single platform.

Researchers have begun to consider the consequences of relations between platforms and their users. The way that policies, algorithms, and user roles are designed can have a substantial impact on platform access and data visibility [6, 24, 34]. Such work examines how the design of online platforms and user behaviors can affect information visibility. By contrast, in this paper we draw attention to socioeconomic factors outside the platform and user behaviors that form the major part of the story. We studied users

for whom the platforms were not designed, and for whom access was extremely limited.

## 6.3 Supporting Marginalized Communities

ICT4D and related fields have studied technologies suitable for resource-constrained rural contexts [42, 43, 51]. For example, Thies et al. [41, 68] demonstrated how speech-based interfaces could be employed to improve accessibility for illiterate or semi-literate users. Voice calls are cheaper and more available in rural areas than the internet, so speech-based platforms lower the barriers to entry for many rural citizens. CGNet Swara is a community voice station that addressed the marginalized, resource-constrained, and largely unheard rural population in Chhattisgarh, India [41]. By amplifying online voices through citizen dialogue and stories, this station successfully motivated government actions [41]. The outcomes of CGNet Swara are similar to our own findings, and address similar issues, especially in terms of stimulating the attention of governments for endemic problems.

In our field study we uncovered strong community ties and support that people drew upon to face the challenges related to riverbank erosion. We found several instances in which people collaborated to share information and resources within and across villages. Although most migrants eventually established new livelihoods, many with improved incomes, this change came with high risk, effort, and social costs. The Facebook study revealed how the activism we studied drew on, and reinforced, community relations and collaborative activities, increasing social solidarity across geographic distances to form online communities and raise people's voices. Posters acted from concern about their friends and families in their natal regions, expressing the need for action.

The hashtag activism in Ramgoti and Kamalnagar addressed relatively small audiences, yet had political bite. Unlike the more typically reported rapid mobilization of strangers that follows disaster events when they go viral, our findings demonstrate how social media can support more gradual and directed social mobilization (see also [20]). Geographically distant community members who had access to the internet and mobile phones established a small but focused online activism on behalf of the entire community. These individual posters collectively acted to increase the visibility of the ground realities with text, pictures, and video posted to Facebook in order to hold local governments accountable. It was especially noteworthy how a relatively small design change like the addition of hashtags to Facebook was able to support activism and community.

## 7 CONCLUSION

The riverbank erosion that we studied in Bangladesh revealed how media and government disinterest were part of the context of poverty, corruption, and ordinary people's lack of voice—voices muted in part by limited internet access in the increasingly internet-centric realm of public discourse. By looking at both sides of the internet-access divide, we found two differing situations. The victims of riverbank erosion who were offline generally lacked organized support and relied on their social networks to survive. People with access to Facebook built broader online communities that attempted to address riverbank erosion in a collective manner.

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