



Research article

Livelihood, WASH related hardships and needs assessment of climate migrants: evidence from urban slums in Bangladesh



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ABSTRACT

Bangladesh, being the world's most climate-vulnerable country, is affected by plenty of climate-related hazards every year, mostly along its south-western coast. As a consequence, many people relocated from these regions' worst-affected neighborhoods to Khulna city, and began to live as slum dwellers. They faced a variety of issues in these informal settlements, particularly regarding water, sanitation, and hygiene (WASH) facilities and livelihood options, but no research has been conducted in Bangladesh. With an emphasis on WASH services and livelihood prospects, this study therefore aimed to provide a comprehensive understanding of the challenges/hardships and needs of climate migrants living in urban slums in both general and COVID-19 contexts. Qualitative methods were applied to collect data from the climate migrants of slums in five wards (3, 12, 17, 21, and 30) of the Khulna City Corporation. Nine focus group discussions and four key informant interviews were conducted to collect the data from primary (community people) and secondary (local government and non-government and community-based organizations officials) stakeholders. The thematic analysis was used to analyze the data. The findings revealed that climate migrants experienced significant water scarcity, insufficient drainage systems, a lack of toilets, tube wells, and bathing facilities, inadequate hygiene management, a lack of core skills required for urban jobs, low payment, and an income shortage. Similarly, sustainable drinking water sources, sanitary toilets with WASH blocks, personal hygiene materials and awareness building, skill development for diverse livelihood opportunities, and income-generating capacity development were their top priorities. Overall, the findings of this study provided a holistic overview of the challenges/hardships and needs of climate migrants in urban slums regarding WASH services and livelihood opportunities. The authorities should intervene and develop policy initiatives to alleviate the hardships and meet the needs of climate migrants.

1. Introduction

Climate change is widely predicted to be a potential cause of human displacement in the foreseeable future. Migration flows and vulnerabilities are growing in both rural and urban areas where individuals are susceptible to severe weather conditions, especially in low-income developing countries (Pachauri et al., 2014; Rahaman et al., 2018). According to the Global Report on Internal Displacement 2019, conflict and disasters across 148 countries and territories resulted in 28 million new displacements in 2018. Catastrophic events caused about two-thirds (61%) of the total new internal displacement in 2018. Moreover, about 250 million people are expected to be displaced due to climate change by 2050 (Centre, 2020). Furthermore, available evidence indicates that climate variations are often associated with migration (Abel et al., 2019; Baez et al., 2017; Bohra-Mishra et al., 2014; Dallmann and Millock, 2017;

Gray and Mueller, 2012; Mastroiello et al., 2016; Missirian and Schlenker, 2017; Sedova and Kalkuhl, 2020).

Bangladesh is regarded as one of the most vulnerable countries to climate disasters. Speedy urban population growth in Bangladesh has already been observed in several regions of the country through rural-urban migration aimed at escaping vulnerable climatic regions and reaping the benefits of better living conditions, livelihoods, and job prospects. Literature suggests that environmental issues, including the effects of climate change, are driving people's choices to migrate in urban area from the rural area (Kartiki, 2011; Martin et al., 2013, 2014; Siddiqui and Billah, 2014). Moreover, an earlier study in southwestern coastal Bangladesh indicated that people affected by Cyclone "Aila" were relocating to adjacent territories because they were financially vulnerable, had lost physical assets, and felt insecure. They were struggling with unemployment, accommodation, health issues, and the limited

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availability of local government amenities (Islam and Hasan, 2016). These climate migrants are not often able to manage the expense of standard accommodation in the urban area, and therefore, they begin to live in densely populated urban slum settlements where they have minimal access to water, sanitation, education, healthcare, and social services as they are living in informal settlements (Pandey et al., 2018; Rahaman et al., 2018; Rashid, 2009). Urban communities that emerge outside of conventional legal principles aimed at registering landholdings and tenure and regulating in accordance with standards connected to planning and land use, constructed foundations, public health and wellbeing are called "informal settlements" (Satterthwaite et al., 2020). The majority of these communities are constructed on vacant, low-lying government or private land. As a consequence, these settlements are severely susceptible to flooding and waterlogging caused by inadequate drainage systems and numerous different natural disasters. Communities are also exposed to industrial toxic pollutants since many informal settlements are constructed on waste or contaminated places. These pollutants in slum regions quickly degrade the environment and threaten human health because slum dwellers have a lack of adequate preventive facilities that can assist them survive the effects of environmental degradation and climate change (Alcayna-Stevens, 2015; Pandey et al., 2018; Wekesa et al., 2011). Additionally, residents in urban settlements are exposed to greater climate risk due to a lack of adaptation ability (Giri et al., 2021; Pandey et al., 2018). With low resources, degraded infrastructure, fewer livelihood choices, and knowledge gaps, informal settlements are extremely vulnerable (Giri et al., 2021). Furthermore, most of the people in such settlements are engaged in informal sectors such as low-paid day labor, rickshaw pulling, and housekeeping for their livelihoods as they do not have enough skills to perform the activities related to the formal job market. Thus, they do not generate enough income to pay for their housing rent and calorie consumption. An earlier study on climate migrants in Bangladesh discovered that the majority of slum dwellers were unemployed or engaged in informal employment such as day labor, hawking, vegetable vendors, and so on, with the majority earning less than BDT10,000 per month (Rahaman et al., 2018).

Bangladesh today has around 2.23 million residents who live in slum regions in metropolitan areas (BBS, 2015). The city of Dhaka, for example, has the highest concentration of urban informal dwellings in Bangladesh. Slum clusters may also be found in considerable numbers in other major cities of the country, where Chittagong contains 1,844, Khulna contains 520, Sylhet contains 756, and Rajshahi contains 641. There may be more surviving slums all across the nation, too (Rashid, 2009). According to the Census of Slum Areas and Floating Population 2014, there were about 135,340 slum households (22.75%) in Dhaka North City, 127,585 slum households (21.75%) in Chittagong City, 56,770 slum households (9.54%) in Gazipur City, 40,591 slum households (6.82%) in Dhaka South City, 20,658 slum households (3.47%) in Khulna City, 11,927 slum households (2.01%) in Sylhet City, 10,987 slum households (2.01%) in Narayanganj City, 10,202 slum households (1.72%) in Rajshahi City, and 9,629 slum households (1.61%) in Barishal City, respectively (BBS, 2015).

Study on slum dwellers revealed that the geographical and environmental conditions of their settlements, as well as the availability of public amenities such as water and sanitation, are remarkably below the average in Bangladesh. Along with poverty and financial insecurity, slum inhabitants are threatened with eviction on an ongoing basis, and they are exposed to infectious illnesses and social neglect (Hossain, 2011). In addition, an awful state of affairs exists with regard to WASH in urban slums, globally. Many individuals (around 2.6 billion) do not have access to improved latrines, and many others (about 1.1 billion) do not have access to improved drinking water sources (Ssemugabo et al., 2020). A lack of adequate WASH scarcity is considered to be a crucial contributor to the spread of various diseases, including diarrhea and vomiting, malaria, pneumonia, skin problems (scabies, ringworms) and common colds/coughs (Bwire et al., 2013; Dana, 2011; Ssemugabo et al., 2019). Furthermore, inadequate sanitary environments are responsible for

nearly 4 million fatalities every year, most of which occur among newborns and young children. The availability of clean water has a high correlation with the survival of children under the age of five (Dana, 2011). Another finding of previous research conducted in Bangladesh is that the vast proportion of slum inhabitants are from low-income families. Slum dwellers have faced remarkable challenges due to a lack of an adequate waste management system, a lack of proper sanitation and drainage systems, a water shortage that is more than necessary, and a lack of adequate health care facilities, all of which contribute to their lower socioeconomic position. Furthermore, the livelihood status of the slum dwellers is also found to be poor (Rokanuzzaman et al., 2013).

At the same time, an estimated sixty million city dwellers residing in low-income communities across Bangladesh have experienced terrible conditions during the continuing COVID-19 outbreak. The pandemic has added new difficulties with the shortage of job opportunities, financial problems, inadequate water, sanitation, and hygiene (WASH) facilities, food insecurity (malnutrition and deficiencies), insufficient access to healthcare/medicare, and the rise of violence against women and girls (VAW-G), which have put them at greater risk (Barkat et al., 2020). Moreover, slum dwellers in urban regions and rural poor people who depend on regular income for their livelihood are the greatest sufferers from COVID-19. Since the emergence of the corona infection, the mean income of these poor individuals has declined by more than 80%. Slum-dwellers had lost 82 percent of their regular earnings as of February 2021. That is a decrease of around 81 Bangladeshi taka (\$0.97) compared to their prior income of 108 taka (\$1.30) (Hossain, 2021; Kamruzzaman, 2020). Furthermore, WASH facilities have been considered the most crucial aspect of combating COVID-19 infection. But maintaining better WASH facilities in densely populated urban slums is practically impossible because nearly two-thirds of the households share a water supply with ten or more people (Islam and Kibria, 2020). In addition, the greater portion of the urban slum dwellers in Bangladesh share both toilet facilities and the source of water, which has raised COVID-19 related risks among these populations (Hasan et al., 2021).

Overall, Bangladesh is confronted with a serious rural-to-urban migration problem, which is exacerbated by climate change. Most of these migrants live in urban slums, where they face difficulties in gaining access to public facilities, which are already in low supply for current slum inhabitants (Ahsan et al., 2014). WASH and livelihood-related problems are highly prevalent among the slum dwellers in Bangladesh, and the COVID-19 pandemic has made the situation more severe (Akter et al., 2021). In these settings, climate migrants in Bangladesh's urban slum settlements require more livelihood and WASH-related assistance from the government and private sectors, in addition to the existing support, to overcome their current hardships and build resilience among the climate migrants. Although earlier studies have been found to evaluate the WASH and livelihood-related problems among the slum dwellers in Bangladesh (Hasan et al., 2021; Hossain, 2011, 2021; Rokanuzzaman et al., 2013), no study has been found that specifically evaluates climate migrants' livelihoods and WASH-related hardships and needs in Bangladesh. All of these factors, therefore, demand the necessity of examining the hardships and needs of these communities in the country in terms of livelihood and WASH. To bridge all of these knowledge gaps, this reconnaissance aimed to get a broad picture of the challenges/hardships and needs of climate migrants in Bangladeshi urban slums with a focus on WASH services and livelihood opportunities in both general and COVID-19 contexts. Furthermore, documenting a comprehensive representation of the challenges/hardships and needs of climate migrants in urban slum areas, particularly in relation to WASH services and livelihood opportunities may enable both the public and private sectors to develop appropriate initiatives and policies to decrease difficulties and build the resilience capability of climate migrants regarding WASH facilities and livelihood prospects. This type of study is also necessary for policymakers to design the scheme for successful management of urban growth (UN, 2018) and sustainable urbanization (UN-Habitat, 2020).

2. Materials and methods

An exploratory qualitative inquiry was conducted in both the general and COVID-19 contexts to gain a better understanding of the challenges/hardships and needs of climate migrants in Bangladeshi urban slums, with a particular focus on WASH services and livelihood prospects. The evidence demonstrates that qualitative research has the potential to generate outcomes integrating actual facts with theoretical assertions that are applicable to a wide range of situations (Schwandt, 2014). Furthermore, qualitative research methods such as focus group discussions and informant interviews have already been used in the formulation and validation of quantitative instruments such as survey questionnaires (Ahsan and Warner, 2014; Jones, 2007). Similarly, multiple processes were followed in order to successfully accomplish the assessment (Figure 1). At first, literature reviews and key informant interviews ((KIIs) were used in this study to narrow down the study area selection. Following that, data from the community were gathered through focus group discussions (FGDs). The KIIs also provided data for the study. Finally, the data were thematically (Braun and Clarke, 2006) analyzed and reported on the basis of the meaning, context, phrases, frequency, and intensity of the statements made by the participants.

2.1. Description of the study area

As determined by literature reviews, local government officials, and community experts, the study was undertaken in Khulna City Corporation (KCC) wards 3, 12, 17, 21, and 30 (Figure 2) because these are the areas where the majority of climate migrants have taken shelter (Rahaman et al., 2018). The majority of these wards are located along the riverbank and on the rail station side of KCC, respectively. Khulna, a 46km² low-lying coastal city in Bangladesh (Akter et al., 2021), is one of the world's six most climate-vulnerable cities (Hanson et al., 2011). With 20 percent of slum dwellers out of 1.5 million residents, it is Bangladesh's third-largest metropolitan area (Roy et al., 2018). The Khulna City Corporation (KCC) has 31 wards (Map-1) with a population density of 32,500/km². KCC has 1,134 slums, which account for 8.14 percent of the city's total land area (BBS, 2015). The majority of slums are extremely crowded (550–3200 people per hectare) and share WASH amenities (Akter et al., 2021). They are evaluated by poverty and unsanitary living circumstances (Sikder et al., 2015). The average family here consists of 4.5 people, who live in kacha and semi-pucca dwellings. While males typically head households, females play a larger role in communal authority (Akter et al., 2021). Households in the following wards (3, 12, 17, 21, and 30) are classified as low-income group (KCC, 2015). The majority of the people who live in these wards work in informal jobs such as rickshaw pulling, hawking, van pulling, day working, and portaging. Due to an inflow of migrants from surrounding climate-vulnerable places like Satkhira, Bagerhat, and Khulna, it has been noticed that the population of these wards has increased by more than 50% during the previous fifteen years (KCC, 2014; Rahaman et al., 2018). In addition, slum dwellers in these wards, like other wards of KCC, are vulnerable to the COVID-19 pandemic because they have shared/inadequate/damaged WASH infrastructure, overcrowded household characteristics (with narrow in-house

space), and an inability to access isolation/quarantine facilities. Moreover, they lack formal/permanent employment, savings, social safety net support, and credit access (Akter et al., 2021).

2.2. Data collection

This reconnaissance employed a qualitative participatory approach, including four KIIs and nine FGDs to gather data from both primary (community people) and secondary (local government and non-government and community-based organizations officials) stakeholders in the KCC. The fundamental rationale for using this technique was to gather the lived experiences (Akter et al., 2021) from the community people and the professionals/experts working/worked for the community, particularly on WASH and livelihood issues of the climate migrants in the slums of the selected wards. Moreover, a previous study used the combination of FGDs and KIIs to collect data to explore the facilitators and barriers to the uptake of WASH interventions among slum dwellers in Kampala, Uganda (Ssemugabo et al., 2020). Furthermore, obtaining a large enough sample size for quantitative analysis was challenging during the COVID-19 pandemic. All of this information was gathered in August 2021 by a five-member field assessment team. For the sake of accuracy in the data collection processes, the team was trained by experts from CARE Bangladesh and the Bangladesh Centre for Advanced Studies (BCAS) before proceeding to the field.

Four KIIs were carried out purposively in collaboration with relevant government, non-government, and community-based officials, including KCC, Community Development Committees (CDC), BRAC (a Bangladesh-based international development organization) and Caritas Bangladesh, because they are currently working or have previously been involved with these communities about five or more years. All the KII participants were qualified with Master's degree (Table 1). The lead authority asked the KIIs to join the assessment using an email appointment that was sent to them a week before the interview was scheduled. Each interview spanned around ten to fifteen minutes, and it was taped using an audio recording application/device, which was afterwards documented.

Likewise, Nine FGDs among three male and six female groups (comprised of adolescent girls) were conducted purposively since females were more influential in the slum community and male members were occupied with their work, making them less available for FGD participation. Furthermore, previous studies have reported a higher proportion of female participants among slum dwellers (Akter et al., 2021; Rahaman et al., 2018). Female and male groups were divided for the purpose of conducting the FGD in order to better encourage replies and capture diverse viewpoints between the genders. Exactly one day before the session, the assessment team conducted a selection using snowball sampling to pick the participants from the slum community people for the FGDs. A total of 66 climate migrants participated in nine FGDs. There were about five to eight participants in each of the FGDs (Table 1) because in terms of providing relevant data, this size is perfect for a homogeneous group (Krueger, 2014). The assessment team finalized eight participants for each FGD before previous day of the session, but the team occasionally missed two or three participants because participants were engaged in their own work for the sake of their livelihood, particularly among the male groups. Two members of the field assessment team moderated each of the FGD. One moderator ensured that the session progressed well, while the other ensured that all concerns were addressed. The duration of each session was twenty to thirty minutes in general, and the discussion was noted by another member of a field assessment team. Table 1 briefly describes both the KII and FGD assessments.

2.3. Overview, reliability, and validity of the checklists

For KII and FGD, completely separate checklist was utilized. A series of open-ended questions were employed to conduct KIIs among the professionals/experts working/worked for the community. The KII

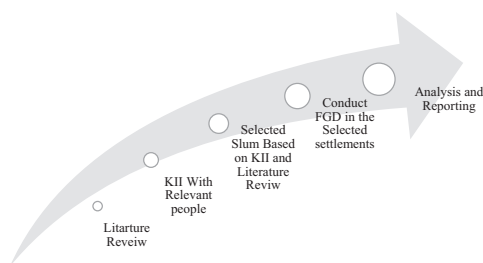


Figure 1. Procedures of this study.

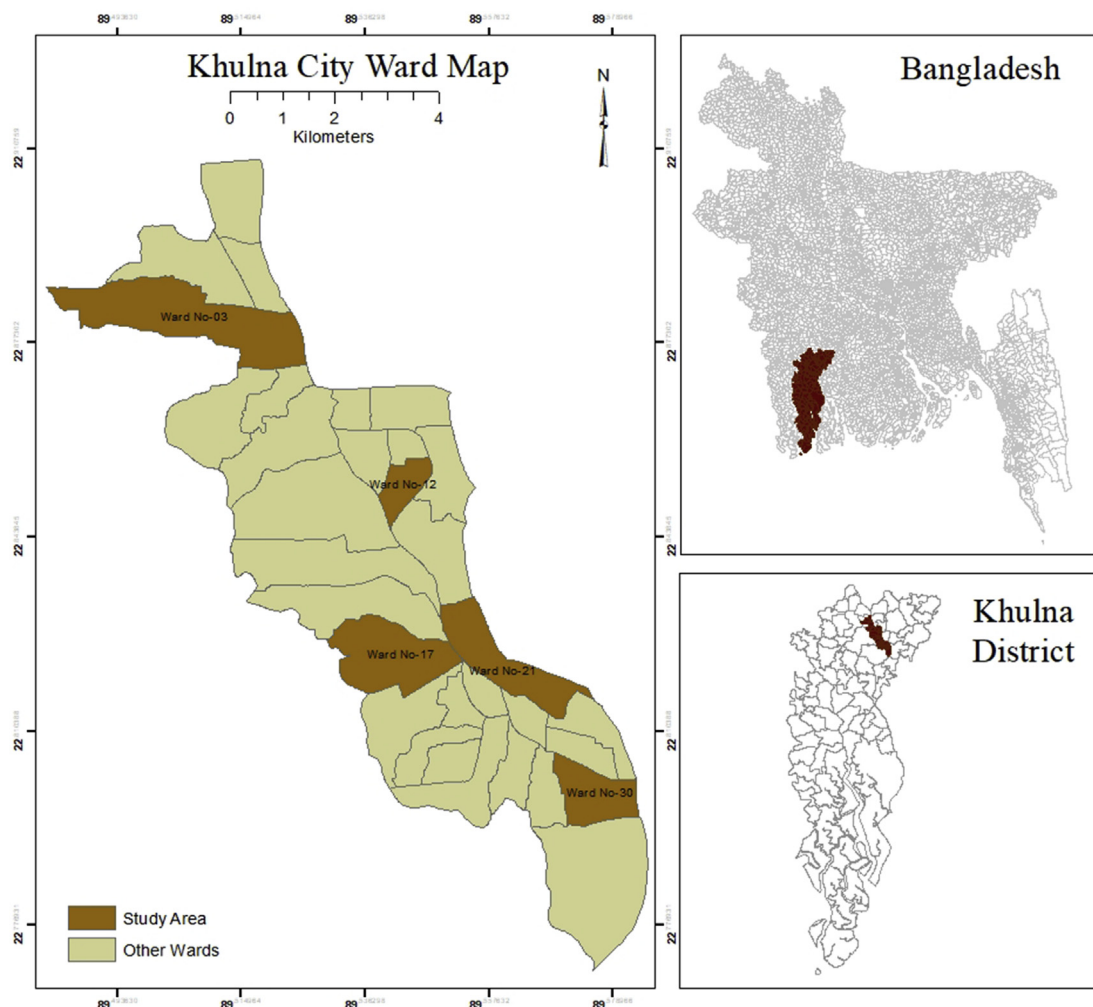


Figure 2. Map of the study area.

Table 1. A brief description of the KII and FGD assessments.

	KII	FGD
Numbers of assessment	Four	Nine
Gender	Three male informants and one female informant	Three male groups and six female groups (admitting adolescent girls)
Number of participants in each assessment	One	Five to eight
Participants	One KCC official, one CDC member, and two NGO experts (BRAC and Caritas)	Climate migrants (Slum dwellers)
Educational qualifications of the participants	All the KII participants were qualified with Master's degree	Not Applicable
Working experience with slum dwellers	KCC official – Over 10 years CDC member – About 5 years BRAC – About 5 years Caritas Bangladesh – About 5 years	Not Applicable
Study area	KCC	KCC (ward 3, 12, 17, 21, and 30)

checklist includes, "Which settlements have the most climate-induced migrants and from where most of the people migrated? Which settlements are badly affected/prone to COVID-19? What challenges do these low-income migrants face? (In general and in the context of COVID-19 &

environmental impacts in the city like water logging & heat stress) What is your organization (GO/NGO) doing to serve the slum dwellers (migrants in particular)? What are their I) Employment & Livelihood and II) WASH & health-related problems (In general and in the context of COVID-19)? What are the major ongoing interventions to support the migrants? What are the priority needs? What are the new challenges they are facing in this pandemic? What issues do women and girls face particularly concerning WASH, Health, employment, and income?"

Similarly, another set of open-ended follow-up questions were set up for conducting the FGDs among the community people. Questions like "Where did you migrate from? What were the root causes of migration (climate hazards like cyclones, salinity, waterlogging, floods and river-bank erosion, etc.)? What environmental stresses do you face in your current location? What are the existing challenges associated with migration, including finding a settlement, renting a house, working and earning in the city, social insecurity, and environmental problems in the slums? What are the impacts and problems you are facing from the COVID-19 pandemic and lockdowns? What are the social-economic conditions, problems, or challenges/needs related to I) WASH & health; II) Employment, skills, and Livelihood security (uncertainty, low pay, assault & violence at work, seasonality, etc.)? Are you and your neighbors getting worse during this COVID-19 pandemic? If yes, can you please mention the challenges related to I) WASH? II) Livelihood? What services are the slum dwellers receiving? Whom are providing these services? How has COVID impacted this service system? Is there a participatory mechanism to address the slum dwellers' needs? What are

the priority needs of slum dwellers related to I) WASH II) Livelihood (In general and in the context of COVID-19)? What can be done to reduce these challenges and issues? Do women and girls have access to the services (WASH, medical & health services, and social safety net)? Are there any challenges or special needs? Are there any incidents of gender-based violence against migrant women? What can be done to reduce these challenges and issues? What are the main challenges related to livelihood issue? Are the skills-set useful in the urban context what they have brought from village? If not, what can be done to fit them in the urban context?" were used to conduct the FGDs. The checklist was tested among a randomized group of community members from a slum in Ward 21 of KCC to assess the reliability and validate understanding of the FGD questions among the participants, as well as to correct language errors.

Finally, experts from CARE Bangladesh and BCAS gave their approval to both the KII and FGD checklists. The both checklists were written in local language (Bengali) to easily conduct the data collection session and then converted into English for the purpose of manuscript writing. Standard ethical protocols were maintained to conduct this research. The study protocol was approved by the experts from CARE Bangladesh and the BCAS. Before starting the discussion, the objectives of this study were explained, as well as the informed consent of the participants was taken. It was promised that the participants' identities would be kept anonymous and that the information they supplied would only be utilized for research purposes. At the same time, all hygiene standards of COVID-19 were maintained during the field assessment.

2.4. Data management and analysis

Thematic analysis was conducted to analyze the data, as this is widely used in qualitative data analysis (Braun and Clarke, 2006). At first, the author transcribed accurately the KII audio recordings and FGD notes, translated them into English, and started reading and going over the data several times to fully understand it. After transcribing and understanding, the author identified the main features of the data and made notes in the form of code based on the objectives of the study. After coding, the author took a closer look at the text and identified the initial themes and sub-themes from the data. After that, the author reviewed the themes and sub-themes to ensure sufficiency with the research objectives and made the final changes to the themes and sub-themes as needed. Finally, the author named and defined the themes and sub-themes and wrote the final manuscript for this study.

3. Results

Six themes emerged based on the KIIs and FGDs, i.e., slum residents' origin and major causes of migration, social insecurity and environmental problems, WASH related hardships, livelihood hurdles, needs and priorities- WASH, and needs and priorities- livelihood.

3.1. Slum residents' origin and major causes of migration

This study found that the majority of residents in the KCC slum region migrated from the surrounding divisions and districts. Khulna (including Bagerhat, Satkhira, and Khulna districts), Barishal (including Barishal, Pirojpur, and Barguna districts), and Dhaka (including Madaripur district) were some of the divisions identified from which inhabitants were moved to the slums of Khulna city (details in Figure 3). The major cause

of that movement was the loss of their livelihood options and property/homestead owing to climate risks such as cyclones, river erosion, floods, salinity, and other catastrophes. For example, the key informant from BRAC claimed,

"Residents of Koyra Upazila (a sub-district of Khulna district) who were affected by Cyclone Aila migrated to Khulna. People who had come here for livelihood opportunities were unable to pay their expenses and began to live in the cheaper slums. A portion of the affected population of Satkhira district also came here. In addition, people from certain upazilas of Bagerhat and Pirojpur districts moved to Khulna in search of work."

3.2. Social insecurity and environmental problems

Climate migrants came to Khulna city from their homelands in search of a higher standard of living and a better way of life. However, due to a lack of necessary skills for higher positions in the city, they were unable to pay for the expense of living. As a result, many people were forced to work in the informal economy or to live in overcrowded slums. The bulk of the slums are built on government-owned low-lying property, which has less social security and greater environmental hazards. In this study, social insecurity included living in rented house and government vacant land, lack of permanent jobs and financial uncertainty, whereas environmental stresses comprised water logging and flooding. For instance, an older adult from ward 3 expressed fear,

"We could be homeless at any time if the owner asked us to vacate the land."

Another male member from ward 3 told,

"Due to the narrow drainage systems, we face water logging after a heavy or medium rain, and therefore inundate our lower houses."

A female member from ward 21,

"We do not have any permanent jobs. Most of the time, in a year, we are jobless. So, we have no economic and social security."

In addition, the COVID-19 pandemic added to their social and economic insecurity like "to slay the slain". For example, a female participant from Ward 17 put her words,

"Due to the harshness of the pandemic, it was difficult for me to continue working as a vegetable seller at my local community market."

3.3. WASH related hardships

Water, sanitation, and hygiene (WASH) were consistently a critical concern as a potential problem in urban slum areas. Due to the ongoing COVID-19 crisis, these problems have gotten worse. Almost all of the slums that were visited had issues with water, sanitation, and hygiene. During the assessment, approximately all of the slums reported a severe lack of drinking water. Slum-dwellers have to deal with a deplorable scenario when it comes to drinking water. A similar issue was noted in terms of the number of water sources available. In most cases, just a small number of water sources were visible, which was reflected in their voices. For example, a female participant from ward 21 confessed,

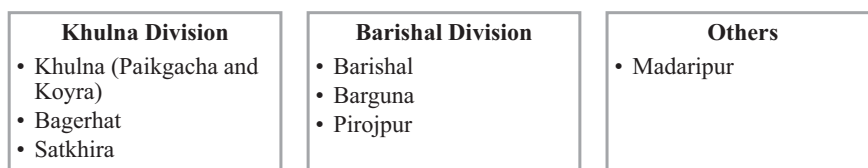


Figure 3. Origin of climate migrants.

"Our settlements have just four tube wells for drinking water, which is barely enough for 200 households. Every day we confront several challenges with collecting water. In addition, we cannot collect enough water from these tube wells in the summertime as a result of the lower water supply."

Moreover, frequent waterlogging due to the poor drainage systems in the city made the water undrinkable. For instance, a female participant from ward 17 added,

"The tube well used to provide drinking water, but it currently generates salty water owing to regular waterlogging problems. Moreover, the tube well does not supply water, particularly on hot summer days."

Furthermore, they did not get any facilities from the Water Supply and Sewerage Authority (WASA). For instance, the key informant from KCC said,

"Slum dwellers do not have access to the WASA since no slum has a holding number, and the WASA does not grant access to those who do not have a holding number. Furthermore, they lack tube wells in the sense that city dwellers cannot install a tube well without the approval of the WASA."

Additionally, women faced difficulties in collecting water as they were responsible for it in most cases. In some cases, they had travelled far from their house to collect drinking water. For example, a female participant from ward 21 added,

"We have to go about ½ km away from our settlement to collect water as our tube wells do not supply water properly in the summer."

The key informant from BRAC also told,

"Most of them (women) have to wait in line to collect water, which has a severe detrimental impact on their daily life as they have to manage all household chores besides collecting water."

Simultaneously, the majority of assessed slums had a restricted number of toilets and bathing facilities, creating a major issue for slum residents, particularly for women. They (women) sometimes neglected their hygienic needs, as there was often no separate toilet for women, the number of toilets was relatively low as compared to the total number of households in a settlement, and the construction and quality of the toilets were not women-friendly. Therefore, women faced problems in terms of menstrual hygiene management (MHM). The key informant from Caritas Bangladesh mentioned something similar about this issue. He spoke,

"Women don't have separate sanitation facilities in many slums and they hurdle with men in meeting their WASH needs."

Additionally, the key informant from BRAC shared his experience regarding this issue, as,

"Women suffer WASH issues since they have to utilize a communal bathing facility. In the slums, the dweller-to-bathroom ratio is inadequate. As a result, women are forced to limit their hygienic requirements, which may lead to long-term health problems. Women are sometimes forced to bath adjacent to the roadside tube well that is obviously no longer comfortable."

Similarly, the COVID-19 outbreak had a detrimental effect on slum populations since they had fewer WASH facilities from the previous period. Personal hygiene items such as sanitizers, masks, and soaps, as well as general medicine, were in short supply, putting their health in danger during the pandemic. Aside from that, they had to deal with a heightened risk of COVID-19 infection due to communal toilets and tube wells. A male participant from ward 3 told,

"We could not usually afford to pay for our medical costs. The COVID-19 outbreak has complicated the situation more. Although we received some hygiene kits from NGOs, including hand sanitizer, masks, and soap, it was insufficient to maintain hygiene for an extended period. Furthermore, we

were anxious about communal diseases as we had to share our limited number of toilets and tube wells with a large number of individuals. At the same time, the majority of us were forced to work even during the peak moment of the COVID-19 outbreak in the country because we rely on daily income. As a result, there are always health risks associated with us in the ongoing COVID-19 context."

3.4. Livelihood hurdles

As previously discussed, the loss of livelihood was a key reason for climate migrants' relocating. These individuals were primarily employed in the informal economy when they relocated to the slums. As a result, it is important to highlight that, by default, dwellers in low-income settlements have problems with their livelihood. The current COVID-19 outbreak has had a significant influence on the livelihoods of these slum dwellers, specifically those who often earn their livelihood by working in the informal economy. In both the general and COVID-19 contexts, the study made an attempt to depict the miseries of slum citizens in the Khulna city region in terms of disruption in livelihood opportunities.

This study found that slum dwellers generally had no sustainable livelihood options. Most of them depended on the informal working sector for things like day labor, rickshaw pulling, micro-businesses, and home maids. For example, the key informant from Caritas Bangladesh agreed with this statement. He stated,

"Slum dwellers do not have any sustainable livelihood opportunities. They do not have the capacity to work in diversified employment opportunities. Particularly women are not engaged in any income generation work."

Similarly, the female member's possibilities for earning a living were shown to be inadequate. Slum women lacked the fundamental skills needed to work outside the house. As a result, the majority of them chose to stay at home. As a result, the majority of them remained homemakers. For instance, a female participant from ward 21 added,

"The majority of the women have to stay at home as homemakers. We lack the necessary abilities to engage in other occupations. We have to rely on the family's male members."

In addition, earning members of the slum community with fewer skills engaged in subsidiary professions including day labor, rickshaw pulling, micro-businesses, and home maids and generated lower incomes that were inadequate to meet the needs of their families. For example, a male participant from ward 12 claimed,

"I work in the city as a rikshaw puller as the sole earning member of my family. I make between 300 and 400 BDT per day and pay the rikshaw owner rent of 50 BDT. The remaining earnings are insufficient to meet the expenses of a six-member family, including food, house rent, children's education, and electricity bill."

Furthermore, the COVID-19 outbreak severely harmed their livelihood options. They were unable to work due to COVID-19 outbreak-induced lockdowns, and their income was reduced. Some had borrowed money from various sources. As the family's income was cut off during the lockdown, they were unable to meet their basic requirements. Slum residents stated that they or their family members lost their jobs or money sources as a result of the outbreak, leaving them in a vulnerable situation. In some situations, the family's sole male earner lost his job, and the female member of the family began working in the informal sector as maids, cleaners, and other similar jobs. However, it appeared that they were in very difficult circumstances. Due to their inadequate income, they were unable to fulfill the needs of their family. For instance, the key informant from the CDC shared her opinion,

"In general, slum dwellers experience difficulties ranging from a lack of clean water supplies to inadequate settlements and proper drainage

facilities, with the most common issue being waterlogging. During COVID-19, occupational options were severely reduced, and health risks rose. Working as day laborers and pulling rickshaws are the major sources of income and employment for them. And because of the COVID-19 crisis, all of these job prospects were severely harmed."

In addition, the key informant from KCC mentioned,

"COVID-19 has mostly impacted the income and livelihood of city dwellers and slum dwellers. According to a recent survey, dwellers' loan amounts have been increased from 10000 BDT (\$116.88) to 70000 BDT (\$818.14)."

Moreover, a male participant from ward 17 stated,

"I have a rented tea stall in our community market. I did not open my shop as a result of the pandemic-induced lockdown, whereas I had to pay the rent to the owner. I have lost my capital and again started my stall by taking a loan from a local lender with a high-interest rate."

Additionally, a female participant from ward 21 added,

"Because of the lockdown, my husband lost his job. I am now the sole earner in my household. Meeting the requirements of my family and children is quite difficult for me."

3.5. Needs and priorities- WASH

The needs and priorities- WASH theme was broken down into three sub-themes based on the KIIs and FGDs. The following is an overview of the three sub-themes considered.

- Sustainable drinking water source

According to the discussion above, most slums in the Khulna metropolitan region lacked an adequate proportion of safe drinking water sources. Moreover, every tube well was manually operated and not installed deep enough in comparison to the groundwater level. Consequently, they had to struggle with a scarcity of water throughout the summer, as the groundwater level had dropped in comparison to other seasons. Therefore, managing a sustainable drinking water supply system for them is absolutely essential for every slum. Installation of the submersible water pump/deep tube well was indicated as a sustainable drinking water source solution by these residents. For example, a male participant from ward 17 urged,

"In the summertime, the tube wells do not provide enough water. It would be great if our settlement has a submersible pump/deep tube well."

- Establishment of sanitary toilet cum WASH blocks

This research was an absolutely superb attempt at addressing the sanitation needs of climate migrants. They had difficulties with communal latrines, particularly for female members, as previously mentioned. In addition, the COVID-19 scenario allotted a new challenge to this hurdle. To overcome the overall hurdles, this study identified the necessity of building hygienic toilets with separate WASH blocks for men and women. A noteworthy need was claimed by a young woman participant from ward 12,

"Handwashing systems throughout the slum would be quite beneficial during this corona period. Furthermore, having separate tub wells, bathrooms, and latrines for men and women are desirable to us."

Moreover, the key informant from the CDC added,

"WASH facilities are the main priority in the slum area. A clean drinking water source is required to provide them with safe drinking water. Separate

blocks for men and women in sanitation should be the top priority for slum dwellers."

- Personal hygiene materials and awareness building

The majority of slum residents were unaware of the direct impact of COVID-19. Organizing a campaign to raise awareness about COVID-19 infection and encourage people to get vaccinated is very necessary. Slum residents also had a high need for personal hygiene items such as soap, masks, and hand sanitizers, as well as a Menstrual Hygiene Management (MHM) package for adolescent girls. Because, the key informant from Caritas Bangladesh added,

"Menstrual hygiene for adolescent girls is a concern in slum areas as they do not use the necessary required items during menstruation. Similarly, people with COVID-19 symptoms in slums did not test themselves for fear of becoming socially and economically isolated."

3.6. Needs and priorities- Livelihood

This study also developed two sub-themes under the needs and priorities-Livelihood theme, which were established on the KIIs and FGDs. The following were the two sub-themes that were addressed.

- Skill development for diverse livelihood opportunities

This study has already identified that climate migrants were, by default, unable to maintain stable livelihoods since they had very limited skills for urban-based work and many of them had already lost their employment owing to the current outbreak-induced lockdown. In these circumstances, they require skill development programs for diverse livelihood opportunities. For example, a male participant from ward 12 told,

"As we had to start working at an early age due to poverty, we didn't have enough possibilities to build tech-based abilities. The majority of us in the city work as day laborers, rickshaw pullers, or taxi drivers. Furthermore, we have never owned a vehicle of our own. We have no choice except to hire these vehicles, which reduces our revenue. Many young people, I've found, earn a decent income as mobile and computer repair mechanics. As a consequence, having the option to acquire such capabilities would be useful to us (particularly young adults). Furthermore, construction industry skills are in high demand in the city, and remuneration is higher."

At the same time, the key informant from KCC stated,

"Training may be used to improve the livelihood options of climate migrants, but training providers must have to establish connections between the trainee and the employment providers. He gave an example of how GIZ Bangladesh and KCC collaborated on a project in which they were able to connect with job-providing authorities and generate livelihood opportunities for 81 people from the city's various slums, including motor driving, vehicle maintenance, and mobile and computer repair. They're now working in a variety of locations around the country."

- Income generate-based capacity development for women

According to this investigation, the majority of women among climate migrants were found to be unemployed. They also lacked the necessary skills for the job. To sustain a financially secure life, these large numbers of jobless people require particular skill development possibilities, such as tailoring and handicrafts. For instance, two female participants from ward 17 urged,

"Male can receive training in fields such as driving, fridge mechanic, mobile mechanic, and motor mechanic. Female, on the other hand, can learn tailoring and handicrafts, parlor activities, and boutique-related work."

Moreover, the key informant from KCC added,

"Migrants must be provided local employment opportunity-based training in order to include women in various occupations such as medical technicians and nursing."

4. Discussion

This study found that most of these slum dwellers in KCC migrated from the surrounding districts like Barishal, Pirojpur, Barguna, Madaripur, Bagerhat, Satkhira, and Khulna. This outcome was supported by the existing evidence which revealed that more than 50% of the populations in different slums of KCC have been increased as a result of people migrating from climate-vulnerable locations like Satkhira, Bagerhat, Khulna, Patuakhali, Bhola, Pirojpur, and Noakhali in the previous fifteen years (Rahaman et al., 2018). In a previous study, the proportion of people migrating and relocating owing to extreme climatic events such as riverbank erosion, cyclones and storm surges, floods, and saline intrusion was also observed. According to the findings of that study, climate disaster-induced migration and relocation in slum area are more common in the Khulna and Barishal Division in Bangladesh (Sarker et al., 2019). Simultaneously, the primary drivers of this migration were recognized as the loss of livelihood opportunities and property/homestead due to climatic hazards such as cyclones, river erosion, flooding, salinity, and other disasters in this study. Evidence has also revealed that an integration of long-term progressive deterioration, such as soil salinization, and catastrophic climate events might eventually drive rural coastal farmers and fishermen to evacuate their native areas and relocate to the nearest metropolis (Ahsan et al., 2016). Moreover, livelihood insecurity, agricultural damage, water and land salinity, etc., were demonstrated to be the major causes of displacement of climate migrants in the urban slum of KCC in previous research (Rahaman et al., 2018). In a similar vein, social insecurity, such as living in a rented house or on government-owned vacant land with a lack of permanent employment and financial stability, as well as environmental stresses including water logging and flooding due to poor drainage systems, were found among climate migrants living in urban slums in this study. The available literature has reported similar issues such as living in low-lying vacant land (Ahsan et al., 2016; Rahaman et al., 2018), job insecurity and financial instability (Ahsan et al., 2016), and waterlogging due to inadequate drainage systems (Rahaman et al., 2018) among climate migrants living in urban slums in Bangladesh. Furthermore, the COVID-19 outbreak has exacerbated the existing uncertainty of employment and income at a high level among the slum inhabitants who participated in this study. A prior study on slum dwellers indicated a similar consequence in terms of destroying livelihoods, insecurity, and economic difficulties as a result of COVID-19 (Akter et al., 2021). Likewise, climate migrants living in urban slums had major WASH issues, including a scarcity of water sources, salinity in the water due to frequent waterlogging, an absence of WASA services, a lack of toilets and bathing facilities, and insufficient hygiene management for women, according to this study. A relatively similar problem appeared in a study among climate migrants in the slum areas of Bangladesh, where there was no water or sanitation service in either paid or unpaid slum areas. In those slums and squatters, people used water from ponds and canals for their dwellings and drinking purposes (Rahaman et al., 2018). Further research revealed that KCC do not provide any water services to the slum dwellers (Tanni et al., 2014). In addition, in Bangladesh, when slums were mapped, it was discovered that 70 percent of the slum communities lacked access to safe toilets. Most slum communities had latrines shared by a number of households, and nearly half of them had at least six families sharing a single latrine (30 or more people) (Islam et al., 2006). This lack of adequate sanitation created a major hygienic hazard, particularly for women and young female adolescents. It was substantially more challenging for women, and they expressed feelings of

embarrassment and uneasiness about their circumstances (Rashid et al., 2013). The hygiene management of climate migrants in slum areas with insufficient WASH resources and shared toilet facilities and tube wells were further challenged by the COVID-19 pandemic in this study. Similar outcomes were highlighted by a previous study among slum dwellers of KCC (Akter et al., 2021). Evidence also demonstrated that handwashing options amidst the COVID-19 outbreak were substantially lower in urban slums compared to non-slum communities. About two-thirds of dwellings shared a water source with 10 or additional dwellings within slums (Islam and Kibria, 2020). Similarly, this study noted that climate migrants in urban slums experienced a number of livelihood challenges, including a lack of sustainable livelihood alternatives, a lack of skills for tertiary professions, poor wages, and an inadequacy of income. An earlier study in the KCC slums found similar results. According to the findings of that research, slum inhabitants lacked sufficient education and were hence unable to obtain a decent profession. Furthermore, the female members had a greater percentage of illiteracy, so they tended to remain at home excessively. The majority of individuals living in the slums had to put forth long hours of work to earn a livelihood. Since they work all day, they didn't have time to pursue an additional profession. As a result, the slum dwellers' income distribution was dominated by the leading professions. Most individuals living in slum areas are involved in physical work, not intellectual work. In addition, they had a comparatively lower salary (Tanni et al., 2014). Another assessment on climate migrants in the KCC slums found that the majority of the climate migrants were engaged as day laborers, hawkers, vegetable vendors, and home maids for their livelihood. A huge proportion of the population was out of work. Their income patterns indicated that the vast majority of climate migrants earned between 2000 and 6000 BDT per month (Rahaman et al., 2018). Additionally, the study reported that livelihood challenges, such as loss of employment and income, have been intensified among climate migrants residing in urban slums as a result of the COVID-19 pandemic-induced lockdown. Relative results were found among the urban slum people in Bangladesh by earlier investigations (Hossain, 2021; Kamruzzaman, 2020). Furthermore, a previous study found that climate migrants received a lower wage as a result of the limited employment alternatives available to them. As a result, they were compelled to live in urban slums, where they were subjected to terrible living conditions and received only a limited number of WASH facilities. With the lack of water, sanitation, and employment opportunities these slum dwellers also experience health burden (Rahaman et al., 2018). Additionally, malnutrition, instability, and environmental risks plagued the slum inhabitants, resulting in a shortened life expectancy and a rise in infant mortality for them. Consequently, slum residents are jeopardizing the viability of urban livelihoods as a result of their living arrangements (Uddin, 2018). Moreover, poor sanitation and water scarcity, in addition to other factors, have been identified as critical contributors to livelihood vulnerability among climate-vulnerable communities (Gerlitz et al., 2017; Tran et al., 2020). As a response, this research addressed the needs of Bangladeshi climate migrants living in urban slums who experienced WASH and livelihood hardships in both general and COVID-19 contexts. Sustainable drinking water sources with the installation of sub-miscible and deep tube wells, the establishment of sanitary toilet cum WASH blocks, and personal hygiene materials and awareness building were all identified as WASH-related needs in this study. Further, skill development for diverse livelihood opportunities as well as income-generating capacity development for women were listed as livelihood-related needs of climate migrants residing in urban slums, according to the findings of this research. Similarly, prior research emphasized the need to install more deep tube-wells for slum inhabitants (Tanni et al., 2014). In addition, the need for providing jobs and income-generating activities was previously highlighted in research to combat climate migrants' dire circumstances. Access to clean water, sanitation, electricity, and health services were also mentioned as necessities for climate migrants in urban slums. Additionally, it is important to note that Bangladesh's slum

upgrading initiatives (such as SIP and LPUPAP) place emphasis on capacity-building, entrepreneurial training, housing/infrastructure renovation, and the establishment of large roads/footpaths, drainage, toilets, and tube wells (Panday, 2020). Moreover, in a prior study, the majority of these socio-spatial interventions were considered to be critical in developing planning and upgrading strategies for slum residents' COVID-19 resilience (Akter et al., 2021). Furthermore, the lives of the poor are improved by sanitation. Women and men who lack access to safe sanitation have the ability to plan and arrange their resources more effectively. There may be a loss of energy and productivity among those in need if basic sanitation is not provided in their homes or in their community. It is possible that better sanitation may motivate disadvantaged families who are unable to develop or enhance their economic standing. Similarly, better livelihoods help improve sanitation. Decent living circumstances enable disadvantaged people to consider proper sanitation as a worthwhile aim to pursue on their own or with support (Borba et al., 2007). Public and private sectors may utilize this evaluation to build evidence-based programmatic initiatives to enhance better WASH services and livelihood opportunities for these disadvantaged populations.

5. Conclusion

This study highlighted the hardships and needs of Bangladeshi climate migrants living in urban slums in both the general and COVID-19 contexts, with a particular emphasis on WASH services and livelihood opportunities. Following thematic analysis, this study revealed that climate migrants were subjected to substantial water scarcity, insufficient drainage systems, a lack of toilets, tube wells, and bathing facilities, inadequate hygiene management, a lack of core skills required for urban jobs, low wages, and a lack of income. They placed a high priority on sustainable drinking water sources, hygienic toilets with WASH blocks, personal hygiene items and awareness-raising, skill development for a variety of livelihood options, and the development of income-generating capabilities. Multiple specific recommendations were also addressed from this study, including the installation of the sub-miscible/deep tube well, the establishment of separate WASH blocks, adequate access to water and toilets for women and girls, providing technical training, empowering women in the community by giving income-generating training, the COVID-19 vaccination program, the distribution of a Personal Hygiene Package (Soap, Hand Sanitizer, Masks), supply Menstrual Hygiene package for adolescent girls, and the arrangement of the awareness campaign. Therefore, this assessment may guide both the public and private sectors in the development of effective and evidence-based programmatic interventions to improve the WASH facilities and livelihood possibilities of these disadvantaged populations. Furthermore, the participation of all essential stakeholders (e.g., governments, private organizations, policymakers, and whole communities) is required in order to meet the needs of climate migrants because literature has indicated the necessity of such integration as the effort of guaranteeing climate-resilient trajectories for the underprivileged (Leal Filho et al., 2021).

Declarations

Author contribution statement

Md. Ayatullah Khan: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

Additional information

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