



ARTICLE



<https://doi.org/10.1057/s41599-020-0443-2>

OPEN

# Trapped in the prison of the mind: Notions of climate-induced (im)mobility decision-making and wellbeing from an urban informal settlement in Bangladesh

Sonja Ayeb-Karlsson <sup>1,2✉</sup>, Dominic Kniveton<sup>1</sup> & Terry Cannon<sup>3</sup>

**ABSTRACT** The concept of Trapped Populations has until date mainly referred to people ‘trapped’ in environmentally high-risk rural areas due to economic constraints. This article attempts to widen our understanding of the concept by investigating climate-induced socio-psychological immobility and its link to Internally Displaced People’s (IDPs) wellbeing in a slum of Dhaka. People migrated here due to environmental changes back on Bhola Island and named the settlement Bhola Slum after their home. In this way, many found themselves ‘immobile’ after having been mobile—unable to move back home, and unable to move to other parts of Dhaka, Bangladesh, or beyond. The analysis incorporates the emotional and psychosocial aspects of the diverse immobility states. Mind and emotion are vital to better understand people’s (im)mobility decision-making and wellbeing status. The study applies an innovative and interdisciplinary methodological approach combining Q-methodology and discourse analysis (DA). This mixed-method illustrates a replicable approach to capture the complex state of climate-induced (im)mobility and its interlinkages to people’s wellbeing. People reported facing non-economic losses due to the move, such as identity, honour, sense of belonging and mental health. These psychosocial processes helped explain why some people ended up ‘trapped’ or immobile. The psychosocial constraints paralysed them mentally, as well as geographically. More empirical evidence on how climate change influences people’s wellbeing and mental health will be important to provide us with insights in how to best support vulnerable people having faced climatic impacts, and build more sustainable climate policy frameworks.

<sup>1</sup> University of Sussex, Falmer Brighton, UK. <sup>2</sup> United Nations University – Institute for Environment and Human Security, Bonn, Germany. <sup>3</sup> IDS, University of Sussex, Falmer Brighton, UK. ✉email: [S.Ayeb-Karlsson@sussex.ac.uk](mailto:S.Ayeb-Karlsson@sussex.ac.uk)

### (Im)mobility and climate change

The diverse terms describing immobility or immobile people includes everything from *involuntary immobility*, *stayers*, *non-migrants*, *staying put*, and *left behind* (Carling, 2002; Toyota et al., 2007; Gray, 2011; Hjälm, 2014; Mata-Codesal, 2018). Immobility in the context of climate change is not as widespread of an idea as mobility, but it is an emerging area of research interest (Black et al., 2013; Baldwin, 2016; Suliman et al., 2019). The notion of Trapped Populations, first introduced by the UK Government's 2011 Foresight report on Migration and Global Environmental Change (MGEC), referred to vulnerable populations lacking the resources (mainly financial) to escape environmental stress although wanting to do so (Foresight, 2011; Black et al., 2011). The concept was thereafter extended by various migration scholars to include those 'trapped' by legal protocols, border situations and social barriers including gender and place attachment (Black and Collyer, 2014; Ayeb-Karlsson et al., 2018). The importance of non-financial immobilising elements was also raised within a UNFCCC climate policy context through the conceptual creation of 'Non-Economic Losses and Damages' (UNFCCC, 2013, 2015; Barnett et al., 2016; Boyd et al., 2017; Tschakert et al., 2019).

The climate-induced immobility literature, however, somewhat stagnated in economic immobility framings despite these efforts. Previous narratives on 'trapped' populations also mostly cover rural people facing environmental hazards. This although the Foresight report almost a decade ago stressed how cities in low-income countries should be considered high-risk areas for involuntary immobility. Surprisingly little empirical evidence examines climatic immobility, and even less so, urban immobile people (Ayeb-Karlsson et al., 2018; Schewel, 2019). Underlying these narratives is a normative framing of decision-making as rational and linear whereby behavioural intention (in this case the desire to migrate) is assumed to lead to the desired behaviour. The idea of a mobility bias within migration research focussing on the *drivers* and *flows* of migration while neglecting immobility outcomes, serves as another explanation for the lacking research perspective (Adey, 2006; Beratan, 2007; Schewel, 2019).

This article provides a valuable contribution to this gap in the literature as it focusses on climate-induced immobility in an *urban* informal settlement<sup>1</sup>, Bhola Slum, in Dhaka, Bangladesh, instead of the more common rural 'trapped' perspective. The name of the settlement arose as it housed the arriving migrants from Bhola Island after the devastating 1970 Bhola cyclone, and more recently due to riverbank erosion (McNamara et al., 2016; Ayeb-Karlsson et al., 2016; Ayeb-Karlsson, 2018). The study showcases why (im)mobility decision-making is highly complex, or less rational and linear, through a Q-based Discourse Analysis. If we are to better understand the apparent inability of people to move away from places that involve risky situations, we need to analyse the deeply contextual psychosocial aspects that affect a person's state of mind, wellbeing, and thereby their (im)mobility decision-making (see Fig. 1). These include feelings of belonging, identity-constructions, attitudes to risk, and emotional or mental wellbeing. In other words, this study will give us a better understanding of why individuals with similar socio-cultural, economic and legal status can exhibit different (im)mobility and wellbeing outcomes.

### Urban (im)mobility and mental wellbeing

Even though studies of urban immobility are limited, there is a literature body elaborating around urban (and slum) wellbeing or mental health. Similar to the climate immobility scope, there are more empirical research investigating mental wellbeing in rural than urban areas, and slum settings are in particular neglected. This is a critical knowledge gap as about a billion people around

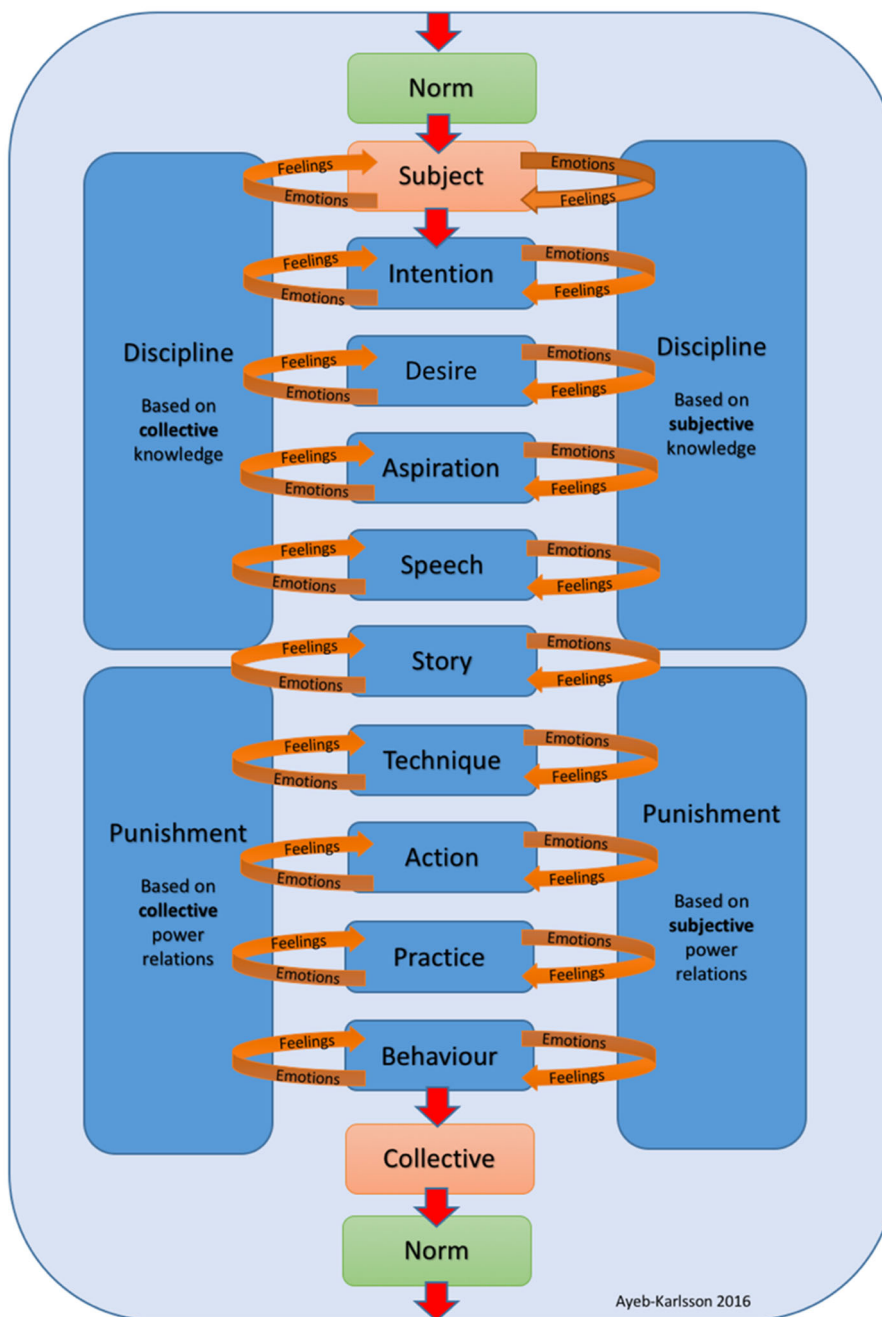
the world live in slums, a steadily rising number (Cook and Kirke, 2003; Sclar et al., 2005; Lilford et al., 2017). People trying to escape environmental changes often end up in slum areas upon arrival in the cities (Hunter et al., 2015; Etzold, 2016; Adri and Simon, 2018). The environment and life in these informal settlements (globally as well as in Bangladesh) often places people in higher risk of developing health issues (Ezeh et al., 2017; Schwerdtle et al., 2018). People living here are also more vulnerable to climatic changes, such as heat strikes and flooding than people living in housing providing shade and protection from direct sunlight, high temperatures and standing water (De Sherbinin et al., 2007; Woodward et al., 2014; Khan et al., 2014).

More research efforts on the connections between health (particularly mental health) and climate change are therefore urgently required to better protect the world's urban and most vulnerable populations (Nahar et al., 2014; Blanchet et al., 2017; Watts et al., 2017, 2018, 2019). These vulnerable populations include those who live in over-crowded slum households that lack the infrastructure to protect them from environmental stress, while also lacking access to clean water, good sanitation, and public health services (Unger and Riley, 2007; Butala et al., 2010; Wekesa et al., 2011). As a result, these urban settlers are more at risk of developing mental ill-health or disorders (such as depression, anxiety, bipolar disorder, violent or abusive behaviour and schizophrenia) or even dying from suicides and unnatural deaths (Cattaneo et al., 2009; Gruebner et al., 2011, 2012; Mberu et al., 2015).

In the context of slums in Bangladesh, there is a strong focus on female experiences linking garment factories, violence, depression and PTSD (Akhter et al., 2017; Parvin et al., 2018; De and Murshid, 2018; Fitch et al., 2017, 2018). People living in slums here, and particularly women, adolescents and children, report struggling more with mental health issues and lower quality of life than people in other urban areas (Islam et al., 2003; Mullick and Goodman, 2005; Izutsu et al., 2006; Khan and Flora, 2017). A few investigations even link mental ill-health and life dissatisfaction in the slums of Dhaka and Khulna to climate-induced mobility (Ruback et al., 2002, 2004; Rahaman et al., 2018).

### Method: Q-methodology and Discourse Analysis

This Q-based Discourse Analysis will examine urban (im)mobility decisions and wellbeing through people's subjective attitudes and perceptions (see Table 1). The interdisciplinary and innovative empirical mixed-method was carried out over 3 years and involved Q and Discourse Analysis (DA). The 62 participants were not randomly selected, but efforts were made to ensure that they reflected the overall representation of the socio-economic and religious groups, as well as the distinction of age, gender, and livelihood backgrounds in Bhola Slum. The study applied respondent driven sampling (or snowball sampling) to select the participants. This non-probability sampling technique encourages existing informants to recruit additional participants through their social networks (Goodman, 1961; Goel and Salganik, 2010; Heckathorn, 2014). As with any research method or sampling technique there are strengths and weaknesses with respondent driven sampling. One potential weakness is the risk for biases. For example, social individuals are more likely to be recruited as they will have a wider social network. To improve the final study sample, it has been suggested to begin the sampling with an initial informant group from diverse backgrounds (Brace-Govan, 2004; Kurant et al., 2011). Our initial sample group therefore included informants from different religious, political, social, livelihood, and ethnical backgrounds. Since the hierarchical power structures and social groups in the settlement traced back to people's



**Fig. 1 Discursive decision-making model.** The figure illustrates a conceptual idea of how the decision-making process links to discursive and social-norms through the interaction of power (through punishment), knowledge (through discipline), feelings, emotions and wellbeing (Ayeb-Karlsson, 2018, p. 24).

migration history (e.g. time period since migration from origin village), efforts were made to ensure that the initial sample included a good balance here. Besides this, a sampling route ascertained a geographical spread of the final sample (Heckathorn, 2002; Browne, 2005).

*Q-methodology* (Stephenson, 1935, 1986; Brown, 1980, 1996; Stenner, 2008; Watts and Stenner, 2012) captures people’s subjective attitudes through a sorting exercise of Q-statements (see Fig. 2). The selected Q-statements used in this study were based on qualitative fieldwork sessions conducted between 2014 and 2015. 100 statements or quotes describing prominent (im)mobility narratives were pulled out from the previously conducted qualitative individual and group session transcripts. The

statements described values and behaviours around migration and non-migration behaviour. These statements were then grouped into themes, storylines and narratives that appeared to be re-occurring. The statement sampling process continued by making sure that each Q-sample presented a good coverage and balance of the discourse. Out of the 100 statements, 40 were selected for the final Q-set.

A good Q-sample must be broadly representative of the overall opinions in the discourse, while presenting a balanced set of statements. This does not imply that half of the statements ought to be negative (con) and the other half of them positive (pro). Balance has a wider meaning, which is to ensure that the statements are not biased towards a specific opinion or viewpoint. It is

**Table 1 Q-statement overview.**

Statement	Q-statements	The Landless (Discourse A)	The Displaced (Discourse B)	The Sacrificed (Discourse C)	The Returners (Discourse D)	The Dreamers (Discourse E)
1	I could get evicted tomorrow.	4	4	4	2	5
2	The riverbank erosion forced us to move here.	5	-1	5	3	-1
3	My health issues do not allow me to migrate.	-3	-2	2	-5	0
4	I sacrificed my honour in the struggles here.	-1	-1	3	-4	0
5	Things would have been better if I never moved here.	-5	1	3	2	-4
6	My family doesn't want to move.	-1	-1	1	-1	0
7	There have to be people I know in the new destination.	0	3	-4	1	-1
8	One is safer in Bhola Slum than where I was living.	0	-3	-3	-2	3
9	Moving is not the right thing to do.	-1	1	1	1	-2
10	If I could move from Bhola Slum I would.	2	0	4	3	2
11	It doesn't feel right to abandon the people living here.	-1	-1	0	4	-1
12	The cyclones were the main reason why I moved here.	2	-5	2	1	-3
13	Women live a better life here.	3	0	-5	-2	4
14	Lack of land is the main reason why I cannot leave.	1	0	2	0	3
15	I migrated because education here is better.	-2	-4	0	-1	-1
16	If I only had enough money to start up a new life elsewhere I would go.	3	4	2	0	1
17	I am not mentally strong enough to move.	-4	2	0	0	1
18	Bhola Slum is not a good place.	3	1	1	0	-4
19	If I was offered a job elsewhere I would go.	0	0	1	3	-1
20	One should never leave their family behind.	2	2	3	0	2
21	It was unsafe where I was living.	0	-4	-2	-3	0

Table 1 (continued)

Statement	Q-statements	The Landless (Discourse A)	The Displaced (Discourse B)	The Sacrificed (Discourse C)	The Returners (Discourse D)	The Dreamers (Discourse E)
22	If I leave I lose everything I invested in this place.	-4	-3	-2	-3	1
23	This is not where I belong.	-1	2	-1	-4	1
24	People I knew in Bhola Slum told me to come here.	0	-1	-1	-3	0
25	My place is here.	2	-2	-1	1	0
26	If others would decide to move so would I.	0	1	1	0	0
27	I thought my living conditions would improve after I migrated.	4	3	0	2	2
28	I am afraid something may happen when I get to the new destination.	1	0	0	-1	0
29	The outcome is anyways not in my hands.	1	2	1	1	2
30	I would like to return to my home district.	0	5	-1	4	-5
31	Job opportunities played an important role in our decision to move here.	0	3	0	5	3
32	I am unhappy here.	1	1	0	0	-2
33	People here in Bhola Slum wouldn't like it if I left.	-2	0	-1	-1	1
34	My indebtedness doesn't allow for me to go.	1	0	-4	-2	1
35	Improved healthcare is why we decided to come here.	-3	-3	0	2	-2
36	I am caught in a bad circle. It did not turn out like I had hoped last time so why should I move again.	-3	-2	-3	-2	-3
37	I would jump on the next bus if I only had enough money for the ticket.	-2	-2	-2	-1	-1
38	My husband needs to be the one deciding if we stay or go.	1	-1	-2	1	4
39	People told me I should migrate.	-1	0	-1	-1	-2

Listing the 40 Q-statements used in this study and how each discourse group ranked them. The selected statements were based on the qualitative fieldwork sessions carried out between the years 2014 and 2015.



**Table 2** Discourse group overview.

Discourse group	The Landless (Discourse A—Female)	The Displaced (Discourse B—Male)	The Sacrificed (Discourse C—Female)	The Returners (Discourse D— Female)	The Dreamers (Discourse E— Female)
Q-Most agree statements	2. The riverbank erosion forced us to move here +5 1. I could get evicted tomorrow +4 27. I thought my living conditions would improve after migrating +4 5. Things would have been better if I never moved here -5	30. I would like to return to my home district +5 1. I could get evicted tomorrow +4 16. If I only had enough money to start up a new life I would go +4 12. The cyclones were the main reason why I moved here -5 15. I migrated because education here is better -4 21. It was unsafe where I was living -4	2. The riverbank erosion forced us to move here +5 1. I could get evicted tomorrow +4 10. If I could move from Bhola Slum I would +4 13. Women live a better life here -5 34. My indebtedness does not allow for me to go -4 7. There have to be people I know in the new destination -4	31. Job opportunities played an important role in our decision to move +5 30. I would like to return to my home district +4 11. It does not feel right to abandon the people living here +4 3. My health issues do not allow me to migrate -5 4. I sacrificed my honour in the struggles here -4 23. This is not where I belong -4	1. I could get evicted tomorrow +5 13. Women live a better life here +4 39. My husband needs to be the one deciding if we stay or go +4 30. I would like to return to my home district -5 5. Things would have been better if I never moved here -4 18. Bhola Slum is not a good place -4
Q-Most disagree statements	17. I am not mentally strong enough to move -4 22. If I leave I lose everything I invested into this place -4	2 21-60 Garment factory	5 26-56 Household decision-makers (4)/ housewife/ housemaid (1) 4	3 20-31 Housewives (3)/garment factory (1)	3 25-52 Garment factory (3)/ housemaids/ housewives (3)
Men	5	9	4	3	2
Age	26-44	16-47	27-61	26-66	45
Livelihood	Construction work/day-labourers	Construction work/garment factory/ day-labourers/taxi-drivers/fruit sellers	Day-labourers/selling vegetables or nuts/ pulling rickshaw	Permanently contacted construction workers/ transport or security workers	Permanently contracted plumbers/ electricians/ construction work supervisors
Total	15	11	9	6	5
Education	Most never attended school, those who did only for 2-3 years.	Most attended school for 2-3 years (7), although two men report having gone to school for 6-8 years.	Half of the group attended school for 2-3 years.	Half of the group attended school for 2-4 years.	Most attended school for more than 4 years (4).
Migration history	All except one woman moved to Bhola Slum.	All moved to Dhaka, many between the years of 2001-2010 (5).	Most migrated to Dhaka between 1990-2012 (7).	All arrived in Bhola Slum between 2000-2008.	Most migrated to Bhola Slum already around its creation in the 1970s. The only more recent

Table 2 (continued)

Discourse group	The Landless (Discourse A—Female)	The Displaced (Discourse B—Male)	The Sacrificed (Discourse C—Female)	The Returners (Discourse D— Female)	The Dreamers (Discourse E— Female)
Migration desire	<p>Most arrived between 2000–2014 (11). Two men carried out seasonal work elsewhere in the past.</p> <p>Most want to return to Bhola Island (9), nobody wants to move to another rural area and only one would move to another city.</p> <p>Most willing to stay in Bhola Slum for the next 5 years due to work opportunities (12), although another area of Dhaka would be better as rent is lower, no eviction risk, more work and better social environment (9).</p>	<p>Many want to return to Bhola Island (5) or other rural home villages (2).</p> <p>Most do not see themselves staying in Bhola Slum within the next 5 years (9).</p> <p>Dhaka would be better as rent is lower, no eviction risk, more work and better social environment (9).</p>	<p>Most willing to stay in Bhola Slum for the next 5 years to save up money (5), but moving to another area in Dhaka would be better (7). Only one would consider moving to another urban area in Bangladesh.</p> <p>Two women want to send their sons abroad to Malaysia or Saudi Arabia.</p>	<p>One man and one woman engaged in seasonal construction work.</p> <p>Most want to leave Bhola Slum within 5 years (4).</p> <p>Most want to return to Bhola Island or other rural home villages.</p> <p>Most would move to another area of Dhaka temporarily (5).</p> <p>One man would consider moving to another urban area in Bangladesh as education is better here for his son. One woman would consider sending her son abroad.</p>	<p>move took place over 10 years ago.</p> <p>Most women left the island due to family related troubles with their step-mothers.</p> <p>Many are willing to stay in Bhola Slum within the next 5 years as they have invested time and money into the settlement (3).</p> <p>Most do not pay rent as they 'own/occupy' the rights to the governmental land (4).</p> <p>Long-term they want to move to another urban area as work and education is better here, only one want to return to Bhola Island.</p> <p>The environmental stressors on the island are too much of a risk for the others.</p> <p>Most want to move abroad (3) to Mauritius or Saudi Arabia where they can make more money and create a better life.</p>

This table shows an overview of the five discourse groups, how they sorted the 40 Q-statements (e.g. between most +5/+4 and least -5/-4 (dis)agree), as well as informant history and migration background which was captured in the survey questionnaire.



reflection of this viewpoint (Brown, 1980; Watts and Stenner, 2012). The advantage of using Q in this analysis is that it supports the identification of such subjectivities in the study site. The way that Q systemises and quantifies the grouping of people's experiences or viewpoints will be useful. However, some of the nuances and complex links to contexts beyond the Q-statements, that DA of language captures, are often lost in Q-studies. It is important to remind oneself that a Q-analysis is topic, group and time specific. The captured Q-viewpoints therefore only make sense in relation to these elements.

The analysis will draw conclusions around the discourse groups' perceptions around (im)mobility and wellbeing. 'Discourse group' refers to the Q-factor groups identified through the Q-analysis which groups people's subjective responses in relation to the Q-set in such a way that it reflect the broader discourses in the study area (as described in Watts and Stenner, 2012). The analysis will tell us more about whether people want to move, and why they feel like they cannot leave the settlement, or how people understand their immobility, why they perceive themselves as immobile, and what this means for their wellbeing.

Q (originally coming out of psychology) in combination with DA has proved to be a successful way of analysing people's perceptions and viewpoints around climate change and migration (e.g. Dryzek, 1994; Barry and Proops, 1999; Niemeyer et al., 2005; Ockwell, 2008; Wolf et al., 2009; Morinière and Hamza, 2012; Hugé et al., 2016). The power of discourses to produce 'knowledge regimes' is the main focus of a Foucauldian Discourse Analysis (Foucault, 1977, 1981; Hajer, 1995; Adger et al., 2001). The power and knowledge concepts can give us important insights into climate-human relations. This is because it is power and knowledge that lock people into social discourses who simply respond to their feelings and emotions (Morales and Harris, 2014; Eriksen et al., 2015; Owusu-Daku et al., 2019). Knowledge can, for example, maintain people in a discourse by disciplining their actions, and power by socially punishing those who step outside the discursive norm (Foucault, 1977, 1982; Butler, 2011; Ayeb-Karlsson et al., 2019). In this article, the concepts will serve as valuable analytical tools to understand subjective climate-induced (im)mobility, or why people sometimes do not manage to escape environmentally and socially risky situations (see Fig. 1).

### Applying Q to understand urban (im)mobility wellbeing

Five discourse groups were identified through the factor analysis. Each factor (or discourse) group represents a different perspective on (im)mobility and wellbeing in the settlement (see Table 2). After the Q-sorting exercise, the participants were asked to explain why, or how they felt and thought when they ranked the Q-statement extremes (+/-5, +/-4, 0). The following analysis of the discourse groups include participant information from the survey, as well as the Q and a DA of the responses from the post-sorting interview. The heading of each discourse group represents a summary of the analysis and indicates the Q-statement(s) ranked as most important for the overall group e.g. distinguishing Q-statements and ranking extremes. The informant number, statement number and sort value are referenced in brackets. Here the article follows a Q-referencing system that indicates (informant: statement sort value), or to give an example, (46:2 +5) for individual informant ranking, and (statement sort value) or (2 +5) for discourse group ranking.

**The Landless (Discourse A): I want to return, but the erosion took my land.** Discourse A explains 11% of the study variance or 15 out of 46 participants are highly associated with this discourse group. The female dominated *Landless* group, with an average age of 33, employs a narrative concerning the riverbank erosion that

the participants faced on Bhola Island. The *Landless* agrees the most with statement 'The riverbank erosion forced us to move here (2 +5)', and disagreed the most with 'Things would have been better if I never moved here (5 -5)'. The erosion is described as a problem much deeper than a temporary stress back on the island. It marks a turning point that has ended up cursing their lives and future:

Q1: The river sucked everything out of us (46:2 +5).

Q2: I lost everything. To be able to survive I had to come here (12:2 +5).

Q3: The riverbank erosion is the only thing that drove us here (45:2 +4).<sup>4</sup>

The *Landless* expressed living in great fear due to the risk of eviction, and feeling disappointed about how the move turned out:

Q9: We know that we can get evicted anytime. We have to be ready to go (6:1 +4).

Q10: Many people leave thinking that [their living conditions would improve]. That is what I thought too, before I came to this place (26:27 +4).

Q11: I came here with a lot of dreams and expectations (60:27 +5).<sup>5</sup>

Next to the disappointment, the *Landless* convey a feeling of meaninglessness or emotional emptiness. This is, for example, captured in the way happiness and honour are referred to as luxury items:

Q13: Poor people cannot afford happiness (7:32 0).

Q14: What am I supposed to do with happiness? (6:32 0).

Q15: Poor people do not need to be honoured (7:4 0).

Interestingly, given this dissatisfaction the *Landless* appear mentally and emotionally ill-prepared to move on. The group emphasises that the lack of financial resources and land, prevents them from moving, or returning to Bhola Island:

Q16: I cannot afford to go to a better place (21:3 -4).

Q17: I can maybe afford to buy a bus ticket, but I do not have anywhere to live in my homeland (38:26 -5).

Q18: If I could buy some land and build a house, then I would go home (52:30 0).<sup>6</sup>

The *Landless* refer to Bhola Island as home, and most of them would have stayed, or returned, if it was not because of the erosion. The group does not express similar attachments to Bhola Slum or to its social environment. This comes through in how the settlement is portrayed. It is not described as a place where people want to be. Nonetheless, the *Landless* seem to temporarily have come to terms with the idea that they will need to stay:

Q20: This is a very dirty and crowded place, but we have nowhere else to go (59:19 0).

Q21: There are drug addicts here so we cannot bring up our children properly, but we have nowhere else to go (52:35 0).

Q22: I have to stay here I guess. That is just it (60:32 0).<sup>7</sup>

**The Displaced (Discourse B): This is not where I belong, I want to go home.** Discourse B explains 8% of the study variance or 11 out of 46 participants are highly associated with this discourse group. The male dominated *Displaced* group, with an average age of 35, expresses a strong feeling of being displaced or not belonging in the settlement. This is reflected in the Q-statement ranked as most agree; 'I would like to return to my home district (30 +5)', and in the distinguishing statements ranked higher than by the other groups:

Q27: I want to go back to my village as it is a wonderful place for me to live in (40:30 +4).

Q28: I do not want to live here. I want to go back to my village (43:23 +4).

Q29: I am homesick. I enjoyed life in my hometown so much (15:5 +4).<sup>8</sup>

Similarly, this is observed in how the *Displaced* describe the settlement and its social environment:

Q33: I feel no connection to this place (15:25 -4).

Q34: Back in the village there was honour, but in this place all people do is counting money (29:4 +5).

Q35: The island was so much safer. I do not like this place. There are dangers here at night, thieves and kidnappers (15:8 -5).<sup>9</sup>

One important difference from the *Landless*, is that the *Displaced* explain their migration decision by economic reasons rather than due to environmental stress. This is expressed in the Q-statements they disagree with the most 'The cyclones were the main reason why I moved here (12 -5)' and in the overall narrative. Lack of financial resources is described as the main constraining factor keeping them in a place where they do not want to be:

Q40: I was hoping to increase my income, but I have lost hope (36:27 +4).

Q41: I will go to a better place when I have enough money (35:16 +4).

Q42: If I had enough money I would go, but the lack of money is the problem (38:16 +5).<sup>10</sup>

**The Sacrificed (Discourse C): Lost health and honour for economic gain.** Discourse C explains 8% of the study variance or 9 out of 46 participants are highly associated with this discourse group. The *Sacrificed* group has an average age of 42 years which makes it the oldest group out of the five. Interestingly, most women are household decision-makers due to different circumstances such as their husband's abandonment, illness or death. Poor health and difficulties to support the household financially are common elements of the men. Most of them report earning about 300–400 tk per day (at the time of writing, this was about £3 to £4). This is relatively low for a male day-labourer in Dhaka. The *Sacrificed* group report having some similar attitudes to the *Landless*. The group has strong feelings around the past impact of the erosion and the current fear of eviction:

Q47: I lost everything. To survive I was forced to come here (8:2 +5).

Q48: The erosion is the only reason why I am here (31:2 +5).

Q49: This is not our land. There are no papers or documentation allowing us to live here. If the government wants to, they can ask us to leave anytime. There is no security (1:1 +5).<sup>11</sup>

The *Sacrificed* refers to their loss of wellbeing, or sacrifices made, by having to live in the settlement. The narrative of the *Landless* circulated around emotional numbness and hopelessness, while the *Sacrificed's* storyline moves even further into the darkness. People are aware that they are forced to stay in the slum, although they express being fed-up and that they would like to escape:

Q53: Bhola Slum is not a good place, but what can we do? There is no other option (1:18 0).

Q54: I need to make sure to move. If I find a good opportunity, I will do so (3:9 -5).

Q55: I had to live here so obviously as a result I had to sacrifice my honour (33:4 +4).<sup>12</sup>

The loss of honour (including religious norms) seems to affect women more, and is related back to the toxic social environment that creates in an unsafe female space. Q-statement 'Women live a better life here (13 -5)' is ranked as the statement the *Sacrificed* disagrees with the most:

Q62: There is not enough security here for women (20:13 -5).

Q63: Women face various problems here. Problems that make it difficult for them to maintain their religious obligations (3:13 -4).

Q64: The manner here is not to cover up. Women do not follow any religious values here (1:13 -4).<sup>13</sup>

The *Sacrificed* explains their immobility with the lack of land and financial resources, but ill-health is mentioned as another important factor:

Q66: The lack of land is the main reason why I cannot leave (62:14 +4).

Q67: My family wants to go to a better place, but I cannot afford it (20:6 -4).

Q68: There are more job opportunities here, and my husband is sick (3:12 -4).<sup>14</sup>

**The Returners (Discourse D): I came here to save up money, after that I will return home.** Discourse D explains 6% of the study variance or 6 out of 46 participants are highly associated with this discourse group. The *Returners*, with an average age just under 33, is the youngest group out of the five. Increased job opportunity was the main reason why the *Returners* decided to move to Bhola Slum. This is also reflected in the Q-interviews:

Q70: I came to Dhaka to earn money (41:31 +5).

Q71: I am here because of poverty (10:3 -5).

Q72: I came here to get a better life (25:5 +4).<sup>15</sup>

The move was supposed to be temporary - to save up money and leave - people want to return home eventually:

Q75: We are all here to save up some money. Money that will enable us to buy a piece of land and get a house (25:30 +5).

Q76: I hope I will be able to go back, back to Bhola (56:30 +4).

Q77: If I can arrange enough money, I will go back to my birthplace, Bhola (56:10 +5).

An important difference from the *Sacrificed* and the *Displaced*, is the disagreement of Q-statements on ill-health, loss of honour and feelings of not belonging:

Q78: No one has to sacrifice their honour, but they have to work hard (10:4 -4).

Q79: We are physically well by the grace of God almighty, but we are lacking money (51:3 -4).

Q80: I know this is not a good place, but I live here. I have the right to be here (41:23 -4).<sup>16</sup>

The *Returners* emphasise having the right to be here, but they do not express a strong attachment to the settlement:

Q83: They are not my people. Not everyone is that helpful (56:33 -5).

Q84: I have not invested anything into this place (25:22 -4).

Q85: If we could find a better place, we would move (51:23 0).<sup>17</sup>

The *Returners* convey a complex perspective of immobility or being 'trapped'. People want to leave the settlement in a few years and return home. Additionally, they would not have migrated here if they would have gotten by financially in their home villages. The *Returners* came here with a clear purpose; to save up money and return. This is a state of limbo—they must, need and are fairly comfortable here—but this temporary satisfaction heavily depends on the hope of returning home to a better future. The satisfactory status quo could change if they do not manage to return home with some savings in a few years. This uncertainty is expressed in the interviews:

Q92: It all depends on the situation (51:30 0).

Q93: I do not know anything about what will happen. Allah knows better than us all (41:29 0).

**The Dreamers (Discourse E): Urban dreams of betterment.** Discourse E explains 7% of the study variance or 5 out of 46 participants are highly associated with this discourse group. The *Dreamers* has an average age of 40 years. This is the only group that does not identify themselves as landless. Most women stopped working once they had children or when their children became of age to care for them financially. Three households have a TV and two a fridge. These symbols of wealth were not found in the other groups. Most women interestingly moved from the island to escape family issues with their step-mothers. This is also the only group that want to move abroad. In Mauritius or Saudi Arabia, they can make good money, create a better life and fulfil

their dreams. The *Dreamers* top-rank Q-statements around eviction, women's safety and men's decision-making rights:

Q94: We are always afraid of eviction (5:2 +5).

Q95: Ladies live a secure life here (19:13 +4).

Q96: He is the head of the family so we will have to follow his decisions (48:39 +5).<sup>18</sup>

This is the only group that ranks Q-statement 'I would like to return to my home district (30 -5)' as most disagree:

Q98: My children are studying here and we do not have anything left in our village (5:30 -5).

Q99: My husband has no land in our home district. My step-mother is also there and my father's condition is not very well (48:30 -5).

Q100: All has been taken away by the river. I do not want to go there (4:30 -4).

The *Dreamers* do not believe that things would be better if they never migrated here, nor that Bhola Slum is a bad place:

Q101: It is not that Bhola Slum is not a good place, it is just that there are too many people here (4:18 -4).

Q102: Anything can happen anywhere. This place is safe (19:28 -4).

Q103: I am happy here because our relatives are here and life is not that expensive (19:32 -4).

The migration from the island is explained by domestic abuse and trauma, as well as environmental stress:

Q104: I was tortured by my step-mother. I came here to make a better life, and to get a job in the garment factories (48:27 +4).

Q105: If the riverbank erosion would not have grabbed the land from us, we may be happier living on our own land (19:2 +4).

Q106: If I had my land, and my father would not have died, then we might be living well (32:5 -4).<sup>19</sup>

The *Dreamers* do not want to return to Bhola Island, nor do they want to stay in Bhola Slum forever. People dream of betterment, but they currently do not manage to move. A number of reasons keep them here such as ill-health and weak household economy:

Q111: I carry several diseases, so it is hard for me to move to another place (32:3 +4).

Q112: My mental strength allows me to move, but we are not economically stable. Our relatives are also here (19:17 0).

Q113: I am a widow, and I have to think about my children so I cannot move (5:34 +4).<sup>20</sup>

## Discussion

All groups expressed a desire to leave Bhola Slum. However, *why*, *how*, *when* and *to where* strongly differentiated between the discourse groups. The *Landless*, *Displaced* and *Sacrificed* wanted to

return home to Bhola Island, while the *Returners* mentioned other rural places, and the *Dreamers* other urban areas or countries. Some would stay in the settlement for a few years, while others wanted to escape immediately. Some said that their mobility was restricted by the lack of land, others financial resources, poor physical or mental health, and emotional wellbeing.

The captured notions around the (im)mobility state were in this way most diverse. If anything, the analysis illustrated how the complex state of climate-induced (im)mobility interlinks with people's wellbeing. The findings outlined a long line of climate-induced non-economic losses and damages that people faced through the rural-urban move from the island, and through the displacement in the slum. These included the loss of identity, honour, sense of belonging, physical and mental health or wellbeing. It is important to acknowledge that people faced these losses although many of them 'decided' to migrate (Barnett et al., 2016; Tschakert et al., 2019). These are crucial findings for the upcoming UNFCCC climate policy discussions that are to shape the conceptual development of Loss and Damage, and advise on how to best support vulnerable people facing such losses.

A suggestion of how to widen our understanding of the interlinkages between (im)mobility and wellbeing, is to frame more empirical studies around the Non-Economic Loss and Damage concept and its links to mental health. The lack of empirical insights investigating the emotional and mental aspects of climate change impacts otherwise risk being a costly public health inaction (Watts et al., 2017, 2018, 2019). Bhola Slum captured a long line of mental ill-health descriptions, such as anxiety and acute stress reaction to the eviction risk, depression and apathy due to the loss of identity and belonging, or trauma and PTSD in relation to physical and psychological abuse. The lack of wellbeing often related to new urban (and gendered) risks such as the work conditions in the garment factories, or the living conditions in the slum (Ezeh et al., 2017; Parvin et al., 2018; Fitch et al., 2017, 2018). The study clearly illustrated how people's, and in particularly women's, immobility go far beyond economic constraints.

We know how to treat mental ill-health and disorders, such as trauma, depression and anxiety. More political and financial efforts must be made to ensure that climate-induced migrants, displaced and immobile populations have immediate access to psychological support upon their arrival. People must have a chance to heal any trauma related to what may have forced them to leave, or to what they found when they arrived. People need support to adjust themselves to their new living conditions. At the same time, the root causes to people's interrupted wellbeing can be traced back to deeper structural, political and societal disfunction, such as poverty, unhealthy living conditions, labour- and human rights violations. The recommendation of a family doctor in such a situation would surely be that '*we must treat the problem rather than the symptoms*'.

Whenever mobility is framed as an adaptive policy solution for 'trapped' populations, one must question whom the solution is for, and by whom it is raised (Black and Collyer, 2014; Ayeb-Karlsson et al., 2018). Similarly, we must ask why there has been a rural overrepresentation of populations deemed 'trapped', why the rural perspective of rural-urban migration is more widespread within environmental migration research, and why climate-induced migration or mobility is more commonly investigated than climate-induced immobility (Baldwin, 2016; Schewel, 2019).

For decades migration scholars have debated around *what defines*, and *who is to define* forced or involuntary and voluntary migration. This study however showed that more focus is needed on the diverse ways that climate-induced (im)mobility may damage and erode someone's wellbeing. We need to know more

about how to reduce, minimise and address these damages to protect people's wellbeing. It is time that we acknowledge that not only people who are forced to migrate face eroding wellbeing, but also people who choose to migrate. This became evident as some of the discourse groups clearly fell more under an involuntary migration scenario than others. Similarly, the study showed that researchers need to refrain from searching for 'permanently immobile rural populations' and open up to wider scenarios where mobility can lead to immobility, and where climate-induced immobility can be urbanely placed and short-termed or temporary rather than permanent.

## Conclusion

This empirical study has illustrated a range of modes related to urban-immobility. The findings demonstrate the need to widen our understanding of immobility and 'trapped' populations from simply being financial, practical and functional towards a more complex subjective and psychosocial process. Psychosocial processes (such as identity loss and place attachment) may generate or reinforce someone's subjective immobility. Mental health was indicated as a contributing factor to people's immobility status. For example, people who have experienced traumatic events, such as violence, abuse, or dealing with depressive thoughts, strongly aligned their compromised wellbeing with their immobility status. To our knowledge, this study is pioneering in the sense that it first in investigating mental health and wellbeing as an element of 'trapped' populations or immobility. However, further research explicitly investigating mental disorders and ill-health in climate-induced (im)mobility settings must follow. We urgently need more research investigations of the mental health impacts of migration, but also of the urban immobility state. This will help us comprehend what the mental health impacts are, why people develop them—drawing out the longer health pathways, as well as how to support vulnerable individuals.

Similarly, we need more in-depth people-centred studies from different geographical, cultural and social research settings to reveal the similarities and differences in states of immobility. It is clear that some of the presented findings in this study are location specific, while others potentially can be generalised to a wider context. The understanding of psychosocial processes and their relationship to subjective immobility, for example, as well as the discursive decision-making model are possibly human related rather than socially and culturally specific. This article also provides some valuable and replicable research tools. The research method will likely prove useful and effective for further studies in similar research areas. The hope is that the detailed and transparent methods section will effectively support and facilitate the application for researchers.

A commonly embraced idea around migration is that it is a rationale decision based around a combination of push and pull factors. For example, factors such as pay differentials between migration origin and destination, a desire for household livelihood and risk diversification, and education and health service opportunities are often cited as factors that push and pull people away from and to locations. This study illustrates that the process of decision making around migration and particularly immobility can also be thought of as a function of a complex and delicate network of elements (as the proposed model outline). Subjective and psychosocial feelings and emotions boosting or reducing people's wellbeing status, for example, often relate to whether an intention, desire or aspiration to migrate, leads to migrating. The state of an individual's mind plays a crucial role here. This study sheds light on the relationship between thinking and feeling that one is trapped and being trapped, as well as widening the ways that people may identify themselves as trapped.

**Data availability**

The datasets generated and analysed during the current study are not publicly available due to the sensitive nature of this study topic and the vulnerability of the informants but are available from the corresponding author upon reasonable request.

Received: 21 November 2019; Accepted: 20 March 2020;

Published online: 20 April 2020

**Notes**

- 1 'Informal settlement' here builds on OECD's definition based on legality. In the case of Bhola Slum, it refers to the fact that the settlement was built by people without the permissions or support of the government. The settlement was therefore determined illegal and the people living here accused of occupying governmental land. The authors chose to broaden the use of the word 'slum' to also include this term. This is to acknowledge and neutralise negative associations or stigma around words, such as 'slum' and 'slum dwellers'.
- 2 PQ Method was designed by Peter Schmolck that can be downloaded online (<http://schmolck.userweb.mwn.de/qmethod/index.htm#PQMethod>).
- 3 For more details on the survey questions, see the questionnaire included in the [supplementary material](#).
- 4 See supplementary material Q4 to Q8 for more examples.
- 5 See supplementary material Q12 for more examples.
- 6 See supplementary material Q19 for more examples.
- 7 See supplementary material Q23 to Q26 for more examples.
- 8 See supplementary material Q30 to Q32 for more examples.
- 9 See supplementary material Q36 to Q39 for more examples.
- 10 See supplementary material Q43 to Q46 for more examples.
- 11 See supplementary material Q50 to Q52 for more examples.
- 12 See supplementary material Q56 to Q61 for more examples.
- 13 See supplementary material Q65 for more examples.
- 14 See supplementary material Q69 for more examples.
- 15 See supplementary material Q73 to Q74 for more examples.
- 16 See supplementary material Q81 to Q82 for more examples.
- 17 See supplementary material Q86 to Q91 for more examples.
- 18 See supplementary material Q97 for more examples.
- 19 See supplementary material Q107 to Q110 for more examples.
- 20 See supplementary material Q114 to Q119 for more examples.

**References**

- Adey P (2006) If mobility is everything then it is nothing: towards a relational politics of (Im)mobilities. *Mobilities* 1(1):75–94. <https://doi.org/10.1080/17450100500489080>
- Adger WN, Benjaminsen TA, Brown K, Svarstad H (2001) Advancing a political ecology of global environmental discourses. *Dev Change* 32(4):681–715. <https://doi.org/10.1111/1467-7660.00222>
- Adri N, Simon D (2018) A tale of two groups: focusing on the differential vulnerability of "climate-induced" and "non-climate-induced" migrants in Dhaka City. *Clim Dev* 10(4):321–336. <https://doi.org/10.1080/17565529.2017.1291402>
- Akhter S, Rutherford S, Kumkum FA et al. (2017) Work, gender roles, and health: neglected mental health issues among female workers in the ready-made garment industry in Bangladesh. *Int J Women's Health* 9:571–579. <https://doi.org/10.2147/ijwh.s137250>
- Ayeb-Karlsson S, Fox G, Kniveton D (2019) Embracing uncertainty: a discursive approach to understanding pathways for climate adaptation in Senegal. *Reg Environ Change*. <https://doi.org/10.1007/s10113-019-01495-7>
- Ayeb-Karlsson S (2018) When the disaster strikes:(Im)mobility decision-making in the context of environmental shocks and climate change impacts. Doctoral thesis in Development Studies, University of Sussex and Institute for Development Studies, Brighton
- Ayeb-Karlsson S, Smith CD, Kniveton D (2018) A discursive review of the textual use of 'trapped' in environmental migration studies: the conceptual birth and troubled teenage years of trapped populations. *Ambio* 47:557–573. <https://doi.org/10.1007/s13280-017-1007-6>
- Ayeb-Karlsson S, van der Geest K, Ahmed I et al. (2016) A people-centred perspective on climate change, environmental stress, and livelihood resilience in Bangladesh. *Sustain* 11(4):1–16. <https://doi.org/10.1007/s11625-016-0379-z>
- Baldwin A (2016) Premediation and white affect: climate change and migration in critical perspective. *Trans Inst Br Geogr* 41(1):78–90. <https://doi.org/10.1111/tran.12106>
- Barnett J, Tschakert P, Head L et al. (2016) A science of loss. *Nat Clim Change* 6(11):976. <https://doi.org/10.1038/nclimate3140>
- Barry J, Proops J (1999) Seeking sustainability discourses with Q methodology. *Ecol Econ* 28(3):337–345. [https://doi.org/10.1016/S0921-8009\(98\)00053-6](https://doi.org/10.1016/S0921-8009(98)00053-6)
- Beratan K (2007) A cognition-based view of decision processes in complex social–ecological systems. *Ecol Soc* 12(1). <https://www.jstor.org/stable/26267857>
- Black R, Bennett SRG, Thomas SM, Beddington JR (2011) Climate change: Migration as adaptation. *Nature* 478(7370):447–449. <https://doi.org/10.1038/478477a>
- Black R, Collyer M (2014) "Trapped" populations: limits on mobility at time of crisis. In: Martin SF, Weerasinghe S, Taylor A (eds) *Humanitarian crises and migration. causes, consequences and response*. Routledge, London, pp. 287–305
- Black R, Arnell NW, Adger WN et al. (2013) Migration, immobility and displacement outcomes following extreme events. *Environ Sci Policy* 27: S32–S43. <https://doi.org/10.1016/j.envsci.2012.09.001>
- Blanchet K, Ramesh A, Frison S et al. (2017) Evidence on public health interventions in humanitarian crises. *Lancet* 390(10109):2287–2296. [https://doi.org/10.1016/S0140-6736\(16\)30768-1](https://doi.org/10.1016/S0140-6736(16)30768-1)
- Boyd E, James RA, Jones RG et al. (2017) A typology of loss and damage perspectives. *Nat Clim Change* 7(10):nclimate3389. <https://doi.org/10.1038/nclimate3389>
- Brace-Govan J (2004) Issues in snowball sampling: the lawyer, the model and ethics. *Qual Res J* 4(1):52.
- Brown SR (1980) *Political subjectivity: applications of Q methodology in political science*. Yale University Press, Yale
- Brown SR (1996) Q methodology and qualitative research. *Qual Health Res* 6(4):561–567. <https://doi.org/10.1177/104973239600600408>
- Browne K (2005) Snowball sampling: using social networks to research non-heterosexual women. *Int J Soc Res Methodol* 8(1). <https://doi.org/10.1080/1364557032000081663>
- Butala NM, VanRooyen MJ, Patel RB (2010) Improved health outcomes in urban slums through infrastructure upgrading. *Soc Sci Med* 71(5):935–940. <https://doi.org/10.1016/j.socscimed.2010.05.037>
- Butler J (2011) *Gender trouble: feminism and the subversion of identity*. Routledge, London and New York
- Carling J (2002) Migration in the age of involuntary immobility: theoretical reflections and Cape Verdean experiences. *J Ethn Migr Stud* 28(1):5–42. <https://doi.org/10.1080/13691830120103912>
- Cattaneo MD, Galiani S, Gertler PJ et al. (2009) Housing, health, and happiness. *Am Econ J-Econ Policy* 1(1):75–105. <https://doi.org/10.1257/pol.1.1.75>
- Cook DB, Kirke J (2003) Urban poverty: addressing the scale of the problem. *Proc Inst Civ Eng-Munic Eng* 156(4):251–262
- De PK, Murshid NS (2018) Associations of intimate partner violence with screening for mental health disorders among women in urban Bangladesh. *Int J Public Health* 63(8):913–921. <https://doi.org/10.1007/s00038-018-1139-x>
- De Sherbinin A, Schiller A, Pulsipher A (2007) The vulnerability of global cities to climate hazards. *Environ Urban* 19(1):39–64. <https://doi.org/10.1177/0956247807076725>
- Dryzek JS (1994) Australian discourses of democracy. *Aust J Political Sci* 29(2):221–239. <https://doi.org/10.1080/00323269408402291>
- Eriksen SH, Nightingale AJ, Eakin H (2015) Reframing adaptation: the political nature of climate change adaptation. *Glob Environ Change* 35:523–533. <https://doi.org/10.1016/j.gloenvcha.2015.09.014>
- Ezeh A, Oyebode O, Satterthwaite D et al. (2017) The history, geography, and sociology of slums and the health problems of people who live in slums. *Lancet* 389(10068):547–558. [https://doi.org/10.1016/S0140-6736\(16\)31650-6](https://doi.org/10.1016/S0140-6736(16)31650-6)
- Etzold B (2016) Migration, informal labour and (trans) local productions of urban space—the case of Dhaka's street food vendors. *Popul Space Place* 22(2):170–184. <https://doi.org/10.1002/psp.1893>
- Fairclough N (2013) *Critical discourse analysis: the critical study of language*. Routledge, London
- Fairclough N (2003) *Analysing discourse: textual analysis for social research*. Routledge, London
- Fitch TJ, Yu X, Chien LC et al. (2018) Traumatic life events and development of post-traumatic stress disorder among female factory workers in a developing country. *Int J Soc Psychiatry* 64(4):351–358. <https://doi.org/10.1177/0020764018761502>
- Fitch TJ, Moran J, Villanueva G et al. (2017) Prevalence and risk factors of depression among garment workers in Bangladesh. *Int J Soc Psychiatry* 63(3):244–254. <https://doi.org/10.1177/0020764017695576>
- Foresight (2011) *Migration and Global Environmental Change: future challenges and opportunities*. Final project report. The Government Office of Science, London
- Foucault M (1982) The subject and power. *Crit Inq* 8(4):777–795. <https://doi.org/10.1086/448181>

- Foucault M (1981) *The order of discourse*. In: *Untying the text: a post-structuralist reader*. Routledge, London
- Foucault M (1977) *Discipline and punish: the birth of the prison*. Pantheon Books, New York
- Foucault M (1972) *The archaeology of knowledge*. Irvington Publishers, New York
- Garfinkel H (1974) The origins of the term ethnomethodology. In: Turner R (ed) *Ethnomethodology*. Penguin Books, Harmondsworth, pp. 15–18.
- Goel S, Salganik MJ (2010) Assessing respondent-driven sampling. *Proc Natl Acad Sci USA* 107(15): 6743–6747. <https://doi.org/10.1073/pnas.1000261107>
- Goodman LA (1961) Snowball sampling. *Ann Math Stat* 32(1):148–170. <https://doi.org/10.1214/aoms/1177705148>
- Gray B (2011) Becoming non-migrant: lives worth waiting for. *Gend Place Cult* 18(3):417–432. <https://doi.org/10.1080/0966369X.2011.566403>
- Gruebner O, Khan MMH, Lautenbach S et al. (2012) Mental health in the slums of Dhaka—a geoepidemiological study. *BMC Public Health* 12. <https://doi.org/10.1186/1471-2458-12-177>
- Gruebner O, Khan MMH, Lautenbach S et al. (2011) A spatial epidemiological analysis of self-rated mental health in the slums of Dhaka. *Int J Health Geogr* 10. <https://doi.org/10.1186/1476-072x-10-36>
- Hajer MA (1995) *The politics of environmental discourse: ecological modernization and the policy process*. Oxford: Clarendon Press Oxford
- Heckathorn DD (2014) Respondent-driven sampling: a new approach to the study of hidden populations\*. *Soc Probl* 44(2):174–199. <https://doi.org/10.2307/3096941>
- Heckathorn DD (2002) Respondent-driven sampling II: deriving valid estimates from chain-referral samples of hidden populations. *Soc Probl* 49(1):11–34. <https://doi.org/10.1525/sp.2002.49.1.11>
- Hjälms A (2014) The ‘Stayers’: dynamics of lifelong sedentary behaviour in an urban context. *Popul Space Place* 20(6):569–580. <https://doi.org/10.1002/psp.1796>
- Hugé J, Velde KV, Benitez-Capistrós F et al. (2016) Mapping discourses using Q methodology in Matang Mangrove Forest, Malaysia. *J Environ Manag* 183:988–997. <https://doi.org/10.1016/j.jenvman.2016.09.046>
- Hunter LM, Luna JK, Norton RM (2015) Environmental dimensions of migration. *Annu Rev Sociol* 41:377–397. <https://doi.org/10.1146/annurev-soc-073014-112223>
- Islam MM, Ali M, Ferroni P et al. (2003) Prevalence of psychiatric disorders in an urban community in Bangladesh. *Gen Hosp Psychiatry* 25(5):353–357. [https://doi.org/10.1016/s0163-8343\(03\)00067-7](https://doi.org/10.1016/s0163-8343(03)00067-7)
- Izutsu T, Tsutsumi A, Islam AM et al. (2006) Mental health, quality of life, and nutritional status of adolescents in Dhaka, Bangladesh: comparison between an urban slum and a non-slum area. *Soc Sci Med* 63(6):1477–1488. <https://doi.org/10.1016/j.socscimed.2006.04.013>
- Kanim K (2000) Q methodology—advantages and the disadvantages of this research method. *J Community Nurs* 15(4):8–12
- Khan AM, Flora MS (2017) Maternal common mental disorders and associated factors: a cross-sectional study in an urban slum area of Dhaka, Bangladesh. *Int J Ment Health Syst* 11. <https://doi.org/10.1186/s13033-017-0129-3>
- Khan MMH, Gruebner O, Kramer A (2014) Is area affected by flood or stagnant water independently associated with poorer health outcomes in urban slums of Dhaka and adjacent rural areas? *Nat Hazards* 70(1):549–565. <https://doi.org/10.1007/s11069-013-0829-1>
- Kurant M, Markopoulou A, Thiran P (2011) Towards unbiased BFS sampling. *IEEE JSAC* 29(9):1799–1809. <https://doi.org/10.1109/jsac.2011.111005>
- Lilford RJ, Oyeboode O, Satterthwaite D et al. (2017) Improving the health and welfare of people who live in slums. *Lancet* 389(10068):559–570. [https://doi.org/10.1016/S0140-6736\(16\)31848-7](https://doi.org/10.1016/S0140-6736(16)31848-7)
- Mata-Codesal D (2018) Is it simpler to leave or to stay put? Desired immobility in a Mexican village. *Popul Space Place* 24(4):e2127. <https://doi.org/10.1002/psp.2127>
- Mberu B, Wamukoya M, Oti S et al. (2015) Trends in causes of adult deaths among the urban poor: evidence from Nairobi urban health and demographic surveillance system, 2003–2012. *J Urban Health* 92(3):422–445
- McNamara KE, Olson LL, Rahman MA (2016) Insecure hope: the challenges faced by urban slum dwellers in Bholu Slum, Bangladesh. *Migr Dev* 5(1):1–15. <https://doi.org/10.1080/21632324.2015.1082231>
- Morales MC, Harris LM (2014) Using subjectivity and emotion to reconsider participatory natural resource management. *World Dev* 64:703–712. <https://doi.org/10.1016/j.worlddev.2014.06.032>
- Morinière LCE, Hamza M (2012) Environment and mobility: a view from four discourses. *Ambio* 41(8):795–807. <https://doi.org/10.1007/s13280-012-0333-y>
- Mullick MSI, Goodman R (2005) The prevalence of psychiatric disorders among 5–10 year olds in rural, urban and slum areas in Bangladesh. *Soc Psychiatry Psychiatr Epidemiol* 40(8):663–671. <https://doi.org/10.1007/s00127-005-0939-5>
- Nahar N, Blomstedt Y, Wu B, Kandarina I et al. (2014) Increasing the provision of mental health care for vulnerable, disaster-affected people in Bangladesh. *BMC Public Health* 14. <https://doi.org/10.1186/1471-2458-14-708>
- Niemeyer S, Petts J, Hobson K (2005) Rapid climate change and society: assessing responses and thresholds. *Risk Anal* 25(6):1443–1456. <https://doi.org/10.1111/j.1539-6924.2005.00691.x>
- Ockwell DG (2008) ‘Opening up’ policy to reflexive appraisal: a role for Q Methodology? A case study of fire management in Cape York, Australia. *Policy Sci* 41(4):263–292. <https://doi.org/10.1007/s11077-008-9066-y>
- Owusu-Daaku KN, Rosko H (2019) The discursive construction of adaptation subjects via the Ada Sea Defense System in the Volta RiverDelta of Ghana. *Environ Plan E: Nature and Space*. <https://doi.org/10.1177/2514848619846087>
- Parvin K, Al Mamun M, Gibbs A et al. (2018) The pathways between female garment workers’ experience of violence and development of depressive symptoms. *PLoS ONE* 13(11). <https://doi.org/10.1371/journal.pone.0207485>
- Previte J, Pini B, Haslam-McKenzie F (2007) Q methodology and rural research. *Sociol Rural* 47(2):135–147. <https://doi.org/10.1111/j.1467-9523.2007.00433.x>
- Rahaman MA, Rahman MM, Bahauddin KM et al. (2018) Health disorder of climate migrants in Khulna City: an urban slum perspective. *Int Migr* 56(5):42–55. <https://doi.org/10.1111/imig.12460>
- Ruback RB, Pandey J, Begum HA et al. (2004) Motivations for and satisfaction with migration—an analysis of migrants to new Delhi, Dhaka, and Islamabad. *Environ Behav* 36(6):814–838. <https://doi.org/10.1177/0013916504264948>
- Ruback RB, Begum HA, Tariq N et al. (2002) Reactions to environmental stressors—gender differences in the slums of Dhaka and Islamabad. *J Cross-Cult Psychol* 33(1):100–119. <https://doi.org/10.1177/0022022102033001007>
- Schewel K (2019) Understanding immobility: moving beyond the mobility bias in migration studies. *Int Migr Rev*. <https://doi.org/10.1177/0197918319831952>
- Schwerdtle P, Bowen K, McMichael C (2018) The health impacts of climate-related migration. *BMC Med* 16(1):1. <https://doi.org/10.1186/s12916-017-0981-7>
- Sciar ED, Garau P, Carolini G (2005) The 21st century health challenge of slums and cities. *Lancet* 365(9462):901–903. [https://doi.org/10.1016/S0140-6736\(05\)71049-7](https://doi.org/10.1016/S0140-6736(05)71049-7)
- Stenner P (2008) Introduction: between method and ology. *Operant Subj* 32(1):1–5. <https://doi.org/10.15133/jos.2008.004>
- Stephenson W (1986) Protoconcurrency: the concourse theory of communication (conclusion). *Operant Subj* 9(3):73–96. <https://doi.org/10.15133/jos.1985.003>
- Stephenson W (1978) Concourse theory of communication. *Communication* 3:21–40. (Symposium of mass communication, Amsterdam)
- Stephenson W (1935) Technique of factor analysis. *Nature* 136(297). <https://doi.org/10.1038/136297b0>
- Suliman S, Farbotko C, Ransan-Cooper H et al. (2019) Indigenous (im)mobilities in the Anthropocene. *Mobilities* 1–21. <https://doi.org/10.1080/17450101.2019.1601828>
- Toyota M, Yeoh BSA, Nguyen L (2007) Bringing the ‘left behind’ back into view in Asia: a framework for understanding the ‘migration-left behind nexus’. *Popul Space Place* 13(3):157–161. <https://doi.org/10.1002/psp.433>
- Tschakert P, Ellis NR, Anderson C et al. (2019) One thousand ways to experience loss: a systematic analysis of climate-related intangible harm from around the world. *Glob Environ Change* 55:58–72. <https://doi.org/10.1016/j.gloenvcha.2018.11.006>
- UNFCCC (2013) Non-economic losses in the context of the work programme on loss and damage. UNFCCC, Bonn
- UNFCCC (2015) Adoption of the Paris Agreement. Draft decision-/CP.21. United Nations Office at Geneva, Geneva
- Unger A, Riley LW (2007) Slum health: from understanding to action. *PLoS Med* 4(10):e295. <https://doi.org/10.1371/journal.pmed.0040295>
- Watts S, Stenner P (2012) *Doing Q methodological research: theory, method and interpretation*. Sage, Los Angeles, London, New Delhi, Singapore and Washington
- Watts N, Amann M, Arnell N, Ayeb-Karlsson S, et al. (2019) The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. *The Lancet* 394(10211): 16–22. [https://doi.org/10.1016/S0140-6736\(19\)32596-6](https://doi.org/10.1016/S0140-6736(19)32596-6)
- Watts N, Amann M, Ayeb-Karlsson S et al. (2018) The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. *Lancet* 391(10120):581–630. [https://doi.org/10.1016/S0140-6736\(17\)32464-9](https://doi.org/10.1016/S0140-6736(17)32464-9)
- Watts N, Adger WN, Ayeb-Karlsson S et al. (2017) The Lancet Countdown: tracking progress on health and climate change. *Lancet* 389(10074):1151–1164. [https://doi.org/10.1016/S0140-6736\(16\)32124-9](https://doi.org/10.1016/S0140-6736(16)32124-9)
- Wekesa BW, Steyn GS, Otieno FAO (2011) A review of physical and socio-economic characteristics and intervention approaches of informal settlements. *Habitat Int* 35(2):238–245. <https://doi.org/10.1016/j.habitatint.2010.09.006>
- Wodak R (2011) Complex texts: analysing understanding, explaining and interpreting meanings. *Discourse Stud* 623–633. <https://doi.org/10.1177/14614455611412745>
- Wolf J, Brown K, Conway D (2009) Ecological citizenship and climate change: perceptions and practice. *Environ Politics* 18(4):503–521. <https://doi.org/10.1080/09644010903007377>
- Woodward A, Smith KR, Campbell-Lendrum D et al. (2014) Climate change and health: on the latest IPCC report. *Lancet* 383(9924):1185–1189. [https://doi.org/10.1016/S0140-6736\(14\)60576-6](https://doi.org/10.1016/S0140-6736(14)60576-6)

## Acknowledgements

First and foremost, we would like to thank our Gibika project colleagues Mr. Thomas Loster and Mr. Christian Barthelt at Munich Re Foundation (MRF), and Mr. Istiak Ahmed and Dr. Saleemul Huq at the International Centre for Climate Change and Development (ICCCAD). Various colleagues have in one way or another supported the study including Dr. Robert D. Oakes and Dr. Kees van der Geest at the UN University's Institute for Environment and Human Security (UNU-EHS), Dr. Christopher D. Smith, Prof. David Ockwell and Prof. Michael Collyer at University of Sussex, and Dr. Andrew Baldwin at Durham University. We also thank the Lancet Countdown network for rich and insightful discussions during our working group meetings. Last, but not least, we thank the people of Bholu Slum who opened their homes and dedicated their time.

## Author contributions

S.A.K. developed the conceptual and theoretical idea, and led the overall study including the empirical data collection, data analysis, and the writing of the article; D.K. and T.C. provided critical feedback, revisions, and helped shape the manuscript.

## Competing interests

The authors declare no competing interests.

## Additional information

**Supplementary information** is available for this paper at <https://doi.org/10.1057/s41599-020-0443-2>.

**Correspondence** and requests for materials should be addressed to S.A.-K.

**Reprints and permission information** is available at <http://www.nature.com/reprints>

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2020