A multi-contextual analysis of place attachment, environmental perceptions, and mobility in southwestern Bangladesh

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Abstract

Place attachment is an important factor that may influence migration decisions, although how it relates to environmental change and mobility is poorly understood. This paper uses survey data from 1,695 household heads in 13 villages in south-western Bangladesh to examine how place attachment, demographics, perceptions of environmental change, and mobility interact. We begin by asking how place attachment and mobility are related in this context. We then ask what individual demographics are important for predicting place attachment; how trust in one's neighbors correlate with place attachment; and how perceptions about environmental change in communities influence place attachment. Results indicate that mobility and place attachment are significantly correlated, though more work is needed to understand the nature of the relationship. We find that education and religion are important predictors of place attachment at the individual level. At the community level, trust in one's neighbors is also a strong predictor. In this context, several perceived changes in environmental conditions are also significant, including groundwater salinity and riverbank erosion. In this way, the analysis draws empirical connections among individual perceptions of place, community dynamics, environmental change, and mobility with implications for policies to support communities impacted by environmental stress.

Keywords: Place attachment, migration, environmental perceptions, Bangladesh

Public Significance Statement:

This study advances the understanding of how place attachment, demographics, environmental perceptions, and mobility are related in southwestern Bangladesh. We show that mobility and self-reported place attachment are significantly related, motivating a further investigation of place attachment. We find that education, religion, community-level trust, and select environmental perceptions are important predictors of place attachment. Results highlight the need for policies that consider the complexities of place and people connections when communities experience environmental stress.

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Introduction

Human migration is a complex phenomenon that is influenced by a range of factors across spatial scales, from individual perceptions to local and regional environmental dynamics (Adger et al., 2015; Black et al., 2011; Boas et al., 2019; Hunter, 2005). At the individual level, a single migration is viewed as a personal decision to move or to stay in place (Adams, 2016; Adams & Kay, 2019; Mallick & Schanze, 2020). Mobility, more generally, may refer to the degree to which an individual migrates. As conditions related to climate change and environmental degradation increasingly pressure individuals and communities, scholars have called for more research into the psychology of adaptation decision-making (Clayton et al., 2015; Waldman et al., 2021).

The concept of place attachment, or the extent to which people and/or households are socially and emotionally rooted in an origin location, is an important factor that is likely to influence mobility. This is true even under conditions of environmental stress. For example, place attachment may impact a household's perception of environmental risk and, therefore, influence the threshold of environmental stress they will tolerate before migrating (Adams et al., 2016; De Dominicis et al., 2015; Quinn et al., 2018). Existing work suggests that households with higher levels of place attachment tolerate higher levels of environmental stress before choosing to migrate, and are generally less mobile (Adams, 2016; Dannenberg et al., 2019; De Dominicis et al., 2015; Swapan & Sadeque, 2021).

This paper is motivated by this previous scholarship that suggests individual cognition is important for both climate adaptation behavior and migration decisions (Clayton et al., 2015; Gilligan, 2018; Klabunde & Willekens, 2016; Truelove et al., 2015). Using the context of southwest Bangladesh, where the natural environment is dynamic, vulnerability to climate change is high, and migration histories are complex (Ackerly et al., 2015; Afsar, 2003; Best et al., 2020; Carrico & Donato, 2019; Donato et al., 2016), we empirically investigate both the relationship between place attachment and mobility and also multi-level predictors of place attachment using household survey data from 1,695 household heads from 13 villages in southwestern Bangladesh. We begin by investigating the association between mobility, captured by the number of migration trips, and place attachment. We then investigate predictors of place attachment at the individual, community, and broader environmental levels to explore the multi-level factors that influence an individual's self-reported levels of place attachment to origin communities. In this way, this work uses a large and rich survey dataset to begin to investigate first the association between mobility and place attachment and then the multiple factors influencing place attachment.

Place attachment

The concept of place attachment stems from conceptualizations of place and people-place relationships (Lewicka, 2011) and refers to the idea that people experience intimate and complex connections with their location (Devine-Wright, 2013; Giuliani, 2003; Manzo & Perkins, 2006). In environmental psychology, place attachment refers to people's emotional ties to their environments, and is influenced by both social and physical dimensions of place (Lewicka, 2011; Stedman, 2002). Place attachment is therefore closely related to a sense of identity, community,

and perceptions of one's place (Brown & Perkins, 1992; Devine-Wright, 2013; Raymond et al., 2010). People have different experiences of place attachment and with varying strengths (Adams, 2016). Place attachment is also dynamic and may be disrupted by perceptions of changes to one's community or environment (Agyeman et al., 2009; Brown & Perkins, 1992; Devine-Wright & Howes, 2010). Importantly, place attachment is also influenced by historical forces such as colonization, extractive practices, and politics, as well as individual lived experiences of such historical conditions (Adams & Kurtiş, 2018; Barnwell et al., 2021; Tuck & McKenzie, 2015).

Place-attachment is thought to inform adaptive and protective behaviors. For example, high levels of place attachment may influence "not in my back yard" (NIMBY) behavior, including resistance to efforts to mitigate or adapt to environmental change such as through wind energy development (Devine-Wright, 2009; Devine-Wright & Howes, 2010). Higher levels of place attachment may similarly inhibit action toward transformative adaptation to climate change, as communities with strong place attachment may oppose significant changes to their environments (Marshall et al., 2012).

Connecting place attachment and environmental migration

Place attachment has also been theorized and empirically demonstrated to influence migration, including environmental migration (Bonaiuto et al., 2016; Dandy et al., 2019; Swapan & Sadeque, 2021). Environmental migration refers to human migration that is influenced at least in part by environmental conditions (Black et al., 2011; Klabunde & Willekens, 2016). Though migration is ultimately an individual or household decision to move or stay, it is also influenced by a range of broader factors including economic conditions, cultural norms, social networks,

and politics (Hunter, 2005). Especially with increasing impacts related to climate change, it is important to understand how environmental stress may influence population movement (Perch-Nielsen et al., 2008). In some contexts, migration may be a positive form of adaptation to challenging environmental conditions (Bardsley & Hugo, 2010; Bennett et al., 2011). In other contexts, migration may represent an undesired response where someone is forced to leave their home even though they would prefer to stay in place (Alam et al., 2019; Black et al., 2013; Mallick & Schanze, 2020). To date, surprisingly little work has considered the psychological dimensions of migration decisions in response to environmental stress (Klabunde & Willekens, 2016). Incorporating behavioral theory into the study of migration and adaptation requires the inclusion of individual perceptions and cognitive processes, including perceptions of risk, adaptive capacity, and social relations (Dash & Gladwin, 2007; Grothmann & Patt, 2005).

Recently, place attachment has also received new attention in the environmental migration literature as a relevant individual-level process that influences mobility (Adams, 2016; De Dominicis et al., 2015; Gustafson, 2006; Lewicka, 2011; Quinn et al., 2018; Swapan & Sadeque, 2021). The general idea is that individuals with higher levels of place attachment will be less mobile (i.e., more likely to stay in a place) despite environmental stresses (Adams, 2016; Blondin, 2021; Farbotko & McMichael, 2019; Lin & Lockwood, 2014). Place attachment may also be related to mobility because it influences the environmental risk perceptions of households and works to increase the level of environmental risk household members are willing to tolerate before moving (Adams et al., 2016; De Dominicis et al., 2015; Quinn et al., 2018; Walker et al., 2015). However, the directionality of the connection between mobility and place attachment is ambiguous. It is also possible that the act of migration itself influences place attachment, as the pathway between place attachment and mobility is complex and not likely to operate in one

direction (Bonaiuto et al., 2016; Dandy et al., 2019). As we have noted, historical socio-political conditions in a place can also impact place attachment (Barnwell et al., 2021). For example, Barnwell et al. show that both deforestation and historic colonial rule and apartheid contributed to "place severing" in South Africa (2021). However, we do not include this dimension in this study due to a lack of sufficient data to assess this dimension. To date, most studies that examine how place attachment influences environmental migration are largely conceptual (Swapan & Sadeque, 2021).

Drawing on a multi-context understanding of place attachment (Blondin, 2021; Lewicka, 2011; Raymond et al., 2010) and the relationship between place attachment and mobility (H. Adams & Kay, 2019), Figure 1 categorizes the multi-level factors that affect place attachment. Personal context refers to ways in which individuals interact with their environment, which is influenced by their unique identities. For example, personal context may include individual livelihood activities and landholdings. Community context refers to social bonds and the extent of social connections and support or cohesion in a community, and may also encompass the social, cultural, and economic resources within a place (Adams & Kurtiş, 2018). Environmental context refers to the broader surrounding physical environment including environmental conditions (Blondin, 2021; Raymond et al., 2010). All of these dimensions come together to inform place attachment, which, as described, may be important in the ways that it interacts with mobility.

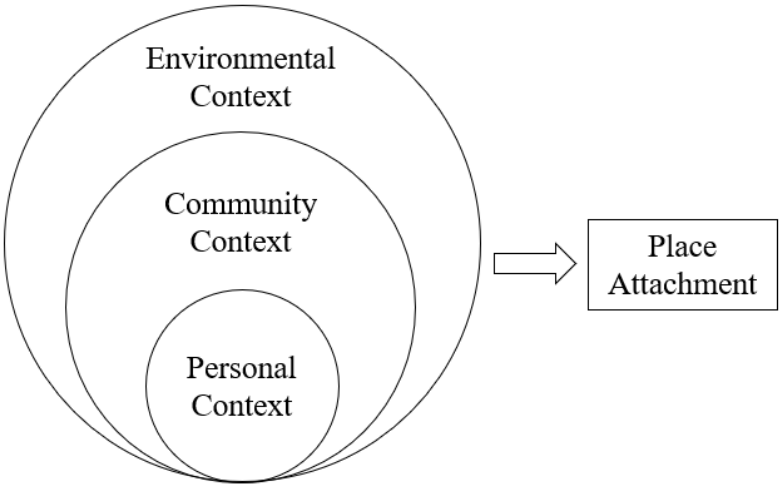

Figure 1: Conceptual framework of multi-level influences (personal, community, and environmental) on place attachment. Adapted from (Raymond et al., 2010)

We begin the analysis presented by first quantifying the association between mobility and self-reported place attachment. Having demonstrated a significant association between mobility and place attachment, it becomes increasingly important to understand the multi-level factors influencing place attachment. The second part of our analysis uses ordinal logistic regression to identify which dimensions of the personal, community, and environmental contexts are associated with respondents' self-reports of place attachment. Through the analysis, we address the following research questions:

1. Are place attachment and mobility significantly related?
2. If so, what individual demographics predict place attachment?
3. How does trust in one's neighbors relate to place attachment?
4. How do perceptions of environmental change within a community relate to place attachment?

In beginning to address these research questions in the context of Bangladesh, we advance the empirical literature connecting multi-contextual place attachment and mobility,

which helps to connect the gaps between individual cognition and environmental migration decisions. We do so by using primary data analysis and a proxy variable for place attachment from a household survey administered in southwestern Bangladesh.

Bangladesh context

We use Bangladesh as a case study to investigate our research questions. Bangladesh is a low-lying deltaic country situated south of the Himalayan mountains and north of the Bay of Bengal. It is home to more than 164 million people and is considered one of the most climate-vulnerable countries in the world (Adams & Kay, 2019; The World Bank, 2020). Impacts of climate change in Bangladesh include changes to the intensity and frequency of cyclones, changes to the monsoons, flooding due to sea-level rise, extreme heat, and salinity encroachment (Chen & Mueller, 2018; Huq & Asaduzzaman, 1999; Minar et al., 2013). Migration, especially internal to Bangladesh, is a common household strategy for people in Bangladesh to adapt to challenging environmental conditions (Ackerly et al., 2015; Best et al., 2020). Furthermore, there is much interest in how climate change may influence migration in Bangladesh (Best et al., 2021; Carrico & Donato, 2019; Chen & Mueller, 2018).

The dynamic natural environment, existing patterns of migration, and high climate vulnerability make Bangladesh an ideal location to investigate complex connections between place attachment, environmental perceptions, and mobility. Previous work in Bangladesh has begun to conceptualize how place satisfaction or dissatisfaction may influence migration decisions by interacting with mobility potential and adaptive capacity (Adams & Kay, 2019). In this work, Adams and Kay use place satisfaction as a proxy for place utility and a measure of rootedness as a measure of place attachment (2019). They show how these measures influence

individual cognition around migration related to exposure to flooding in the southwestern Bangladeshi context (Adams & Kay, 2019). Here, we build upon this existing work in the unique Bangladeshi context.

Data and methods

Data for this analysis come from the Bangladesh Environment and Migration Survey (BEMS) originally collected in 2014. This dataset contains comprehensive survey information regarding migration histories, employment and livelihood information, community and environmental perceptions, and demographics from more than 3,000 individuals from approximately 1,695 households in southwestern Bangladesh. These 1,695 households were randomly sampled from 13 villages in the region (Carrico et al., 2020; Carrico & Donato, 2019; Donato et al., 2016). At each study site, a census of all households was conducted and then a random sample of 200 households was selected. A full description of the BEMS sampling method, including maps of the study sites, is available in previously published work (Carrico & Donato, 2019).

This work utilizes data from the responses of 1,695 household heads across the study locations. In this analysis, we use data related to place attachment, household heads' individual and household characteristics, trust, environmental perceptions, and migration history (Table 1). Table 1 shows the variables and specific survey questions used. Correlations between numeric variables were also assessed (Table S1).

Table 1

Summary of Survey Data Used in Analysis. For numeric response variables, the summary statistic includes the mean +- the standard deviation.

Category	Variable Name	Survey Question	Response	Summary Statistic
Individual (Household head)	Sex	Sex	Male	87.8%
			Female	12.2%
	Age	Age	Numeric	44.6 +- 12.9
	Religion	Religion	Hindu	16.4%
			Muslim	83.6%
	Education	Level of education (highest class passed)	No schooling	28.1%
			Adult informal education	0%
			Class I-IV	21.5%
			Class V	7.6%
			Class VI-IX	21.4%
			SSC	7.3%
			HSC	3.8%
			College	0.8%
			University	9.5%
Household	Household members	Total number of members in the household	Numeric	5.4 +- 2.3
	Agricultural land	Does the household hold (lease or own) land for agriculture?	Yes	45.6%
			No	54.4%
Place attachment	Place satisfaction	Do you like living in this place?	Very much	71.4%
			Somewhat	27.1%
			Not at all	1.5%
Trust	Trust - Mail	You could rely on your neighbors to mail an important letter for you.	Very much	15.9%
			Somewhat	56.1%
			Not at all	28.0%
	Trust - House	You could trust your neighbors to look after your house if you were away.	Very much	31.1%
			Somewhat	55.5%
			Not at all	13.4%

Mobility	Internal migration	How many times has a member of your household migrated within Bangladesh?	Numeric	2.1 +- 3.1
Environmental perceptions	(1) Temperature, (2) Rain during monsoon, (3) Rain during other seasons, (4) Severity of floods, (5) Severity of droughts, (6) Water level in ponds, (7) High tide water level, (8) Salinity of groundwater, (9) Severity of cyclones, (10) Fish in rivers, (11) Biodiversity, (12) Riverbank erosion	Please tell me if, in your own experience, you've noticed a decrease, increase, or no change in these environmental conditions over the past 20 years.	Decrease Increase No change	NA

As Table 1 shows, a proxy for place attachment comes from a survey question in BEMS related to place satisfaction which asks, "Do you like living in this place?" Place satisfaction is an ordinal response ranging from "Not at all" to "Very much". While place attachment itself is undoubtedly more complex than just place satisfaction, this measure is used as an initial proxy due to data availability. Previous work in environmental psychology has demonstrated the close relationship between place satisfaction and place attachment (Ramkissoon et al., 2013; Yuksel et al., 2010), and the measure used here is similar to the proxy for place utility used by Adams and Kay, which is also an ordered and categorical measure of place satisfaction (2019).

Trust variables are used to measure a household's perceived trust in their neighbors to assist with important tasks such as delivering an important letter (*Trust mail*) and looking after one's home (*Trust house*). To operationalize mobility, we use data related to total number of internal migration trips within Bangladesh that the household has reported taking (*Internal migration*) from the BEMS survey *)*. Migration history, then, is used as a proxy for mobility. This approach has been utilized in environmental migration literature (Best et al., 2022; Carrico & Donato, 2019) and residential mobility literature (Oishi, 2010; Oishi & Tsang, 2022). We also utilize 12 survey questions related to the survey respondent's perceived changes in the environment. Respondents are asked to report whether they have perceived a "Decrease", "No change", or "Increase" in a range of environmental indicators including temperature, the frequency of cyclones, changes in precipitation, and changes in water quality and quantity. Each of the 12 perception variables is included independently to identify which, if any, specific perceived changes in the environment are significantly related to place attachment.

For our analyses, we use ordinal logistic regression models where our outcome variable is our place attachment proxy (place satisfaction). Ordinal logistic regression is selected due to the ordered and categorical nature of our place satisfaction data. Ordinal logistic regression is commonly used with survey data when the outcome variable is ordered and categorical, and is a more robust method with such data as compared to, for example, an ordinary least squares regression (Bürkner & Vuorre, 2019; Harrell, 2015; S. Lin & Huang, 2018; Taylor et al., 2006). Our ordinal logistic regression models are implemented with R using the *polr* function in the *MASS* package.

Results

Association between mobility and place attachment

We begin by establishing the connection between mobility, given as the household's reported number of trips internal to Bangladesh, and place attachment, for which we use place satisfaction as a proxy. To do so, we use a Kruskal-Wallis test as one of our variables (mobility) is numerical and continuous while the other (place satisfaction) is categorical with multiple levels (McKight & Najab, 2010). A Kruskal-Wallis test indicated that self-reported mobility differed by level of place satisfaction with $\chi^2 = 41.84$ and $p = .013$. The mean mobility (number of internal migration trips) is highest for those with no place satisfaction, M = 5.33, followed by those with moderate place satisfaction, M = 2.10, and lowest for those with the most satisfaction, M = 2.05. However, a Welch two-sample t-test indicates that the means for moderate and high place satisfaction are not significantly different.

Multi-level predictors of place attachment

Having established that place attachment and mobility are related, we turn to further understanding predictors of place attachment. Our analysis uses an additive modeling approach based on the conceptual framework proposed in Figure 1. We fit a series of additive ordinal regression models predicting place attachment. To begin, we explore predictor variables related to personal context and subsequently expand the analysis in stages based on our framework (adding community and environmental-level predictors). For each regression, we also include dummy variables indicating the community within which the household resides to control for other possible community-level factors.

Table 2 presents results from all three regression models, which are additive (personal, community, and environmental perceptions). For the first model of personal factors (Model 1), results show that education and religion (specifically Hinduism versus Islam) are the only significant predictors of a household head's reported level of place attachment. We see that place attachment is predicted to decrease as education level increases. Household head reported religion being Islam is also associated with a decrease in place attachment (Table 2). We also present the model Akaike Information Criterion (AIC) as an estimator of model predictor error which allows us to compare model fit across our three regressions. AIC is broadly useful for comparing model performance, where the best fit model is identified as the model with the lowest AIC (Burnham & Anderson, 2004; Cavanaugh & Neath, 2019).

Table 2

Nested Models Predicting Place Attachment with Individual and Household Characteristics (Model 1), Community Trust (Model 2), and Environmental Perceptions (Model 3). Coefficients are presented with standard errors given in parentheses.

Variable	**Model 1: Personal**	**Model 2: Community**	**Model 3: Environmental**
Age	0.0029 (0.0055)	0.0033 (0.0055)	0.0070 (0.0060)
Sex (Male)	-0.062 (1.71)	0.024 (0.18)	0.081 (0.19)
Religion (Islam)	-0.38 (0.16) *	-0.36 (0.17) *	-0.17 (0.19)
Education	-0.058 (0.023) *	-0.049 (0.024) *	-0.026 (0.026)
Agricultural land	0.13 (0.11)	0.035 (0.12)	0.12 (0.13)
Household members	0.017 (0.031)	0.030 (0.032)	0.021 (0.034)
Trust mail		-0.23 (0.11) *	-0.16 (0.12)
Trust house		0.77 (0.10) ***	0.81 (0.19) ***
Increase- water high tide			0.48 (0.17) **
Increase- cyclones			0.32 (0.14) *
Increase- groundwater salinity			0.69 (0.18) ***
No change- groundwater salinity			0.34 (0.15) *
No change - biodiversity			1.20 (0.48) *

Increase- riverbank erosion			0.70 (0.16) ***
	AIC = 2130.45	*AIC = 2071.23*	*AIC = 1926.60*

*** ($p<0.001$), **($p<0.01$), *($p<0.05$)

In Model 2, we add the trust variables which are used as proxies to capture the degree of the respondent's social connections within the community. Trust and relationships with neighbors have been previously used as measures of social connectedness in communities (Lewicka, 2011). In this way, this level of analysis is intended to explore the community context of place attachment. Results show that levels of reported trust in neighbors to mail an important letter and to look after a respondent's house are significant predictors of place attachment. Higher reported trust in a neighbor to look after one's house is associated with higher place attachment, while the opposite relationship is predicted for trusting one's neighbor to mail an important letter. Household head's educational level and religion remain significant with a negative coefficient. Other variables remain insignificant (Table 2). We see that with the inclusion of community trust variables, model AIC decreases from 2130.45 to 2071.23, demonstrating that model fit improves.

At the next stage of analysis, consistent with our conceptual framework (Figure 1), we consider the role of environmental context in influencing place attachment. To do so, we add variables for 12 survey questions related to perceived changes in the local environment. These perceptions include changes in temperature, rainfall, water quality and quantity, erosion, and biodiversity. Table 2 (Model 3) includes regression results only for the significant environmental perceptions, but the full regression results are available in Supplementary Materials (Table S2). Notably, education and religion of the household head are no longer significant in this updated

model. Trust in a neighbor to mail an important letter is also no longer significant, while trust in a neighbor to watch one's house remains significant and positive. Of the 12 environmental perception questions included, only a few perceptions were significant (Table 2). They include perceived increase in water levels during high tide (*Increase- water level high tide*), perceived increase in cyclone severity (*Increase- cyclones*) perceived increase and no change in groundwater salinity (*Increase- groundwater salinity, No change- groundwater salinity*), no perceived changes in biodiversity (*No change- biodiversity*), and perceived increase in riverbank erosion (*Increase- riverbank erosion)*. Each of these variables has a positive coefficient, suggesting they correspond to an increase in predicted place attachment (Table 2). Again, we see an improvement in model fit with the inclusion of environmental perception data as AIC further decreases from 2071.23 to 1926.60.

Discussion

By utilizing a large survey dataset of household heads in communities in southwestern Bangladesh, we explore the relationship between mobility and place attachment. We show that mobility is significantly different between the lowest level of place attachment and the medium and high place attachment, though not significantly different between the medium and high. As described, it is not possible at this stage to establish the directionality of the relationship between mobility and place satisfaction. One possibility is that higher place attachment contributes to lower levels of mobility, though the relationship is clearly not linear. This general association between mobility and attachment to place would be consistent with previous theory that place attachment in the form of "rootedness" to an origin could dampen household mobility potential (Adams & Kay, 2019). This effect could be further explained, in part, by the fact that non-mobile

households have longer histories within the community (having not moved there in their lifetime), as time in a location is a known predictor of place attachment (Lewicka, 2011). This analysis is unable to understand the interconnectedness more fully between the two, and more work is needed to understand how place attachment and mobility interact. Despite these limitations, we do show that place attachment is connected to mobility in an important way.

Having established a significant association between mobility and place attachment, we then focus on further understanding some of the individual, community, and environmental predictors of place attachment. We see that educational level and religion of the household head and agricultural land holdings are important predictors of place attachment at the individual level, with higher levels of educational attainment and reported religion being Islam both associated with a decrease in reported place attachment (Table 2). Extrapolating the theory that lower place attachment may be associated with higher rates of migration, our results related to education are consistent with general findings that more highly educated individuals are often more likely to migrate due to having access to more employment opportunities outside of an origin community (Mallick et al., 2021). Religion, especially as it relates to cultural identity, has been shown to influence place attachment, though the specific relationship between Islam and decreased place attachment in this specific context requires more investigation (Bonaiuto et al., 2016; Mazumdar & Mazumdar, 2004; Sherry et al., 2018). However, the personal-level characteristics are no longer significant for predicting place attachment when environmental perceptions are incorporated.

Effects related to trust in neighbors, which we use as a proxy for social connectedness within a community, are mixed and more difficult to interpret. The significance of the trust variables demonstrates the importance of the community context, including social networks

within the community, for understanding place attachment. However, the differing directionality of the two trust variables suggests that the relationship is complex. Trust in neighbors to look after one's house was positively associated with place attachment and highly significant, whereas trusting a neighbor to mail an important letter was negative, though not significant at the $p < 0.05$ level (Table 2). That one of the trust variables is predictive of place attachment is consistent with previous work showing that social connectedness is linked to non-migration behavior in Bangladesh (Mallick et al., 2021).

At the level of the environment, we also see that, in southwestern Bangladesh, environmental perceptions related to water, cyclones, biodiversity, and erosion may be relevant environmental perceptions for predicting place attachment (Table 2). While it is difficult at this stage to identify why certain environmental perceptions are more relevant for place attachment than others, we do know that this region is uniquely susceptible to challenges with flooding, erosion, and cyclones. Being close to the Sundarbans mangrove forest, these communities may also be especially dependent on biodiversity for livelihood and aware of changes to biodiversity (Abdullah-Al-Mamun et al., 2017; Getzner & Shariful Islam, 2013). Therefore, these results may highlight the broad range of environmental challenges that these coastal, southwestern communities face. Interestingly and perhaps unintuitively, our results suggest that perceived increases in environmental stress are associated with higher levels of place attachment. One possible explanation is that respondents with higher levels of place attachment are more likely to be sensitive to and aware of changes in their environment. These results are also supported by empirical work suggesting that the majority of survey respondents in Bangladeshi communities impacted by riverbank erosion would not move despite the environmental hazards (Mallick & Mallick, 2021). Such environmental challenges may be exacerbated with future climate change,

especially as sea-level rise contributes to groundwater salinity (Chen & Mueller, 2018). The data used in this analysis is from 2014, and these identified relationships between place attachment, environmental change, and mobility may only be amplified in more recent data and in the future as climate change imposes more severe changes to the environment in Bangladesh. In this context, our results support the need for further investigation of the relationships between environment, place attachment, and migration, especially in extremely climate-vulnerable places such as Bangladesh.

Conclusions

This work begins to explore how place attachment relates to mobility and the multi-contextual dimensions of place attachment in southwestern Bangladesh. By considering the multiple correlates of place attachment across scales, we offer empirically driven and nuanced insight into how place attachment and mobility might be related. Insights from this analysis suggest that place attachment is related to relevant factors at the individual and household level, as well as individual perceptions related to community trust and environmental changes.

A key limitation of this analysis is our inability to make statements regarding causal processes. Our conceptual framework presents one possible directionality for the relationships between these factors, but our analysis is only able to provide evidence of correlation rather than causation. Our framework lacks the interactions between individual-level aspiration and capability and its relevance with place attachment. It is essential to investigate further how migration motivations (Carling, 2002) may derive through place attachment-related contexts. Future work should focus more on causation and directionality, which may require new and creative methods of data collection and analysis. Still, while preliminary, this work adds

empirical evidence to the concept that mobility, place attachment, and environmental perceptions are closely linked.

Another key limitation of this work stems from our use of place satisfaction as a proxy for place attachment. As we have noted, place attachment is highly complex and therefore difficult to operationalize (Lewicka, 2011). Future work could focus on survey designs to capture multiple components of place attachment and add nuance to the place attachment measurement. Finally, future work should also investigate these questions in other contexts outside of coastal Bangladesh. While it is possible that our findings could be extrapolated to other communities and locations, additional work would be needed to confirm this. Such comparisons across different communities could help to glean further insights into the complex relationships between variables and across scales that we begin to investigate here.

As environmental stress increases with climate change, there is much interest in understanding how place attachment might evolve as well as how migration (or non-migration) decisions will shift. In this context, this study has several practical implications for southwestern Bangladeshi communities and policymakers in the region. This work emphasizes that communities and policymakers must consider the importance of attachment to place, including the emotional and social ties in a location, when planning for future movements of people. Communities and policymakers both should continue to recognize that place attachment is dynamic. Climate change may contribute to place detachment over time, in which case migration may increase (Adams, 2016; Agyeman et al., 2009). Where relocation or migration do occur, support for migrants should include mental health services with attention to the unique emotions, trauma, and psychological impacts associated with loss of place. As mentioned, more research is

needed to further understand the dynamics of place attachment and mobility in Bangladesh, but this work highlights the need for nuanced policy consideration.

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