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Home is where the money goes: migration-related urban-rural integration in delta regions

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ABSTRACT

The dominant movement of people in the mega-deltas of Asia is from agriculture-dominated rural areas to urban settlements, driven by growing opportunities, but resulting in new human development challenges. In this context, the present study aims to investigate whether remittance income leads to enhanced multiple dimensions of well-being in sending areas in deltas, by focusing on two delta regions with significant out-migration rates, Bangladeshi Ganges Brahmaputra and the Vietnamese Mekong deltas. The paper develops a conceptual framework that draws on existing migration theories and the aspirations and capabilities theories. Data from large scale sample household surveys (2010 Bangladesh Household Income and Expenditure Survey and 2012 Vietnam Living Standards Survey) are analysed through multilevel regression modelling to examine well-being outcomes in sending areas and links to remittance income. The results show that the temporal extent of internal and international migration is positively associated with remittances in both delta regions. The results also suggest that in both delta regions remittances have a significant positive effect on household well-being in the source rural areas, including overall income, investments in health, food security and access to sanitation. The study concludes that landscapes of urban and rural deltas are increasingly economically integrated which suggests greater resilience even for environmentally-at-risk tropical deltas.

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Migration; remittances; human well-being; delta regions; sustainable deltas

1. Introduction

The delta regions of Asia are highly populous and increasingly highly mobile with a number of the fastest growing cities in Asia are located in these regions. The principal driver of this rapid urbanization in the past decades has been capital accumulation, manufacturing and foreign direct investment in cities such as Bangkok, Mumbai, Dhaka and Guangzhou (Seto, 2011). Despite this reality, out-migration in these regions is often portrayed as being driven by environmental change in the coastal localities, and this out-migration is often projected

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to increase with climate change impacts such as sea-level rise and extreme weather events (Szabo, Begum, Ahmad, Matthews, & Steatfield, 2015).

Coastal regions and mega-deltas in particular are, however, net receiving areas in terms of migration. de Sherbinin et al. (2012) show that globally between1970s and 2000 censuses, there has been a marked population drift to coastal areas. Most of this net influx is to urban centres, and much of the net increase in cities in deltas is from surrounding delta regions. In the context therefore of present and future environmental risks in delta regions, linkages between urban and rural areas are increasingly important, potentially for spreading risks, for investment in migration sending areas, and for societal resilience. Adger, Kelly, Winkels, Huy, and Locke (2002) showed the diverse investments of remittance flows in coastal migration source areas and that these are not necessarily invested in environmentally sustainable resources. Nevertheless, the importance of remittance income in rural deltas will increasingly be part of the landscape of development in these regions (Deshingkar, 2012).

Globally, over 230 million people are international migrants and around 700 million are internal migrants (World Bank, 2013). In 2013 remittances exceeded USD 404 billion, which represents an overall increase of 3.5% compared to 2012. This growth is projected to accelerate (World Bank, 2014). Although on average, the contribution of remittances to GDP is estimated at 0.7%, in the least developed countries (LDCs) it amounts to 4.5%. In Bangladesh, remittances account for 12% of the country's GDP and in Vietnam the equivalent proportion is 6.3% (World Bank, 2012).At the country and community level remittances were found to be significant predictors of poverty reduction and contribute to food security and economic development (Adams & Page, 2005; Ajaero, Nzeadibe, Obisie-Nmehielle, & Ike, 2017; Kangmennaang, Bezner-Kerr, & Luginaah, 2017; Taylor, 1999). At the micro level, existing studies confirmed that households which receive remittances benefit from higher objective and subjective standard of living (Amuedo-Dorantes & Pozo, 2010; ILO, 2013; Semyonov & Gorodzeisky, 2008; Xing, Semyonov, & Haberfeld, 2010). The importance of remittances for socio-economic development has recently been recognised through the proposed Sustainable Development Goals (SDG) indicators (United Nations Statistical Commission [UNSC], 2015) and in the Addis Ababa Action Agenda on Financing for Development (FfD) (United Nations, 2015).

Analysing the determinants and impacts of remittances is particularly important in countries and regions with significant urban growth poles. In the environmentally vulnerable Ganges Brahmaputra and Mekong deltas the economic drivers of migration interact with the impact of natural disasters, increasing salinity intrusion and droughts. In both Ganges Brahmaputra and Mekong delta regions, the impact of environmental disasters has been widely documented (Hossain, Dearing, Rahman, & Salehin, 2016). In Bangladesh between 1976 and 2001, 270 million people were affected by floods and 25 million people were affected by droughts (Reuveny, 2008). Out-migration to neighbouring India intensified after the creation of the Farakka Barrage and resulted in clashes amongst ethnic, religious and socioeconomic lines (Reuveny, 2008; Swain, 1996). Similarly, in the Mekong delta, agricultural-dependent populations are often forced to temporarily relocate due to flooding and wider environmental degradation (Warner, 2010). Scenarios of environmental change, including sea level rise and salinity, suggest that sending areas will have constrained opportunities for growing, or even maintaining, agricultural incomes into the future, across the world's deltas (Wong et al., 2014), potentially leading to amplification of the economic opportunities between rural and urban areas.

Given these contexts of both rapid economic and demographic shifts in Asia's deltas and the prospect of altered environmental risks, the purpose of the present study is twofold. First, we examine the key characteristics of remittance flows in the Ganges Brahmaputra and Mekong delta regions. Second, we analyse the impacts of remittances on households' well-being, including health outcomes, education and food security. The study area consists of the two delta regions: part of the Ganges Brahmaputra delta comprising the divisions of Khulna, Barisal, Dhaka, Sylhet and the majority of Chittagong, and the thirteen provinces in the Vietnamese Mekong delta.[1] The definition of remittances used in this paper refers to personal transfers and encompasses remittances sent from both abroad and domestically. In addition, the analysis accounts for in-kind donations as reported in the Bangladesh Household Income and Expenditure Survey (HIES) and Vietnam Living Standards Survey (VLSS).

The next section provides an overview of migration trends in the study areas, accounting for increasing environmental vulnerability of both deltaic systems to climate change. In section three, we discuss the data and methods focusing on both outcome and key explanatory variables. In the results section, we report the results of statistical analyses, with an emphasis on selected regression models. The final section presents a summary of conclusions and provides several policy recommendations for local policy makers and developmental agenda, more broadly.

2. Conceptual framework

The conceptual framework presented in this section (Figure 1) serves as the logical background for conducting empirical analysis. The framework draws from the previous research on determinants of remittances (Pfau & Giang, 2009; Semyonov & Gorodzeisky, 2008) as well as a broader body of literature on migration and development (Adams & Page, 2005; Siddiqui, 2003; UNECA, 2006; World Bank, 2014). While there can be numerous motivations to remit, they are typically classified under two umbrella types; i.e. altruistic motivations and those based on self-interest (Carling, 2008). Altruistic motivations usually involve supporting livelihoods of family members in the receiving countries, including current consumption and investments in material goods, health and education. Self-interest motivations can entail

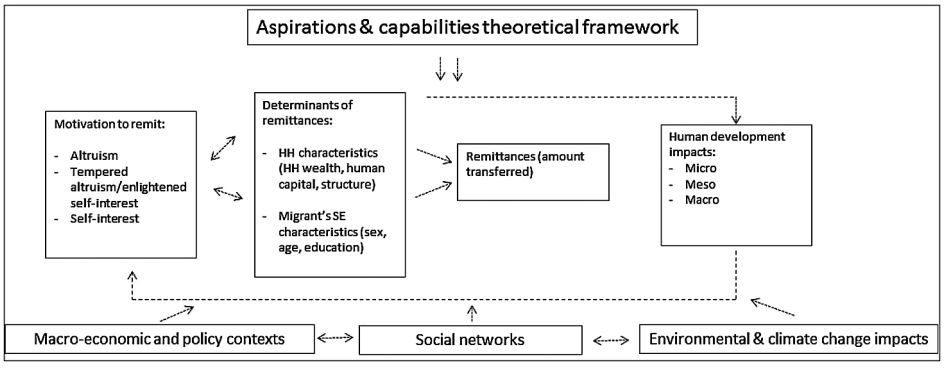

Figure 1. Determinants and context of remittances flows and their impact on human development and well-being.

survival strategies as well as investments and savings for own benefit. In reality, a mix of these motivations is likely to occur, and has been typically referred to as 'tempered altruism' or 'enlightened self-interest' (Carling, 2008). The overall motivations to remit allow us to disentangle specific determinants of remittances.

The key determinants include household income or wealth status, household structure, migration length, whether the sender is an international or domestic migrant, as well as other socio-economic characteristics of migrants, such as their age or sex. The amount of remittances is dependent on the combination of household level and individual level socio-economic characteristics as well as macro level economic and policy situation in both sending and receiving countries and contextual factors, such as the impacts of climate change. The latter are particularly important in climate change hotpots, such as the delta regions (Szabo et al., 2016). In these regions, migration flows and associated remittance flows are likely to affected by recurring environmental and climate change related hazards, including flooding, water and soil salinization and cyclones (Hajra et al., 2017).

Our framework draws primarily from the aspirations and capabilities theoretical approach proposed by de Haas (2011). Within this approach, Haas incorporated the crucial role of human agency into migration decision-making process and accounted for interactions between migration - as a capabilities expanding process – and development. Borrowing from the concepts of capabilities and functioning (Sen, 1999, 2005), Haas argued that 'human mobility can be understood as a capability to decide where to live' and that mobility has both intrinsic and instrumental value for human development (de Haas, 2011, p. 19). In our theoretical framework migrants' capabilities and aspirations influence both motivations to remit as well as specific determinants of remittances. It should be noted that the most vulnerable do not necessarily have the greatest aspirations or capability to migrate (Loschmann & Siegel, 2014). For example, is many societies, including Bangladesh, a younger male is likely to have greater capabilities and aspirations to emigrate in order to support their family as compared to an older female. In addition, both capabilities and aspirations of migrants have an impact on the amount of remittances transferred to their families and thus on well-being of household members.

This leads us to the final element of the conceptual framework presented in Figure 1. As highlighted previously, existing research has shown that households in receipt of remittances benefit from higher standards of subjective and objective standard of living (Semyonov & Gorodzeisky, 2008). At the macro level Giuliano and Ruiz-Arranz (2009) found that countries remittances can contribute to economic growth in developing nations. While limited evidence exists regarding meso level associations, it is reasonable to assume that remittance transfers have a positive effect on communities' development. We also argue that human development impacts can have a direct influence on migrants' motivations to remit. For example, once households become relatively wealthier, the motivation can change from altruism to 'tempered altruism' or self-interest.

3. The study areas

3.1. Mekong delta

The Mekong delta region (Figure 2(a)) is highly vulnerable to adverse environmental events, in particular flooding. While it has been recognised that fluvial floods can bring benefits for

the economy, as they convey sediment and fish species (Tri, Trung, & Thanh, 2013), flooding can also have a disastrous effect on households' livelihoods. Since 2000, the region experienced three major floods (2000, 2001 and 2002); the first of them affecting approximately 11 million people. As a result of this flood 800 thousand dwellings were inundated and 55,123 ha of rice crops destroyed (Nguyen & James, 2013). The economic damage of the 2000 flood was estimated at USD 250 million (Tri et al., 2013). Given the vulnerability of the region to climate change it is expected that extreme weather events will continue to occur in the region at a more frequent pace (Dun, 2011). In addition, climate change is likely to increase not only the risk of flooding but is also associated with sea level rise, salinity intrusion and changes in temperature and rainfall patterns (Dang, Li, Nuberg, & Bruwer, 2014; Nguyen & James, 2013).

These environmental risks exacerbate traditional poverty related push factors and result in high out-migration rates. According to recent estimates, the overall number of internal migrants in Vietnam approximates 7.7 million, including 1.6 million who are intra-district migrants (GSO, 2011). In particular, the Mekong delta region experienced high out-migration, in particular from rural areas. The largest regional movement of people was between the Mekong delta and the neighbouring Southeast region; this flow was estimated at approximately 714 thousand people (GSO, 2011). Additionally, cross-border legal and illegal movements take place, although the exact numbers of emigrants from the Mekong delta region are not available.

3.2. Ganges Brahmaputra delta

Similar to the Mekong region, the delta region of Bangladesh (Figure 2(b)) experiences significant volatility in incomes through exposure to flooding, storm surges and other natural hazards. Between 1970 and 2009, there were 26 landfall cyclones, including cyclone Sydr in 2007 which caused displacement of around 650,000 people (Kniveton, Martin, & Rowhani, 2013). Short term and short distance internal population displacements are immediate response to environmental shocks (Kniveton et al., 2013). In addition, seasonal migration to cities allows to mitigate economic consequences of natural disasters which exacerbate often difficult living conditions of the rural poor. The coastal zone of the Ganges Brahmaputra delta is particularly prone to environmental push factors. A study of major slum areas in Bangladesh revealed that approximately 23% of slum dwellers in Dhaka originate from Barisal district (CUS, NIPORT, & Measure EVALUATION, 2005). At the same time, according to the most recent Bangladesh Population and Housing Census, only 49% of those born in Dhaka district resided in this district in 2011 (BBS, SID, & Ministry of Planning, 2012).

Given the scale of internal and international migration originating from the Ganges Brahmaputra delta region, the Government of Bangladesh had recently started to collect household level data on the volume and determinants of remittances. In 2010, the HIES has for the first time included a module on migration, while in 2013 Bangladesh Statistical Bureau (BBS) conducted a survey on the use of remittances from international migrants. According to the data published by the BBS (2014), during the year in which the survey has been conducted, households receiving remittances received on average TAKA 152,000 (USD 1930) in remittances from abroad. The highest international remittances were reported in Dhaka and Chittagong divisions. This is in line with the observed migration trend showing that the

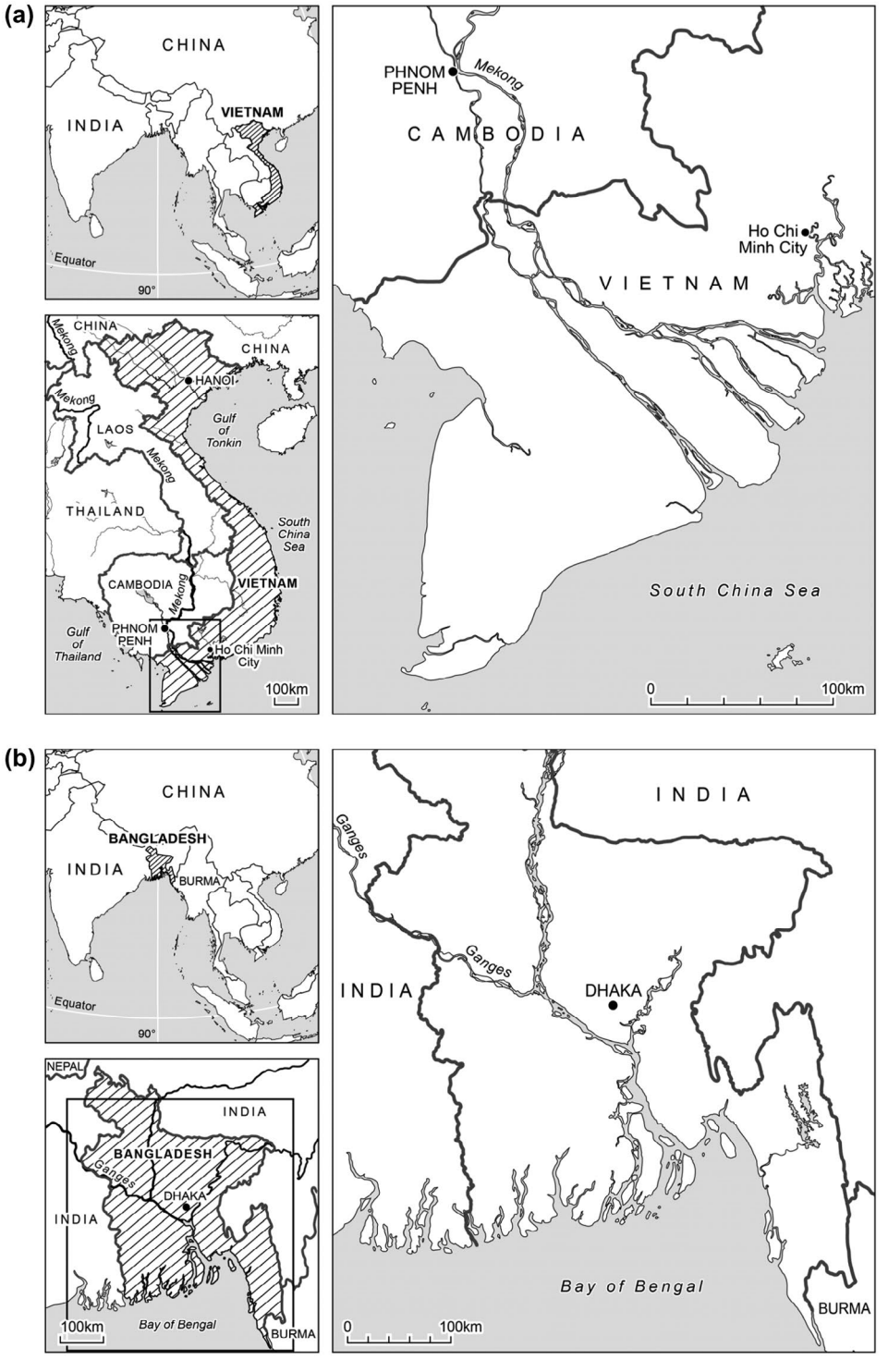

Figure 2. Location of the Mekong and Ganges Brahmaputra delta study areas.

districts of Bhramanbaria Comilla, Chittagong, Dhaka and Tangail have the highest numbers of emigrants (BBS, 2014).

4. Data and methods

4.1. Household data and key variables

The present study makes use of the data from the 2012 VLSS and 2010 Bangladesh HIES. Both datasets were obtained from the national statistical agencies with required permissions. The most recent 2010 HIES data-set contains a specific module on migration, which constitutes a new development as compared to the previous waves of the survey. With regards to VLSS, the migrant population was identified by including in the study sample only these individuals who lived away from home, either within the same province, a different province or a different country.

We consider previously identified predictors of remittances, including migrant's attributes as well household level characteristics (Ajaero et al., 2017; Hagen-Zanker & Siegel, 2007; Niimi, Pham, & Reilly, 2008). With regards to the former, the standard socio-economic variables are accounted for, such as migrant's age, sex and educational attainment. In addition, following on existing literature, we control for the length of migration and migration destination (internal vs. international migration). Hagen-Zanker and Siegel (2007) highlighted that migration length can have both a negative and a positive effect on the amount of remittances sent. From the altruism perspective, migration length is likely to weaken the links between the migrant and relatives at home thus potentially reducing the amount of remittances sent. On the other hand, the longer the migrant stays in the hosting country; the more income stability can be achieved, which may have positive effect on remittances. The key household level characteristics include household size, socio-economic attributes of household head, location of the dwelling, ownership status, and involvement in agricultural activities. The outcome variable measuring remittances is continuous and in order to account for the normality assumption it has been log transformed. In both delta regions, remittances are inclusive of the estimated value of gifts.

Concerning the second analysis, i.e. examining the impacts of remittances on household well-being, we assess separately four key aspects of well-being. We use Amartya Sen's approach to well-being, which he conceptualises as 'a capability to function in a society' (World Bank, 2005, p. 2). The standard well-being (and human development) indicators include household income, health, food security and sanitation. We operationalise the concept by using four selected variables, each pertaining to a different aspect of well-being. The specific variables include overall household income, expenditure on health (measuring investment in health), percentage of expenditure spent on food and access to sanitation. Percentage of expenditure spent on food is an indicator of food security, with higher percentage spent implying greater vulnerability to food insecurity (Smith & Subandoro, 2007). With the exception of sanitation all variables are continuous and have been log transformed. The outcome variable is binary, with 1 indicating access to improved sanitation. Concerning the level of remittances received by households, we assign three categories based on the tertile distribution of the data. While in the first analysis, remittances are estimated at the migrant level, in the second analysis the level of remittances is measured by household.

4.2. Methods

The analytical part of this study is twofold. First, we investigate the determinants of remittances in both delta regions. Analyses are carried out separately for each delta. Second, we examine the effect of the volume of remittances on selected aspects of household well-being. In order to test our hypotheses, we apply multilevel linear and multilevel logistic modelling. The choice of a specific model depends on whether the outcome variable is continuous or binary. In case of continuous variables, we make sure that the normality assumption has been met. If this is not the case, the variables are log transformed and the interpretation of the results adjusted accordingly. All variable are screened for multicolleanarity and outliers are removed. We conduct the analyses using stepwise model selection, where variables are added sequentially.

Random intercept models are fitted in order to test for potential community impacts. As households are nested within communities, the multilevel approach allows us to capture presupposed unobserved heterogeneity at the community level. The first set of models assessing the determinants of remittances is specified as follows:

$$\ln(Y_{ijk}) = \beta_0 + \gamma_j + \beta_1 X_{1ijk} + \beta_2 X_{2ijk} + \beta_3 X_{3ijk} + \cdots + \varepsilon_{ijk;}$$
$$i = 1, 2 \ldots n_1, \quad j = 1, 2 \ldots n_2, \quad k = 1, 2 \ldots n_3$$

where, $\ln(Y_{ijk})$ denotes the amount of remittances transferred by migrants, X_{1ijk}, X_{2ijk}, X_{3ijk}, … denote explanatory variables which are either migrant attributes or household level characteristics. β_0 is fixed intercept $\beta_1, \beta_2, \beta_3$ are the adjacent coefficients that show the magnitude and direction of relationship with Y_i; γ_j refers to the random intercept, while $\varepsilon_{ijk;}$ indicates the error term.

In addition, in the second set of models, which quantifies the impacts of remittances on households' developmental outcomes both logistic and linear regressions are used. The linear models are specified in a way similar to that outlined above, while the logistic models are specified as follows:

$$\text{logit}(Z_{ij}) = \beta_0 + \gamma_j + \beta_1 X_{1ijk} + \beta_2 X_{2ijk} + \beta_3 X_{3ijk} + \cdots + \varepsilon_{ijk};$$
$$i = 1, 2 \ldots n_1, \quad j = 1, 2 \ldots n_2, \quad k = 1, 2 \ldots n_3$$

where, Z_{ij} denotes the binary outcome variable (e.g. access to sanitary facilities), X_1 denotes the level of remittances sent, and X_{2ijk}, X_{3ijk}, … denote additional explanatory variables at the household level. Similarly to the previous set of models, β_0 is the constant, γ_j refers to the random intercept and $\varepsilon_{ijk;}$ is the error term.

Finally, goodness of fit of the selected models is assessed based on the standard statistical tests, including the Wald test, log likelihood test, and R^2 in the case of linear models. All analyses were performed using STATA 12.

5. Results of multivariate analysis

5.1. Determinants of remittance flows

The results of the multilevel modelling for each delta region are reported in Table 1. It can be noticed that migrant's characteristics have a significant impact on the amount of

remittances transferred in both Ganges Brahmaputra and Mekong deltas. In particular, the length of stay away from home, educational attainment, as well as whether migration is internal or international play a significant role. More specifically, *ceteris paribus*, in Bangladesh remittances in households where migrants have been away from home for a year or less are likely to be approximately 35% higher as compared to households with long term migrants (more than for years). Similarly, in Vietnam remittances in households where migration length is one year or less are around 70% per cent higher when compared to households with migrants who have been away for more than four years. These results are in line with previous research which found that migration length is associated with migrant's detachment and thus can lead to reduction in remittances (Hagen-Zanker & Siegel, 2007). Not surprisingly, households with international migrants are significantly more likely to receive higher amounts of remittances. Controlling for other factors included in the model, in the GBD remittances in these households are likely to be almost 140% higher compared to households with internal migrants.

Table 1. Determinants of remittances in the Mekong and Ganges Brahmaputra delta regions.

Remittances (total amount transferred, log)	GBD	Mekong
Variable	β (SE)	β (SE)
Migrant characteristics		
Length of stay abroad		
1 year or less	.35 (.06)***	.70 (.18)***
2 to 4 years	.49 (.06)***	.65 (.17)***
Baseline: more than 4 years	.00	.00
Educational attainment		
Secondary	.06 (.07)	.28 (.12)**
College or higher	.25 (.07)***	−.08 (.20)
Baseline: primary or none	.00	.00
Migrant is a female	−.50 (.14)***	.06 (.11)
Baseline: migrant is a male	.00	.00
International migrant	1.42 (.05)***	2.03 (.27)***
Baseline: internal migrant	.00	.00
Household characteristics		
Rural location	−.01 (.07)	−.22 (.15)
Baseline: urban location	.00	.00
HH size	.02 (.01)**	−.04 (.03)
HH dependency ratio	−.08 (.10)	.61 (.20)***
HH head is female	.31 (.05)***	.03 (.13)
Baseline: HH head is male	.00	.00
HH has sanitary latrine	.18 (.05)***	.19 (.12)
Baseline: HH doesn't have sanitary latrine	.00	.00
Wall material		
Rudimentary	.18 (.06)***	−.12 (.28)
Finished	.18 (.07)**	−.07 (.16)
Baseline: natural	.00	.00
HH engaged in fishing	−.003 (.07)	−.21 (.12)*
Baseline: HH did not engage in fishing	.00	.00
HH occupancy status: owner	−.19 (.09)**	.47 (.52)
Baseline: HH occupancy status: not owner	.00	.00
Constant	6.84 (.14)***	5.18 (.58)***
Random effects parameters		
SD (constant)	.16 (.04)	.45 (.10)
SD (residual)	.97 (.02)	1.39 (.04)
Log likelihood	−2531.2	−1276.4
Number of observations	1808	720
Number of groups	83	40
LR test vs. linear regression, χ^2	11.2, $p < .00$	18.9, $p < .00$

Notes: Significance levels *, **, *** are 90, 95, and 99%, respectively.

In the GBD, migrants' gender and relationship to the household head are also statistically significant. Thus, being a female migrant has a negative effect on the amount of remittances sent, while being a husband or wife of the household head is positively associated with the volume of remittances. In addition, migrants with college or university degrees, are likely to contribute higher remittances compared to migrants with no education or primary education. Comparatively, in the Mekong delta, only secondary education is statistically significant (p <0.01) implying that for households with migrants with secondary education remittances are approximately 28% higher compared with households where migrants have primary or no education.

In terms of households' characteristics, household size and wealth indicators (such as wall material and access to sanitation) are statically significant predictors of remittances in the GBD, but not the Mekong delta. Household size is likely to have a positive impact on remittances because of a greater need of larger families for financial support. On the other hand, household wealth can be indicative of higher educational attainment of the migrant, which can in turn translate into higher earnings and remittances. Interestingly, in both delta regions geographical location defined by urban vs. rural area is not a statistically significant predictor of remittances when controlling for confounding factors. It should however be noted that in an unadjusted model rural residence has a significant negative affect ($p < 0.01$) on the amount of remittances transferred**.**

Finally, household engagement in fishing activities is statistically significant in the Mekong delta, which might indicate that these members of households are less likely to support their families through remittances. The results also show that neighbourhood effects are statistically significant in both the GBD and Mekong delta regions, which highlights the importance of belonging to a particular community in terms of household level outcomes.

5.2. Impacts of remittance flows

Overall, the amount of remittances transferred by migrants has a significant positive effect on household well-being in both delta regions. More specifically, when considering the effect of the level of remittance on the total monthly income of receiving households (Model 1 in Tables 2 and 3), it can be noticed that, *ceteris paribus*, in the GBD, households which receive highest remittances (top tertile of the distribution) are expected to have an income which is 121% higher compared with households with lowest remittances (bottom tertile). Similarly, in the Mekong delta region receiving high level of remittances is positively associated with household income.

The second set of models (Model 2) investigates the determinants of health expenditure. In countries such as Vietnam and Bangladesh where out-of-pocket spending on health is relatively high, i.e. 97% of private expenditure on health in Bangladesh and 85% of private expenditure on health in Vietnam (World Bank, 2012), it is sensible to assume that households with greater financial means are more likely to afford higher health expenditure. In this context, the positive association between the level of remittances and health expenditure is hardly surprising. Controlling for other factors included in the model, the association is statistically significant on both delta regions, although the strength and the significance level of the associations vary. In the GBD, households with highest remittances will spend

Table 2. Impacts of migrants' remittances on household well-being for the Ganges Brahmaputra delta.

	Model 1	Model 2	Model 3	Model 4
Controls	Income (log)	Health (expenditure, log)	Access to sanitation	Food security (% spent on food)
Variable	β (SE)	β (SE)	OR (CIs)	β (SE)
Remittances				
2nd tertile	.58 (.04)***	.18 (.12)	1.58 (1.19; 12.11)***	−.02 (.01)**
3rd tertile	1.21 (.05)***	.28 (.12)**	1.69 (1.27; 2.26)***	−.07 (.01)***
Baseline: 1st tertille	.00	.00	1.00	.00
Rural location	−.29 (.05)***	.02 (.14)	.40 (.27; .60)***	.07 (.01)***
Baseline: urban location	.00	.00	1.00	.00
HH size	.09 (.01)***	.08 (.02)***	1.09 (1.03; 1.14)***	.002 (.00)
HH head is female	−.32 (.04)***	.26 (.13)**	1.39 (1.05; 1.85)**	−.04 (.01)***
Baseline: HH head is male	.00	.00	1.00	.00
Age of HH head	.002 (.00)	.01 (.00)**	1.02 (1.01; 1.03)***	−.001 (.00)**
Education of HH head	.03 (.00)***	.02 (.01)*	1.10 (1.07; 1.13)***	−.01 (.00)***
HH engaged in fishing	.13 (.05)***	−.09 (.12)	.98 (.72; 1.34)	−.02 (.01)
Baseline: HH not engaged in fishing	.00	.00	1.00	.00
Any HH member suffers from chronic illness		.43 (.11)***		
Baseline: No HH member suffers from chronic illness		.00		
Constant	8.47 (.11)***	5.06 (.30)***	.07 (.03; .15)***	.64 (.02)***
Random effects parameters				
SD (constant)	.15 (.03)	.31 (.08)	.79 (.60; 1.05)	.04 (.01)
SD (residual)	.76 (.01)	1.45 (.04)		.14 (.00)
Log likelihood	−2130.0	−1658.7	−1018.9	980.5
Number of observations	1850	917	1855	1855
Number of groups	83	74	83	83
LR test vs. linear regression, χ^2	20.8, $p < .00$	6.4, $p < .01$	76.0, $p < .01$	63.4, $p < .00$

Notes: Significance levels *, **, *** are 90, 95, and 99%, respectively. Income and expenditure are measured in Bangladeshi taka.

approximately 28% more on health expenditure as compared to households which receive lowest level of remittances.

The next set of models (Model 3) consider the impact of remittances on access to improved sanitation. As was the case with other developmental indicators, the regression results show a significant positive effect of the level of remittances transferred on households' access to sanitary facilities. *Ceteris paribus*, in the GBD, the odds of having access to sanitary facilitates for households which receive highest remittances (measured by top tertile) are 1.69 times the odds for households with the lowest level of remittances. In the Mekong delta region, the odds ratio of access to sanitary latrine is as high as 2.39 ($p < .01$) for households with highest remittances. Finally, the last set of models (Model 4) shows the effects of level of remittances on household food security. The results suggest that receiving more remittances is negatively associated with proportion of expenditure spent on food, thus indicating a lower risk of food insecurity. The results are highly significant ($p < .01$) in both Ganges Brahmaputra and Mekong deltas.

Table 3. Impacts of migrants' remittances on household well-being for the Mekong delta.

Controls	Model 1 Income (log)	Model 2 Health (expenditure, log)	Model 3 Access to sanitation	Model 4 Food security (% spent on food)
Variable	β (SE)	β (SE)	OR (CIs)	β (SE)
Remittances				
2nd tertile	.06 (.05)	.28 (.13)**	.96 (.66; 1.43)	−.02 (.01)*
3rd tertile	.28 (.05)***	.41 (.13)***	2.39 (1.60; 3.55)***	−.07 (.01)***
Baseline: 1st tertille	.00	.00	1.00	.00
Rural location	−.28 (.06)***	.02 (.13)	.40 (.25; .63)***	.01 (.01)
Baseline: urban location	.00	.00	1.00	.00
HH size	.21 (.01)***	.15 (.03)***	1.12 (1.03; 1.23)**	−.001 (.00)
HH head is female	−.19 (.05)***	−.23 (.12)*	.98 (.67; 1.42)	.01 (.01)
Baseline: HH head is male	.00	.00	1.00	.00
Age of HH head	−.003 (.00)	.01 (.00)**	.99 (.98; 1.01)	.00 (.00)
Ethnicity of HH head (Viet)	.43 (.08)***	.90 (.18)***	.99 (.56; 1.76)	−.04 (.02)**
Baseline: other	.00	.00	1.00	.00
HH engaged in fishing	−.09 (.05)**	.16 (.11)	.26 (.18; .37)***	−.004 (.01)
Baseline: HH not engaged in fishing	.00	.00	1.00	.00
Constant	7.79 (.16)***	2.76 (.38)***	3.20 (.95; 10.81)*	.57 (.03)***
Random effects parameters				
SD (constant)	.16 (.04)		.55 (.33; .92)	.03 (.01)
SD (residual)	.59 (.02)			.12 (.00)
Log likelihood	−731.4	.10 (R^2)	−474.5	548.1
Number of observations	796	788	796	796
Number of groups	40		40	40
LR test vs. linear regression, χ^2	18.0, $p < .00$	1.1, $p > .10$	13.7, $p < .01$	19.5, $p < .00$

Notes: Significance levels *, **, *** are 90, 95, and 99%, respectively. Income and expenditure are measured in Vietnamese dong.

6. Conclusions and policy implications

This paper has examined the determinants of remittances in the Ganges Brahmaputra and Mekong delta regions and assessed the impact of remittances on selected developmental indicators at the household level. The results of statistical analysis show that both migrant attributes and household level characteristics have an important effect on the amount of remittances transferred back home. In particular, migration length, migrant's education and being an international migrant are significant predictors of the level of remittances. Concerning household level socio-economic characteristics, these are more important in the Ganges Brahmaputra delta, where other things being equal, household size, wealth and gender of household head are all associated with remittances. On the other hand, in the Mekong delta, household dependency ratio has been proven to be a strong predictor of remittances, even when controlling for confounding factors. With regards to the impact of remittance on household well-being, the analysis shows that the level of remittances transferred is strongly associated with key developmental indicators; in particular income, access to sanitary facilities and food security.

Overall, our results reinforce existing understanding of the determinants and impacts of remittances. Similarly to Funkhouser(1995), but contrarily to Garip(2012) our findings suggest that migration length is negatively associated with the amount of remittances transferred thus challenging the altruistic motive of emigration. In particular, research by Collier, Piracha, and Randazzo (2011) showed that this association is not constant across levels' of migrants'

education where more educated migrants are likely to decrease their remittance transfers with time. Our results are also consistent with the recent research findings by Harper and Zubida (2017), who showed that remittances decreased with time because of the new migrant identity generated abroad after a certain period of time. This could be linked to the formation of new family or other networks (Harper & Zubida, 2017). As was the case with previous studies, we do not find full consistency for determinants of remittances across the two delta regions. This suggests the need to pay particular attention to the country, regional and community specific characteristics, as confirmed by statistically significant neighbourhood effects. The lack of significance for place of rural residence also suggests that there might be a need to re-orient the traditional urban-rural dichotomy. Funkhouser(1995) found that urban households residing outside of the capital city were more likely to receive remittances as compared to rural households.

In terms of the impacts of the level of remittances transferred on selected developmental outcomes, our results conform to existing research. In the context of Vietnam, for example, Viet (2008) found that remittances have a significant positive effect of the level of household income and expenditure as well as overall poverty reduction. Our results contribute also to the aspirations and capabilities theory (de Haas, 2011) used for our conceptual framework (please see Section 2). This theory states that and that mobility has both intrinsic and instrumental value for human development (de Haas, 2011, p. 19), and our results confirmed this for all dimensions of human development tested in this paper.

One of the key developmental impacts which came across in this study is the impact of gender. Migration in these deltas has strong gender differentiation. Male migrants are likely to remit significantly more in GBD, whereas in the Mekong there is little gender difference. Furthermore when testing associations with well-being, the gender of the head of household in the recipient household affects the transmission of well-being and resilience through engagement with migration. In GBD, the results suggest that significant impacts of remittances on income are more likely in male headed households, whereas a translation to increased well-being in terms of sanitation and health expenditure are more likely in GBD female headed households. Conversely in the Mekong, the gender effect on receiving households is much less marked: although, like in the GBD the impact of remittances on the income of male headed households is still significantly enhanced compared with female headed households (albeit to a lesser extent than the GBD) - there is little discernible head of household differences in terms of sanitation or food security. Such gender-related results provide interesting reflections in terms of how well being impacts are generally understood. One other study suggests similar results on welfare impacts of remittances based on data across Vietnam is Nguyen, Raabe, and Grote (2013), but these findings are based primarily on income rather than the broader implications of well-being. Remittance income, especially cash, can be important for important alternative well-being outcomes such as health and sanitation. And where gender distinctions are important – such as in the GBD – it appears that the gender of the sender, as well as the recipient head of household can be important in expanding impacts to wider levels of well-being.

While the present study advances our understanding of determinants and impacts of remittances in delta regions, some limitations are acknowledged. Firstly, income, expenditure and remittance data are self-reported and are thus prone to under-reporting by respondents for various reasons. Secondly, international migrants are often part of a grey economy which might also influence the way in which they report data both in terms of earnings as well as

their socio-economic characteristics. Thirdly, we acknowledge a possibility of endogeneity bias owing to potential reverse causality between independent and dependent variables. As highlighted by previous studies (Brown & Jimenez, 2007; Lueth, 2006), the relationship between remittance flows and household welfare may be bi-directional. Individuals from poorer households are expected to have more incentives to move for work and remit, which may then, in turn, contribute to poverty alleviation (Brown & Jimenez, 2007).

The results of the present study have important policy implications. First, they show that determinants of remittances are not uniform and thus area specific analyses are required in order to assess the factors influencing remittance flows in a specific geographical location. Second, in the tropical delta regions, remittances have an important positive effect on households' well-being, including on health status, educational attainment and food security. It is thus critical that national socio-economic development strategies as well as the global development goals specifically incorporate the key role of remittances in advancing human development. We therefore welcome the most recent suggestions to include indicators measuring the costs of remittance transactions amongst the proposed SDG indicators (UNSC, 2015). Given uneven spatial exposure to environmental risks, setting up sub-national data collection and monitoring mechanisms is of crucial importance, in particular in climate hotspots, such as tropical deltas (Szabo et al., 2016). Because delta regions are at comparatively greater risk of negative consequences of environmental and climate change (Szabo et al., 2015), this study suggests that utilising remittances for investment mechanisms that aim at vulnerability assessment and risk management would likely contribute to increasing the resilience and sustainability of such regions in the long run.

Note

1. The thirteen provinces of the Mekong delta include Long An, TiềnGiang, Bến Tre, Trà Vinh, Vĩnh Long, ĐồngTháp, An Giang, KiênGiang, CầnThơ, HậuGiang, SócTrăng, BạcLiêu, Cà Mau.

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References

Adams, R. H., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World Development, 33*, 1645–1669. doi:https://doi.org/10.1016/j.worlddev.2005.05.004

Adger, W. N., Kelly, P. M., Winkels, A., Huy, L. Q., & Locke, C. (2002). Migration, remittances, livelihood trajectories, and social resilience. *AMBIO: A Journal of the Human Environment, 31*, 358–366. doi:https://doi.org/10.1639/0044-7447-31.4.358

Ajaero, C. K., Nzeadibe, C. T., Obisie-Nmehielle, N., & Ike, C. C. (2017). The linkages between international migration, remittances and household welfare in Nigeria. *Migration and Development,* 1–15. doi:https://doi.org/10.1080/21632324.2017.1322171

Amuedo-Dorantes, C., & Pozo, S. (2010). Accounting for remittance and migration effects on children's schooling. *World Development, 38*, 1747–1759. doi:https://doi.org/10.1016/j.worlddev.2010.05.008

BBS. (2014). *Report on the survey on the use of remittance 2013*. Dhaka.

BBS, SID, & Ministry of Planning. (2012). *Population and housing census 2011*. Dhaka: Socio-economic and demographic report.

Brown, R. P. C., & Jimenez, E. (2007). *Estimating the Net Effects of Migration and Remittances on Poverty and Inequality. Comparison of Fiji and Tonga*. Helsinki: United Nations University (Bonn). Retrieved from https://www.wider.unu.edu/sites/default/files/rp2007-23.pdf

Carling, J. (2008). The determinants of migrant remittances. *Oxford Review of Economic Policy, 24*, 582–599. doi:https://doi.org/10.1093/Oxrep/Grn022

Collier, W., Piracha, M., & Randazzo, T. (2011). *Remittances and return migration*. Retrieved August 1, 2015 from https://www.iza.org/en/webcontent/publications/papers/viewAbstract?dp_id=6091

CUS, NIPORT, & Measure EVALUATION. (2005). *Slums in Urban Bangladesh. mapping and census 2005*. Dhaka.

Dang, L. H., Li, E., Nuberg, I., & Bruwer, J. (2014). Farmers' perceived risks of climate change and influencing factors: A study in the Mekong Delta, Vietnam. *Environmental Management*, *54*, 331–345. doi:https://doi.org/10.1007/s00267-014-0299-6

de Haas, H. (2011). *The determinants of international migration. Conceptualising policy, origin and destination effects*. Retrieved August 1, 2015 from https://www.imi.ox.ac.uk/projects/demig/demig-the-determinants-of-international-migration.

de Sherbinin, A., Levy, M., Adamo, S., MacManus, K., Yetman, G., Mara, V., … Pistolesi, L. (2012). Migration and risk: Net migration in marginal ecosystems and hazardous areas. *Environmental Research Letters, 7*, 1–14. doi:https://doi.org/10.1088/1748-9326/7/4/045602

Deshingkar, P. (2012). Environmental risk, resilience and migration: Implications for natural resource management and agriculture. *Environmental Research Letters, 7*, 1–7. doi:https://doi.org/10.1088/1748-9326/7/1/015603

Dun, O. (2011). Migration and displacement triggered by floods in the Mekong delta. *International Migration, 49*, e200–e223. doi:https://doi.org/10.1111/j.1468-2435.2010.00646.x

Funkhouser, E. (1995). Remittances from international migration: A comparison of El Salvador and Nicaragua. *The Review of Economics and Statistics, 77*, 137–146. doi:https://doi.org/10.2307/2109999

Garip, F. (2012). An integrated analysis of migration and remittances: Modeling migration as a mechanism for selection. *Population Research and Policy Review, 31*, 637–663. doi:https://doi.org/10.1007/s11113-012-9246-5

Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth. *Journal of Development Economics, 90*, 144–152. doi:https://doi.org/10.1016/j.jdeveco.2008.10.005

GSO. (2011). *Migration and urbanization in Vietnam: Patterns, trends and differentials*. Hanoi: Vietnam General Statistics Office (VGSO).

Hagen-Zanker, J., & Siegel, M. (2007). *The determinants of remittances: A review of the literature*. Maastricht: Maastricht University.

Hajra, R., Szabo, S., Tessler, Z., Ghosh, T., Matthews, Z., & Foufoula-Georgiou, E. (2017). Unravelling the association between the impact of natural hazards and household poverty: Evidence from the Indian Sundarban delta. *Sustainability Science,*. doi:https://doi.org/10.1007/s11625-016-0420-2.

Harper, R. A., & Zubida, H. (2017). Being seen: Visibility, families and dynamic remittance practices. *Migration and Development.,* 1–21. doi:https://doi.org/10.1080/21632324.2017.1301303

Hossain, S., Dearing, J. A., Rahman, M., & Salehin, M. (2016). Recent changes in ecosystem services and human well-being in the Bangladesh coastal zone. *Regional Environmental Change*. *16*, 429–443. doi:https://doi.org/10.1007/s10113-014-0748-z.

ILO. (2013). *Integrating migration in the post-2015 UN Development Agenda*. Geneva: Author.

Kangmennaang, J., Bezner-Kerr, R., & Luginaah, I. (2017). Impact of migration and remittances on household welfare among rural households in Northern and Central Malawi. *Migration and*

Development., 1–17. doi:https://doi.org/10.1080/21632324.2017.1325551. Retrieved from http://migratingoutofpoverty.dfid.gov.uk/files/file.php?name=wp5-ccrm-b-sensitivity.pdf&site=354

Kniveton, D., Martin, M., & Rowhani, P. (2013). *Sensitivity testing current migration patterns to climate change and variability in Bangladesh*. Retrieved August 1, 2015 from https://migratingoutofpoverty.dfid.gov.uk/files/file.php?name=wp5-ccrm-b-sensitivity.pdf&site=354

Loschmann, C., & Siegel, M. (2014). The influence of vulnerability on migration intentions in Afghanistan. *Migration and Development., 3*, 142–162. doi:https://doi.org/10.1080/21632324.2014.885259

Lueth, E. (2006). *A gravity model of workers' remittances*. Washintgton, DC: International Monetary Fund (IMF).

Nguyen, K. V., & James, H. (2013). Measuring household resilience to floods: A case study in the Vietnamese Mekong River Delta. *Ecology and Society, 18*, 1–14. doi:https://doi.org/10.5751/Es-05427-180313. Retrieved from https://www.ecologyandsociety.org/vol18/iss3/art13/

Nguyen, L. D., Raabe, K., & Grote, U. (2013). Rural-urban migration, household vulnerability and welfare in Vietnam. *World Development*, 79–93. doi:https://doi.org/10.1016/j.worlddev.2013.11.002

Niimi, Y., Pham, T. H., & Reilly, B. (2008). *Determinants of remittances: Recent evidence using data on internal migrants in Vietnam*. Washington, DC: World Bank.

Pfau, W. D., & Giang, L. T. (2009). Determinants and impacts of international remittances on household welfare in Vietnam. *International Social Science Journal, 60*, 431–443.

Reuveny, R. (2008). Ecomigration and violent conflict: Case studies and public policy implications. *Human Ecology, 36*, 1–13. doi:https://doi.org/10.1007/s10745-007-9142-5

Semyonov, M., & Gorodzeisky, A. (2008). Labor migration, remittances and economic well-being of households in the Philippines. *Population Research and Policy Review, 27*, 619–637. doi:https://doi.org/10.1007/s11113-008-9084-7

Sen, A. (1999). *Commodities and capabilities*. New Delhi: Oxford University Press.

Sen, A. (2005). Human rights and capabilities. *Journal of Human Development, 6*, 151–166. doi:https://doi.org/10.1080/14649880500120491

Seto, K. C. (2011). Exploring the dynamics of migration to mega-delta cities in Asia and Africa: Contemporary drivers and future scenarios. *Global Environmental Change, 21*, S94–S107. doi:https://doi.org/10.1016/j.gloenvcha.2011.08.005

Siddiqui, T. (2003). *Migration as a livelihood strategy of the poor*. Retrieved August 1, 2015 from https://r4d.dfid.gov.uk/pdf/outputs/migrationglobpov/wp-c1.pdf

Smith, L. C., & Subandoro, A. (2007). *Measuring food security using household expenditure surveys*. Washington, DC: International Food Policy Research Institute.

Swain, A. (1996). Displacing the conflict: Environmental destruction in Bangladesh and ethnic conflict in India. *Journal of Peace Research, 33*, 189–204. doi:https://doi.org/10.1177/0022343396033002005

Szabo, S., Begum, D., Ahmad, S., Matthews, Z., & Steatfield, P. K. (2015). *Scenarios of population change in the coastal Ganges Brahmaputra Delta (2011–2051)*. *Asia-Pacific Population Journal*, *30*, 51–72.

Szabo, S., Nicholls, R., Neumann, B., Renaud, F., Matthews, Z., Sebesvari, Z., … Hutton, C. 2016. Making SDGs work for climate change hotspots. *Environment: Science and Policy for Sustainable Development, 58*, 24–33. doi:https://doi.org/10.1080/00139157.2016.1209016

Szabo, S., Renaud, F., Hossain, Md. S., Sebesvari, Z., Matthews, Z., Foufoula-Georgiou, E., & Nicholls, R. J. (2015). New opportunities for tropical delta regions offered by the proposed Sustainable Development Goals. *Environment: Science and Policy for Sustainable Development*.

Taylor, J. E. (1999). The new economics of labour migration and the role of remittances in the migration process. *International Migration, 37*, 63–88.

Tri, V. P. D., Trung, N. H., & Thanh, V. Q. (2013). Vulnerability to flood in the Vietnamese Mekong Delta: Mapping and uncertainty assessment. *Journal of Environmental Science and Engineering, 2*, 229–237.

UNECA. (2006). *International migration and development: Implications for Africa*. Addis Ababa: United Nations Economic Commission for Africa (UNECA).

United Nations. (2015). *Addis Ababa action agenda of the third international conference on financing for development (Addis Ababa Action Agenda)*. Retrieved August 1, 2015 from https://www.un.org/esa/ffd/ffd3/

UNSC. (2015). *Technical report by the Bureau of the United Nations Statistical Commission (UNSC) on the process of the development of an indicator framework for the goals and targets of the post-2015 development agenda* (p. 44). Author.

Viet, C. N. (2008). Do foreign remittances matter to poverty and inequality? Evidence from Vietnam. *Economic Bulletin, 15*, 1–11.

Warner, K. (2010). Global environmental change and migration: Governance challenges. *Global Environmental Change, 20*, 402–413. doi:https://doi.org/10.1016/j.gloenvcha.2009.12.001

Wong, P. P., Losada, I. J., Gattuso, J.-P., Hinkel, J., Khattabi, A., McInnes, K. L., … Sallenger, A. (2014). Coastal systems and low-lying areas. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White (Eds.), Climate change 2014: Impacts, adaptation, and vulnerability. part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change (pp. 361–409). Cambridge: Cambridge University Press.

World Bank. (2005). *Introduction to poverty analysis*. World Bank Institute.

World Bank. (2012). *The World Development Indicators*. Retrieved from The World Bank, August 1, 2015 https://data.worldbank.org/indicator/all

World Bank. (2013). *Migration and development brief 21. Migration and remittance flows: recent trends and outlook, 2013–2016*. Washington, DC. Retrieved from http://pubdocs.worldbank.org/en/471191444756853938/MigrationandDevelopmentBrief21.pdf

World Bank. (2014). *Migration and development brief 22. Migration and remittances: recent developments and outlook*. Washington, DC. Retrieved from http://pubdocs.worldbank.org/en/707021444756854385/MigrationandDevelopmentBrief22.pdf.

Xing, Y., Semyonov, M., & Haberfeld, Y. (2010). Labor migration, remittances, and economic well-being: A study of households in Rajasthan, India. *Migration and Culture, 8*, 497–516. doi:https://doi.org/10.1108/S1574-8715(2010)0000008027