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Assessing the linkage between climate change and migration in coastal region of Bangladesh

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Abstract

Climate change is one of the major issues facing Bangladesh from last decades. Every year a large number of people, especially from coastal region migrate different urban areas due to different disaster which is caused for climate change. Rural- urban migration is playing a significant role in this process. Considering the impact of climate change in environmental and socio economic perspective in Bangladesh, the aim of the paper is to explore the impact of climate change on livelihoods of the people. It inspects the linkages between climate change in the coastal region and migration of people from the affected area. Finally, it shows linkages between the refugees from coastal regions and urban slums with spatial distribution pattern. The study was conducted at Shymnagar upazila of Satkhira district in the South West coast of Bangladesh. According to the study, Alia changes their income range, livelihood options and as well as decreased school going education percentage. Total 90% families from migrate groups in slums and 95% families from non-migrate people in neighborhood areas responses that natural calamities like Aila is the main caused of their migration. This over population put pressure on urban infrastructures, utilities and other services which can not handle the usual demand is again burdened with increased service requirement. Finally, a few recommendation are made to suggest the reduced of climate change and migration.

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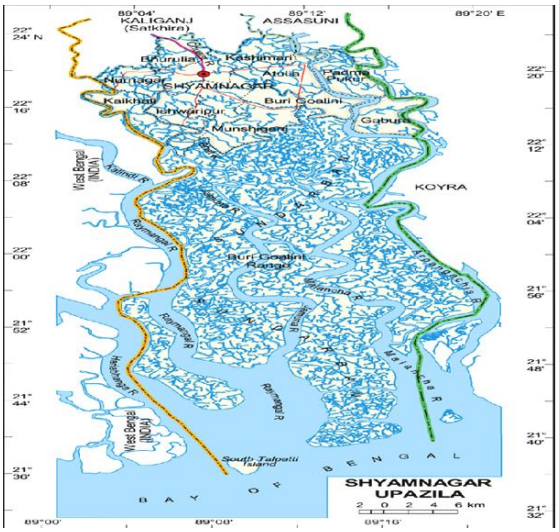
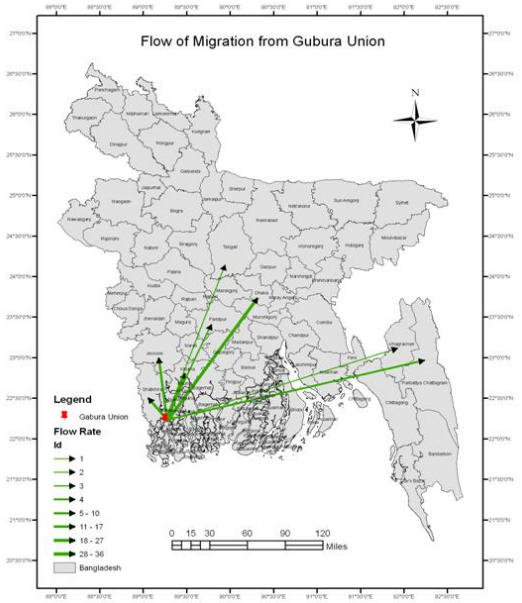
Introduction

Climate change refers to any change in climate over time as a result of both natural variability and human activity. Climate change and Migration is the major issues facing Bangladesh and all over the world now. In Bangladesh impact of climate change create bearer for our development. Every year a large number of people, especially people from coastal region to migrate different urban areas for their better livelihood. These large migrations create problems in cities. In our country climate may be change very quickly than other country because of its geographic location which have stake in its physical condition, Bangladesh is the most vulnerable country to natural disasters. Bangladesh is particularly vulnerable to the impacts of climate change and is one of the rare countries in which natural hazards are the main cause of migration (Piguet, 2008: 6). Climate change increasing human migration. Rural- urban migration is playing a significant role in this process. The net migration (migrants/1000 population) increased dramatically from 1.2 to 16.4 in urban areas between 1984 and 1998 (Rita, 2005). The information from 62 randomly selected villages in Bangladesh shows that nearly two-thirds of the emigration from rural areas was to urban areas (Rahman *et al.,* 1996). Climate Refugees are on move to main Cities in Bangladesh from different Climate Hotspots. Some estimates predict that by 2050 Bangladesh will have about 15 million environmental refugees (Myers, 1993: 754).Rural-urban migration entails important challenges for the development of urban areas. Between 2000 and 2030, the total population of Bangladesh is expected to grow from 129 to 206 million. Two thirds of this increase will take place among the urban population. During this decade, 2000-2010, the increase of the urban population is almost in pair with the increase of the rural population (12 and 14 million respectively), but in the decade 2020-2030 the increase of the urban population will be considerably higher than that of the rural population(Michael, 2009).

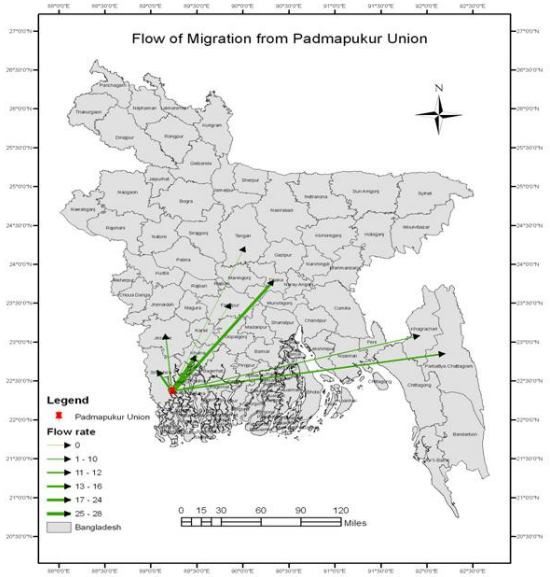
All events of climate events in Bangladesh, for this research we have chosen one event i.e., cyclone Alia. To investigate migration, all data was collected on the basis of Alia event. Cyclone "Aila" hit the west border of Bangladesh on 25 May 2009 affecting an estimated 3.90 million people in 11 coastal districts of the Bangladesh's 64 districts. The impact was aggravated as the cyclone hit Bangladesh during the high tide cycle that resulted to tidal surges of up to 22 feet (In depth assessment, Oct'2009).



Map 1. Study area gabura and padma pukur.



Map 2. This map indicates the flow of migration from Gabura union to different district in Bangladesh including Dhaka slums.



Map 3. This map indicates the flow of migration from Padma pukur union to different district in Bangladesh including Dhaka slums.

Considering the impact of climate change in environmental and socio economic perspective in Bangladesh, it is urgent to study the impact of climate change and migration. Therefore, the study was undertaken with following objectives:

(i) To explore the impact of climate change on livelihoods of the people in the coastal region particularly in Shymnagar upozila of Satkhira district in the South West coast of Bangladesh.

(ii) To inspect the linkages between climate change in the coastal region and migration of people from the area.

(iii) To show linkages between the refugees from coastal regions and urban slums with spatial distribution pattern.

Materials and methods

The study was conducted at two unions in Shymnagar. One is Gabura and other is Padma Pukur. These two unions are severely affected by climate events. From each union, two villages were selected for field survey.

Two separate types of questionnaire (one for Shymnagar and other for Dhaka slums) were developed for collecting data from the study areas for determining the impact of climate change on livelihood.The study was covered 100 families from 4 villages (25 from each village) at Shymnagar and 50 families from 2 slums (25 from each slum) in Dhaka city.Average total 250 families live in each village. From 250 families I was selected one family after 10 families' interval and one person was selected from each family for questionnaire survey. In each urban slum, I was taken 25 families out of 300 families.The sampling technique was mainly random sampling.Data which was collected from both field analyzed by using SPSS version 11.5 and MS excel for investigate impact of climate change on livelihood of the people in coastal region and investigate linkage between coastal regions to urban slums.

The major tasks will be as follows for preparing migration map-

i) Migration data collection along with GPS reading from each village
ii) Convert all GPS points into GIS files.
iii) Join spatial and non-spatial databases.
iv) Classify migration attributes according to place by percentage.
v) Show the migration routes from each village to respective urban areas where people migrated in percentage.

Different secondary information used for understanding the climate change pattern and climate change hazard in Bangladesh.MS Excel, SPSS and Spatial distribution software was used for data analysis and map preparation.GPS reading was used for preparing migration map. GPS reading use triangulation to calculate the user's exact location. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit. A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement.

Results and discussion

The results of the impact of climate change (Aila) on livelihood and migration flow are presented in tabular and graphical forms in this chapter. Climate change event Aila changed people's income range, livelihood options, education etc.

Range

Eight different income rangs classes were taken from one hundred families in 2008 to 2010 at Shaymnagar Thana in Satkhira district who were affected by Alia. Overall income range were changed afther Aila of non-migrate families . Before Aila, 36 families income range were found 3,000-4,000 but after Aila it were reduced in 20 families. Again income range between 2000-3000 was increased after Aila than before. In 5000-6000 income range total 8 families were found after Aila, but before Aila it were found 17 families. The effect of Alia on income is shown in Table 1.

Eight different income rangs classes were taken from fifty families in 2010 at Mirpur Slum in Dhaka district who were affected by Alia. Income range was changed after migration than before Aila. Before Aila, 7 families income range were found 4,000-5,000 but after migration it were increased in 30 families. Again income range between 6000-7000 were decreased after migration than before, but in 2000-3000 range income was not changed. The effect of Alia on income after migration is shown in Table 2.

Table 1. Table indicates the income variations of non-migrate families between before Aila and after Aila of Shaymnagar in Satkhira district.

Household income range (Monthly) BDT	After Alia-Now (No. of Family)	Before Alia (No. of Family)
0-1500	2	1
1500-2000	9	2
2000-3000	38	6
3000-4000	20	36
4000-5000	15	25
5000-6000	8	17
6000-7000	6	10
7000-8500	2	3

Table 2. Table indicates the income variations after migration in the cause of Aila at Mirpur Slum in Dhaka district.

Household income range(Monthly) BDT	Before migration (No. of Family)	After migration (No. of Family)
0-1500	0	0
1500-2000	0	0
2000-3000	10	10
3000-4000	9	10
4000-5000	7	30
5000-6000	0	0
6000-7000	24	0
7000-8500	0	0

The variations in house hold income of the sample population before and after the occurrence Aila were found to be statistically significant. Most of the household income was found before Aila with the range between BDT 3000-4000 however, after Aila it was reduced to BDT 2000-2500. According to a recent (Oct'09) study done by the South Asia Association of Poverty Eradication, each affected household has seen their income decrease by approximately 44% as a result of Cyclone Aila. More than 60,000 people have migrated to search employment, as opportunities for income are very limited in the affected areas. There are many reasons behind it. Firstly, most of the people had lost their land properties. Secondly, this place is low lying area as well as very much close to the Bay of Bangle. For that reasons, people are engaging Ghar farming business i.e. shrimp farming, net webbing, boat making, fish dying, collection of fish seeds and so on. After Aila, they had lost their lands, Ghar and fish/ shrimp business. At the time of flooding, rural people in Bangladesh cannot manage the lingering effects of labor market disruptions, price fluctuations, and consumption deficiency. As a consequence, kin groups, lineages or even entire villages shift from their home to nearby big urban areas (Rayhan and Grote, 2007). Some people of that place were already migrated to other places especially at Mirpur slum in Dhaka district. From

the above reasons their incomes have been changed significantly.

Livelihood options

Livelihood options are categorized into four different groups, namely fishing, farming, forest dependent and others. These four groups are again classified by different sub-groups. These data were taken from 100 families of Shymnagar in Satkhira district, in the time period 'between' 2008 to 2010. The main livelihood option in the affected areas is fishing. From four livelihood options, total 28% of the families were directly or indirectly involved in fishing sectors, but after Alia it was decreased in 4%, because almost all shrimp ghers (fish pond), sweet fish ponds were damaged by Cyclone Aila. In before Aila total 3% families were engaged with farming, but after Aila it was stopped. Others livelihood options including boat men, housing labor, small traders, private employer was also increases than before because they lost their original option, for this reason they engaged with others option for their livelihood. The overall impact of Alia on livelihood is shown in Table 3.

Table 3. Table indicates the Different livelihood options between before Aila and after Aila of Shaymnagar in Satkhira district.

Livelihood options		Livelihood option Sub-group	Loss of livelihood assets by Cyclone Aila	Constraint
Before Alia	**After Alia**			
Fishing (28%)	Fishing (4%)	Fishing (open water bodies), Shrimp farmer, Fish culture, Shrimp farming labour	Net, boat, accessories ,wage, capital , stock goods, fish feed	- Not possible to restart gher, sweet water fish until embankment repaired -Could not re-start due to lack of credit
Farming (3%)	Farming (0%)	Small agri producer (veg/fruits), Farming labor, Livestock's rarer	Standing crops, Wage, Goat (88%), cow (75%)	- Not possible as soil is highly saline - Lack of credit -Lack of tools & fodder
Forest dependent (13%)	Forest dependent (15%)	Honey collector, Leaves (Golpata) collector, Forest laborer	Boat, dram, rope, axe, Tools, Wage,	- Lack of tools - Lack of credit
Others (56%)	Others (81%)	Boat men, Housing labor, Carpenter, Rented motor cycle driver, Small traders (shop keeper),private employer, daily labour	Tools, Thread, Capital, Wage Shop, in stock	- Credit could revamp this group quickly as only the group continuing their job - Lack of credit -Lack of tools

Aila destroyed everything including occupation. Most of the families lost their original occupation. According to South Asia poverty report by South Asia Association of Poverty Eradication, Oct'09, about 52,961 acres of shrimp ghers (fish pond), as well as 1074 acres of sweet fish ponds were damaged by Cyclone Aila. The estimated loss is approximately BDT 1.5 billion. After Alia it was not possible to restart because lack of sufficient credit and also embankment was not repaired which was damaged by Alia. Livelihood option farming was totally stopped by Alia because standing crops, cow, goat was washed away by cyclone Alia. Cyclone Aila completely damaged 3,412 acres (46%) of standing crops out of 7,392 acres (In-depth assessment, Oct'09.). Forest dependent option was increases

after Alia than before because most of the people was lost their occupation by Alia, after Alia they fully dependent on forest for their livelihood.

Damage categories

Damage categories includes household assets, livelihood option, production and human loss. These data were taken from 100 families of Shymnagar in Satkhira district, in the time period 'between' 2008 to 2010 which were not migrate and 50 families from two slums in Dhaka city, which were migrate. Overall damage categories was greater in migrate groups than non- migrate groups. Incase of non- migrate groups, percentage of household asset damage was found 85%, but in migrate groups percentage was found 100%. Again damage of livelihood options, production and human lost was significantly greater in migrate group the non -migrate groups and it is presented in Fig 1.

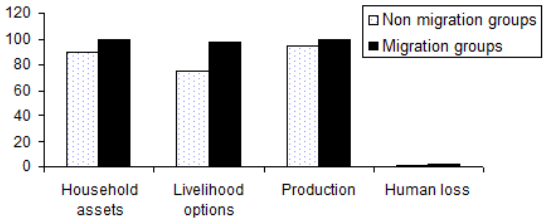


Fig. 1. Following figure indicates the overall damage categories of migrant and non migrant groups of Shymnagar in Satkhira district and Dhaka slums.

Table 5. Table indicates the educational status of school going children between before Aila and after Aila of Shaymnagar in Satkhira district.

	School going children	
	(Mean ± SE)	Level of Significant
Before alia	66.90 ± 4.063	***
After Alia	28.20 ± 4.264	***

*** indicate high significant

This figure shows that overall damage categories was greater in migrate groups than non- migrate groups. They migrate because their houses, occupation and production were totally damaged by Aila. According to The Daily Star, 6 September 2009, about 35,000 homeless people in Gabura, Padmapukur, Munshiganj, Burigoalini and Kashimari unions in the upazila are yet to return home as they could not rebuild their damaged houses due to financial hardship. According to The Daily Star, June 9, 2009, around 2.5 lakh houses were fully damaged, around four lakh houses partially damaged and over 10 lakh livestock were killed by cyclone Aila, which hit hard Shyamnagar and Ashashuni in Satkhira, Koira and Dakope in Khulna, Charfashion and Monpura in Bhola and Galachipa and Kalapara upazilas in Patuakhali.

According to NewAge, June 6, 2009, More than 1.5 lakh people in six unions in Koyra have become homeless and almost every family in the area has been badly affected by the tidal surge, said the upazila administration. They have no scope to stay there because they felt insecurity. According to The Daily Star, 6 September 2009, Fear of attacks by man-eater Royal Bengal Tigers and snakes is another concern for the Aila-hit people living in makeshift houses built on the embankments adjacent to the Sundarbans.

Educational status

Aila destroy most of the educational institutes. For this reason, percentages of school going children's were reduced. Educational status of school going children at Shymnazar Upazila in Satkhira district was found statistically highly significant result. Before Aila the mean of school going children was 66.90% however, after Aila it was only 28.20%. The impact of Aila on education is shown in Table 5.

According to, The Daily Star, June 7, (2009), over 50,000 students is being hampered as the May 25 cyclone Aila followed by tidal surges damaged 487 academic institutions in four upazilas of Khulna district. As many as 194 institutions have been damaged in Koira upazila while the number is 140

in Paikgachha, 78 in Batiaghata and 75 in Dakope upazila under the district. Most of the families had lost their land properties due to Alia. Some of them were migrated to other places even some slums.

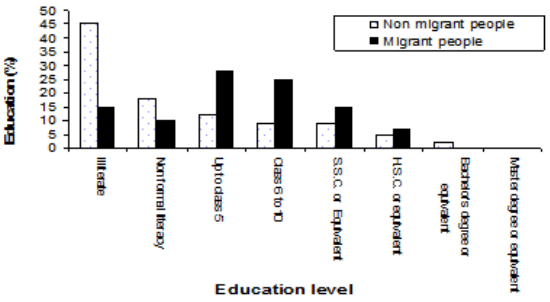


Fig. 2. Educational variation of non migrant and migrant people**.**

Changes in educational status

The data were taken from hundred families of Shymnagar upazila and two slums of Dhaka. Here educational levels are classified into eight different categories. Illiterate percentage is higher in non-migrate than migrate groups. In class 6 to 10 level, non-migrate groups percentage was found 8%, but migrate groups percentage was found 25%. Changes in educational status after Aila are shown in Fig. 2.

Household ownership

These data were taken from 100 families of Shymnagar in Satkhira district, in the time period 'between' 2008 to 2010 which were not migrate. Most percentages of houses were totally damaged by Aila. Total 99% percent families had own houses before Aila, but after Aila it was reduced in 80%. After Aila they made houses by the help of Govt. and NGO's. After Aila used for live in Govt. land is increased than before Aila and it is shown in Fig 3.

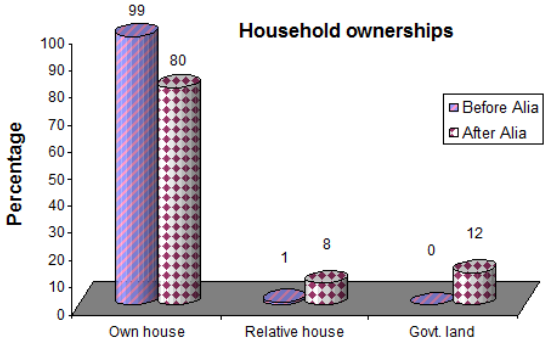


Fig. 7. Figure indicates the household ownership in before and after Alia of non migrant groups of Shymnagar in Satkhira district and Dhaka slums.

Causes of migration

These data were taken from one hundred families at Shaymnagar Thana in Satkhira district and fifty families from dhaka slums. The main causes of migration from Shymnagar upazila to different slums were climate change event like Alia. Most of the peoples lost their houses and occupation by the cause of Alia. They have no choice without migration. Total 90% families from migrate groups in slums and 95% families from non-migrate people about neighborhood migrate peoples response Aila is the main caused of migration. Another reason behind migration is aspiration of better income. Table 8. indicate the reason behind migration.

Map 3 shows that most of the families were migrated from Gabura union to Khulna, Satkhira and Dhaka. They have chosen Khulna because it was very near from their villages and well connected to their village. They had some idea about Khulna and Satkhira. Their some relatives and known persons were living in Khulna, Satkhira that's why they choice first this two district for their migration.

Second most migration occurred to Dhaka from Shymnagar. Dhaka is the capital city in Bangladesh. They have chosen Dhaka for their livelihood because they thought; they have more opportunities in Dhaka. A large percentage of families from Padma pukur union were migrate in Rangamati & khagrachuri district because they had some land properties in Rangamati & khagrachuri district. In past they bought some land properties here, as the land properties rate was very cheap so they bought it to cultivate here.

Recommendation:

There is significant evidence to suggest that climate change is one of the major causes of migration. The following steps are recommended:

1. Need urgent actions to stop the vulnerability of climate change. Mitigation must and first need to stop climate change. Early mitigation can reduces climate risks, human displacement, and migration.

2. Building greater resilience in natural, human and social systems through capacity building of the vulnerable community, actors and stakeholders and embankment, disaster preparedness, new technologies and improving agriculture/cropping patterns.

3. Need better settlements and housing for the coastal community in Bangladesh and planned migration of the vulnerable community

4. Need city development must create space and facilities for the poor.

5. Integrate analysis of the predicted impact of climate change and need to prepare to face the problems.

6. Provide support and create opportunities for the most vulnerable communities in both rural areas and in the cities.

7. Should be preserve social, cultural and economic rights of migrant peoples.

8. Improving the understanding the linkages between climate impacts, poverty and forced migration/climate refugees

9. Take appropriate measures before people are dislocated from their occupations and locations

10. Raising voice of the poor and affected people for climate justice and fairness, because the poor are not responsible for climate change but they are the main victims.

Conclusion

The rural to urban migration in Bangladesh during the first few decades of the twentieth century signified the beginning of many changes in human life. Predicting the impact of climate change on human livelihood and movement is fraught with difficulties. However, it seems unlikely that the alarmist predictions of hundreds of thousands of environmental refugees will translate into reality. This paper has provided the impact of climate change on livelihood in Bangladesh related with human migration. Paper summary clearly shows that environmental degradation Alia generated migration flows. Climate change increasing climate events in Bangladesh. Every year impact of climate change is being increasing with time and a large percentage of population is already affected by climate change event like Aila. Coastal areas in Bangladesh are on the 'front line' of climate change, directly affected by storm surges, drainage congestion, and sea level rise. Impact of climate change on livelihood is vast in coastal areas. Disaster preparedness and after disaster management of rehabilitation process cannot coop with the demand which exacerbate vulnerability of the population in these areas. For this reason, climate victim's peoples have no choice without migration.

Rural-urban migration entails important challenges for the development of urban areas. The increase of the urban population is almost in pair with the increase of the rural population. This over population put pressure on urban infrastructures, utilities and other services which can not handle the usual demand is again burdened with increased service requirement. This huge migrant people live on the street, they are often blamed for crime and other antisocial activities that occur in cities, including commercial sex work, begging and drug use. Lacking regular employment and trapped in a vicious cycle of poverty, deprivation and social ostracism, with barely sufficient income to keep them above starvation level, some turn to crime.

They create social and environmental problems they may cause, such as blocking footpaths or creating hygiene hazards. In terms of public health, large numbers of poor people living in unsanitary conditions without access to proper health care can constitute a source for disease transmission. Living on the street also resulted in significant unhygienic practices, which both pollute the environment and threaten health.

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