**CHAPTER-7: IMPACT OF SLUMS AND RURAL CLUSTERS ON THE HAORA RIVER**

7.1. Introduction

A slum, as defined by the UN agency UN-HABITAT, is “an area of a city characterized by substandard housing, squalor and lacking in tenure security. The slum population is the chronic disease occurred due to the rapid rate of urbanization” (UN, 2002). Slums are characterized by poor sanitation, overcrowded and crude habitation, inadequate water supply, hazardous location and insecurity of tenure (Pramanik et al., 2011). The people living in slums are highly vulnerable to different forms of risks—both natural and man-made. UNICEF and WHO estimated that at present 1.1 billion people have lack access to improved water supplies and 2.6 billion people are not having adequate sanitation (Moe et al., 2006; UNICEF, 2004). Over past decades owing to migration, increase in trade, tourism and commerce activities the migrating population is often more than the resident urban population (Ottong, 1983). This continuous migration is forcing the cities under pressure and introducing slum areas (Rempel, 1996; Kengne et al., 2000; Davis, 2004).

Slum population has been increasing in Tripura over the last four decades along with the growth and expansion of Agartala City and other towns. A huge number of immigrants from East Pakistan (Bangladesh) are entering into Tripura. They are settling down along the Haora River, which is flowing through the Sadar Subdivision as well as the Agartala City. To accommodate this huge number of poor class (Balogun, 1995; Portes et al., 2003; UN-Habitat, 2003; Shatkin, 2004) immigrants, Agartala City is expanding towards the source of the Haora River and thereby some urban slums and rural run down areas are growing up along it. The basic facilities in these urban slum and rural clusters are very much inadequate, specially improper sanitation system. Although 4 types of latrines have been noticed within the Haora River basin, most of these slums and rural dwellers do not have proper sanitation system. Major portion of the dwellers in those areas use *Kachha Latrine*, which release excreta directly into the river (Metcalf et al., 1998; Tanaca, 1992; Tsuzuky et al., 2007). It pollutes the river water, supply extra sediment load to the river and degrade the overall environment. Several industries and markets have been grown up to fulfil the need and greed of human population of the city. These industries and market places dump waste materials along the banks of the River Haora. Moreover, most of the major city-drains are directly connected with the river.
All of these nuisances are making the Haora River sick. In addition to this, lacks of consciousness among the local people as well as the Government are leading the river towards its dying phase. All these slum dwellers use the river water for their daily activities. As a result, majority of population in the Haora River basin suffer from different kinds of water and excreta-borne diseases.

The main objective of the present work is to quantify the impact of solid waste disposal coming from those *Kachha latrines* as well as from other anthropogenic sources, like garbage disposal and other major outlets. Preparation of a perception map related to the acuteness of water borne disease is also a major concern in order to locate the disease prone hot spots along the Haora River and to take necessary measures for it.

From the field survey a total of 63 patches of households, occupying a total of 3.69 km² (Fig-7.1) are found within levee top zone of the Haora River within Indian Territory. These have been considered as of slum and rural run down areas. Although some houses with good amenities are found within this zone, still the inhabitants of this area are being considered as slum dwellers. It is because the area is falling in active flood prone zones and is occupied by relatively poor class of people.

![Fig-7.1 Location of the slums/rural clusters along the Haora River within Indian Territory](image)

**7.2. Growth of major slums of the Haora River basin**

Within the whole Haora River basin two major slums are found i.e. i) Pratapgarh slum area and ii) Battala slum area. These two slum areas are occupying more than 75% of the total slum population of the Haora River basin and are still expanding their territory.

A survey has been carried out on these two slum areas to find out the nature of their expansion (Fig-7.2) in the last decade (2003-2013). From the survey it is found that in
case of Battala area the slum area has been increased from 0.23 km\(^2\) to 0.34 km\(^2\). But the number of clusters in Battala is decreased from 21 to 15 (Fig-7.2). The main reason behind this reduction is the expansion of the slum area and merging of the earlier clusters. This is mainly due to the expansion of houses of the earlier dwellers in order to adjust their expanded family. New dwellers in this area is very less (Fig-7.2). In case of Pratapgarh area the scenario is slightly different.

![Decadal growth of two major slums within Haora River basin](image)

**Fig-7.2 Decadal growth of two major slums within Haora River basin**

The area of Pratapgarh slum is increasing from 0.05 km\(^2\) to 0.12 km\(^2\) and the same time the number of clusters are also increasing from 14 to 20 during the period of 2003-2013. Here people are coming from different parts of Tripura and settling down in rented houses, because the houses are relatively cheaper than other areas and it is located very close to the city (Fig-7.2).

### 7.3. Nature and types of latrines used and their impacts on the river

Within the selected study area of the Haora River basin 4 types of latrines have been found i.e. i) Pakka latrine (systematised latrine with proper cemented storage), ii) Semi kachha or open pit latrine (where excreta is stored in open earthen whole), iii) Kachha Latrine or hanging latrine (where all excreta are directly released into the river) and iv) No latrine. Among these 4 types of latrine the first two types do not have any direct
impact on the river, because in those cases excreta are stored scientifically. But the numbers of such latrines in the whole study area are very few. Concentration of *Pakka latrines* are higher (Fig-7.3) in some parts of Jirania and Bamkimnagar (>50%).

Concentration of *Semi Kachha* type of latrine (Fig-7.3) is higher in the upper catchment of the river and also in some part of Bamkimnagar and Majlispur (>30%). Most particularly the *Kachha* type of latrine (Fig-7.3) is abundant (Ushijima, 2007) in the lower catchment and also in some area of Jirania which is occupied by brick field labours.

This *Kachha* type of latrine is a major threat to this area, because it releases all these excreta directly into the river (Ushijima et al., 2013A; 2013B). Particularly in the lower catchment of the river starting from Khayerpur up to the Bangladesh Border major concentration of slum dwellers are noticed. In this part most of the slum dwellers use *Kachha* type of latrine.

![Fig-7.3 Distribution of 4 Types of latrines along the Haora River](image)

The population pressure per latrine is more than 5 persons in the area (Fig-7.4). They release >3000 head’s excreta /km²/day (Fig-7.4). This huge amount of excreta (Ushijima et al., 2008A; 2011; 2012) is mixing with the River Haora directly.

### 7.4 Distribution of major city-outlets and domestic outlets into the river

Not only the huge amount of solid waste disposal by the slum dwellers but also a large numbers of drains are directly connected with the River Haora. Such drains release the polluted water of the city directly into the river. During field survey it is found that 9 major drains are connected with the Haora River directly and they are located only in three blocks, namely, Agartala, Jogendranagar and Pratapgarh (Fig-7.5). Out of these 9
drains only 2 drains are flowing along the right bank of the river, which means most of the drains of the north Agartala City are connected with some other river.
Apart from this, most of the slum and rural dwellers along the river have made direct connection of their domestic outlets with the river (Ushijima et al., 2008B). From the field data, it is found that 88% of the household along the Haora River have their outlet connection directly with the river. There are only 6% of the household, located at the upstream part of the river don’t have their outlet connection with the river (Fig-7.6).

7.5. Distribution of major garbage disposal sites

Except the brick field areas concentrated in Jirania, Joynagar and Bamkimnagar blocks most of the garbage hot spots are found in the lower catchment particularly in Uttar Champamura, Jogendranagar, Agartala and Pratapgarh blocks. In this area people dump all types of waste products along the river bank, which ultimately leads to the degradation of the river. On the basis of waste materials, the garbage disposal sites have been categorised into three types. Domestic disposal sites are highest in Agartala,
Jogendranagar and Pratapgarh area (pic.-3 in Fig-7.7), industrial disposal sites are found in Battala of Agartala block (pic.-1 in Fig-7.7) and plastics, organic garbage type of disposal are found in Jogendranagar CT (pic.- 2 in Fig-7.7) along the river. There are only 4 market disposal sites along the entire stretch of the Haora River namely in Agartala, Khayerpur, Mekhlipara and Champaknagar area.

Continuous disposals of garbages along the Haora River are affecting the course of the river in micro scale. From the survey in Bridhwanagar Market area it is noticed that all the market disposals are dumped (Islam, 1996) along the right bank of the river. During the observation period (2010-2012) it is seen that these disposals are creating some artificial sediment and also obstruct the water suspended sediment which leads sedimentation along the right bank of the river.
From the cross-section of the river it is noticed that between the years of 2010-2011, the river has shifted towards its left and the width of the river was reduced by about 4.8m. Between 2011-12, the river width has further reduced by 24.4 m and the existing width has become 10.6m. The maximum depth of the river has been increased to 1.4 m, which is found along the left bank at the same place. The sedimented area along the right bank is now considered as the passive course, but it will be converted as a permanent point bar (Fig-7.8).

7.6. Analysis of water quality of the Haora River

For analysing the impact of these excreta, garbage and major drains disposal (Aramaki et al., 2010; Li et al., 2010; Zhou et al., 2010), 5 water samples have been collected from different parts of the river in March 2010. These sample sites are (Table-7.1):

S1 : Confluence point of two streams (debouching point) of the Haora River
S2 : Bordowali Water Intake Point
S3 : Near Battala Crematorium
S4 : Dashamighat, Haora River
S5 : Rajnagar (Boarder area)

The 1st sample has been collected from the unaffected areas in upstream part of the river. Rest of the samples have been collected from the lower stretch in order to analyze the impacts of solid waste disposals, industrial disposal and market disposal on the river. The 2nd sample was taken near Bardowali area having high concentration of plastic factories, other chemical factories and wooden manufacturing units. In this sample water temperature has found high, since several warm pollutants are fixing with river water (Table-7.1). In addition to this, the quantity of Dissolve Oxygen was very low and the rate of Chemical Oxygen Demand was very high, because of the mixing of such pollutants. The 3rd sample was collected from the Battala area, which is the main market area of Agartala City. Moreover, concentration of hotels and restaurants are quite high in that place (Table-7.1). As mixed types of garbage are disposed along the banks in Battala, all pollutant elements were high in concentration particularly Total Dissolved Solid, Water PH and Chloride.

The 4th sample was collected from highly concentrated slum areas. As it is already mentioned that these slum areas are the source of huge amount of excreta, which mixes with river water and enhances the amount of Total Suspended Solid along with Total...
Coliform and Biological Oxygen Demand (Table-7.1). The 5th sample was taken from a place near the India-Bangladesh Border with an intention to assess the quality of the water flowing down to Bangladesh. This point has been selected because of the international issue. According to the enactment of Water (Prevention and Control of Pollution) Act as early as in 1974, no country can provide pollutant river water to the downstream country. But in this point it was found that all the pollutant elements were in vulnerable quantity and the rate was in sharply increasing trend (Table-7.1). It may become a source of Geopolitical conflict between India-Bangladesh (upstream and downstream water user countries), because Bangladesh is suffering from the effects of India’s pollution.

Table-7.1 Water quality analysis of the Haora River along the slum and rural clusters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
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<tr>
<td>Temperatures (°C)</td>
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<td>Total Dissolved Solid (mg/l)</td>
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<td>Total Suspended Solid (mg/l)</td>
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<td>8.1</td>
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<td>10.6</td>
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<td>Alkalinity (mg/l)</td>
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<td>125.68</td>
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<td>29.83</td>
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7.7. Use of river water by the slum and rural dwellers

From the water quality report it is clear that the Haora River is in great threat of degradation.

![Fig-7.9 Distribution maps of different types of use of river water by the dwellers](image)
The pollution rate in the middle-lower catchment has exceeded the tolerance capacity of the river. In the lower catchment of the river the rate of Total Suspended Solid, Total Dissolved Solid, Total Coliform and other chemical pollutants are so high that it can easily accelerate the epidemic of several water borne diseases. In spite of this increasing pollution rate most of the slum-rural cluster dwellers as well as local Government are not conscious about this matter.

From the field survey it is found that although the use of river water for drinking purpose (Fig-7.9) is restricted in the upstream part of the river where the water is less affected, but use of water for bathing and other purposes like washing clothes, cooking utensils etc are high throughout the entire stretch of the river. From Majlispur up to the Bangladesh border, almost 100% households are using river water for their daily needs (Fig-7.9). These practise may call severe epidemic within the Haora River basin in near future.

7.8. References


