

Seasonal Water Logging Problem Influenced By Tidal Influx In Kolkata: A Case Study Of Garden Reach Area(Ward 138), W.B, India

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ABSTRACT: Water logging is a severe problem in the Garden Reach area of Kolkata Metropolitan region. Water logging in Garden Reach area can be classified into two types which are rainfall induced water logging and tide water induced water logging. Rainfall induced water logging in Garden Reach is caused by local rainfall occur in the built up areas. Tidal water from river Hugli enters into the area and thus induced water logging which remains for few hours. Tidal water effect becomes very severe design rainy seasons. Water logging is a situation of flooding in built up areas caused by stagnant water for long time due to lack of proper drainage system and creates adverse impact on daily life. Among the vulnerable areas of Kolkata, Garden Reach is situated in the low lying areas of River Hugli and the communities who are vulnerably affected are mainly poor or middle class people living in shanties and old no uses in congested areas near the canals. Garden Reach falls under macro tidal range and hence it gets affected during the ban which is usually accentuated by the rains and cause water logging. Garden Reach falls under the vulnerable areas of tidal upsurge.

KEYWORDS - Ban, Communities affected, Induced water logging, Tidal upsurge. Macro tidal

Date of Submission: 07-05-2018

Date of acceptance: 21-05-2018

I INTRODUCTION

Kolkata is a metropolitan city located in the southern part of the lower Gangetic plain along the bank of the Hooghly river. The physical configuration of the city is the longitudinal extent of settlement on the levee of the river Hooghly. On the western side it is river Hooghly and in the East it is Salt Lake. The Sewerage and drainage network for Adi Kolkata made by the British were for a lesser population and the canals were adjoined with this system. But by the inappropriate pace of unscientific land use the system gradually collapsed. This older system failed to keep the purity between the drainage systems in various parts of the city. Water logging thus becomes the major problem.

II STUDY AREA

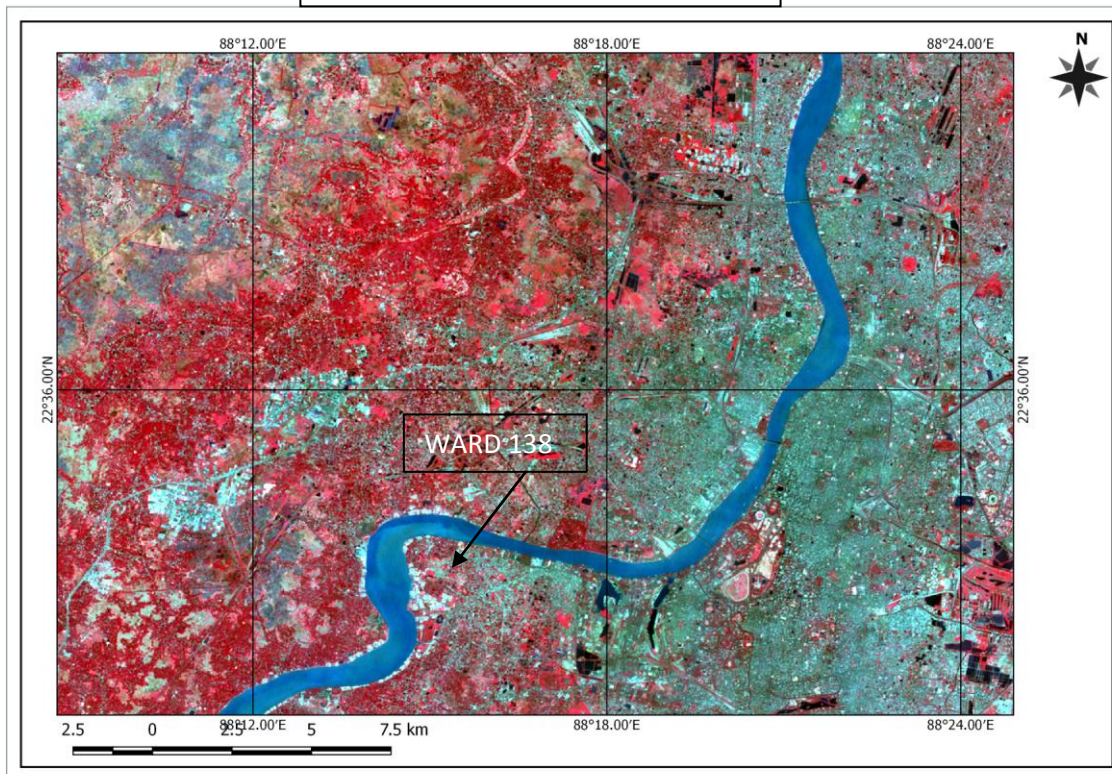
Garden Reach is a neighbourhood of Kolkata in West Bengal, India. It is situated in the south western part of Kolkata and at the eastern bank of the Hooghly river. It is located north east of Mahestala, west of Khidderpore and to the north of Taratala, Behala, Localities within Garden Reach include Matiabruz, BNR Colony (Residential area of south eastern Railway employed, Bartala, Bandhabartala, Sicklane etc.

This area is connected to the history of Nawab Wajid Ali Shah, fifth king of Oudh, who after being ousted by the British made Garden Reach his refuge.

Ward No. 138, KMC is an administrative division of Kolkata Municipal Corporation in Bourough No. 15, covering parts of Metiabruz (Panchpara, Kashyappora, Jabarhat) neighbourhood in the Indian State of West Bengal.

The boundaries of the ward no. 138 are Garden Reach Road and Dr. Abdul Kabir Road one in the North, Murray Road, Halderpara Lane and Halderpara Road in the East. S.A. Farooque Road is in the south. The railway sliding is in the west. The co-ordinates are 22°32'55.7" N and 88°16'6.8" E.

LOCATION MAP



III STATEMENT OF THE PROBLEM

Tidal upsurge affects river and adjacent low lying areas of Garden Reach and causes waterlogging during heavy rains, is a recent problem which is partly man made due to bad sewerage system. So when rainfall starts just after full moon, tidal upsurges were causing backflow in the canals and disturbing flush out of sewerage water and spreading it all over the roads causing waterlogging. Earlier the research has been done on Garden Reach to compute and discuss the various tidal characteristics from many years of observations, the mean sea level there annual and secular variations, changes in tidal regimes due to interfering with tidal flows, effects of freshets on tides surface temperature and salinity cycles, tidal movements and bores. At the mean ranges at Garden Reach have been found to steadily increasing.

Table:1 Luni Tidal Intervals at Garden Reach

MONTH	GARDEN REACH					
	HIGH WATER			LOW WATER		
	1882	1948	1958	1882	1948	1958
JANUARY	1.42	1.77	1.596	9.52	0.93	10.04
FEBRUARY	1.32	1.8	1.52	9.43	10.07	10.08
MARCH	1.32	1.55	1.49	9.47	9.87	10.1
APRIL	1.27	1.35	1.37	9.42	9.65	9.95
MAY	1.2	1.25	1.24	9.25	9.42	9.73
JUNE	0.92	1.33		9.1	9.5	
JULY	0.63	1.28	1.09	9.03	9.53	9.58
AUGUST	0.6	0.98	1.09	9.23	9.52	9.62
SEPTEMBER	0.57	0.97	1.05	9.15	9.65	9.67
OCTOBER	0.73	1.15	1.08	9.22	9.78	9.66
NOVEMBER	1.18	1.38	1.19	9.33	9.65	9.65
DECEMBER	1.28	1.7	1.49	9.18	9.88	9.87
MEAN	1.03	1.37	1.29	9.28	9.7	9.81

DIFFERENCE FOR TRANSIT AT LOCAL MERIDIAN						
	0.22	0.22	0.22	0.22	0.22	0.22
TOTAL						
	1.25	1.59	1.51	9.5	9.92	10.03

Source: Tides in Hooghly river

The mean monthly values of Lunitidal intervals for Garden Reach for the years 1882,1948 and 1958 are given Both high and low water intervals going through periodic seasonal change.

IV OBJECTIVES

The aim and objectives of the study is to evaluate the impact on environment and the population of the area :

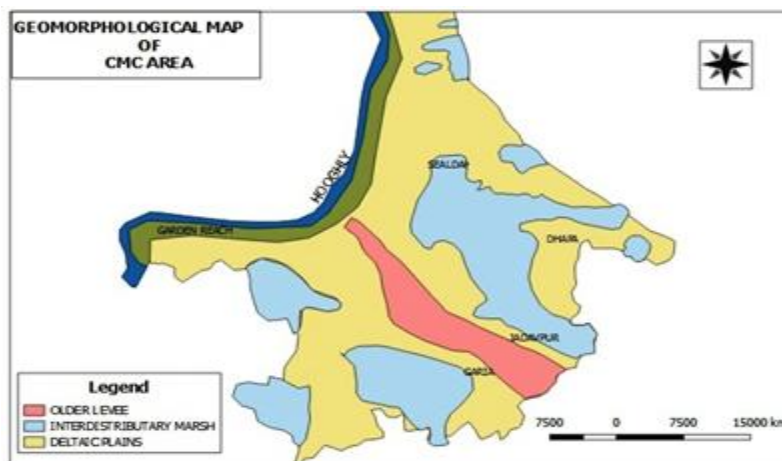
- 1) To highlight the physical condition of the area.
- 2) Analysis the period of water stagnation and impact on the human being.
- 3) To highlight the socio-economic condition of the flood affected victims
- 4) To find out the Condition of sewerage system and health issues.

V METHODOLOGY

The work is mainly done based on primary and secondary data. The primary data were collected from field survey. The secondary data of the drainage and sewerage system collected from the ward office. Literature survey, climatic data study geomorphic map study ,topographical map study were done along with pre-field work. Intensive field study along with physical and socio economic parameter based on prior data was conducted in the study area.Finally maps were prepared and cartographic representation were made with the help of quantitative and qualitative approaches.

VI GEOMORPHOLOGY OF THE STUDY AREA

The Garden Reach area is basically made up of clay which does not allows the water to penetrate and hence the highly intensive rainfall logged within the area. Due to low land the tidal water also increases and enters into the area causing further rise in the water level. This situation highly prevail when the heavy rainfall is accompanied by the full moon or new moon.



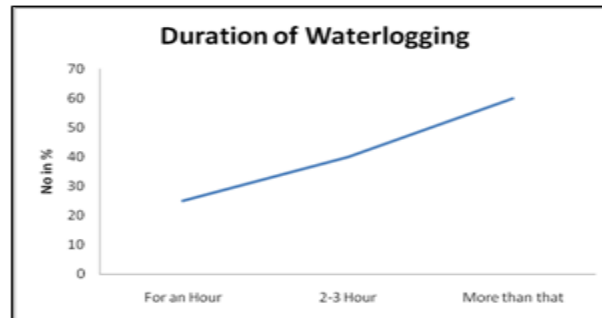
Hence, marshy land, clay layer creates hindrance for percolating the water and moreover the canals also get blocked by waste disposal which are basically untreated.

Hence this problem increases the various problem of the area such as the scarcity in availability of vehicles, closed shops, accidents and soon. The transportation system of Garden Reach is worse during the water logging period. Every year during the month from July to September people face bad day because they had to combat water logging in presence of the high tide.

VII RESULTS AND DISCUSSIONS

Garden Reach is situated on the bank of the river Hugli and it is under the younger levee. The industrial and commercial establishment along the bank of the river have their independent sewerage and drainage system draining into the river Hooghly directly. The neighbour hoods of Paharpur, Bichalighat, Akra Road, Doctor

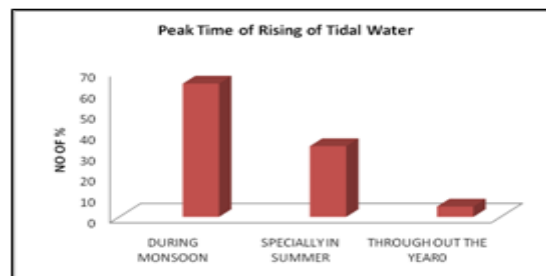
Abdul Kabir Road suffer very much in every monsoon. The incessant rains in July 2017 have drowned Garden Reach and Metiabruz to the worst levels, which was combined with high tide and raised the level of water which became equal to the road level. It really become dangerous walk through the path with manhole covers missing on a street which is submerged. It becomes very much problematic when the heavy rainfall coincides with the high tide in the Hooghly river. In ward No. 138 Dakait Bagan and Chatkal Basti is the water logging pockets along with Admojol.



6.1 Amount of Water Flow During Water Logging

In planned road setup have decayed the physical setup of the area. The moderate water logged area are mainly found in Borough XV along their roads. The population are increasing here due to heavy industrial activities and thus the vehicles are also increasing. The roads are narrow in the slum area which leads to water logging there. The improper management of roads leads the formation of pits and holes which leads further water logging.

Borough XV, ward no 138 falls under the middle length that is 36cm. Here the main reason for water logging is the improper drainage and sewerage facilities but not the road width. Hence here the negative relation is found between the water depth and road width



6.2 Character of Canals and Channels

The exciting drainage pattern of this basin is predominantly open surface drains, with Dhankheti Canal and Khaldhari Canal as the two major drainage outlets. Apart from these, there exist a large number of surface drains, which discharge the combined flow directly to the river, Hooghly basin is broadly divided into three drainage sub – basins viz – Dhankheti Canal Sub – basin, Khaldhari Canal Sub – basin and Hooghly sub basin. Dhankheti Canal carries the large portion of pollution of the area to the Hooghly. Ward No. 138 drains most of its of its water to Hooghly Canal system. Manikhali Canal provides the drainage system and sewer system for ward no. 138 in borough XV. Ward no. 138 is partly served by Hooghly basin and partly by Manikhali Canal.

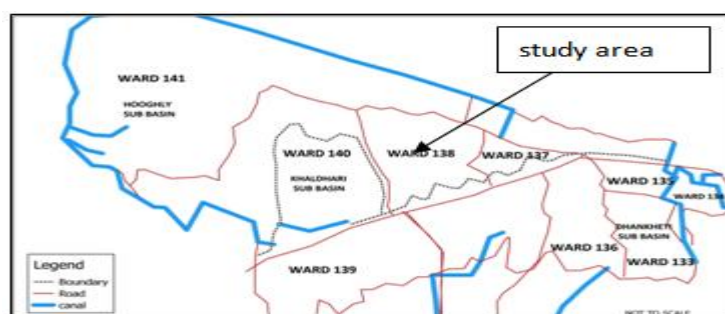


Table:2

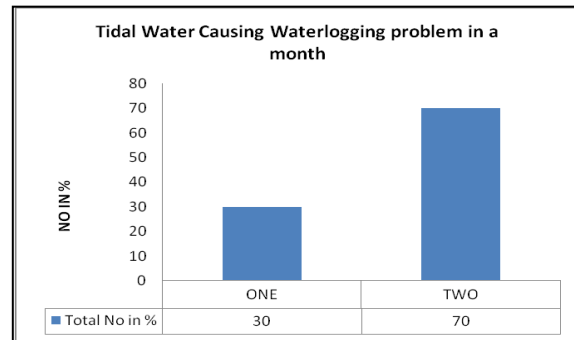
System	Wards covered		Areas served	Coverage of under ground drainage system	Canal / status	Kmc's project coverage
	FULL	PART				
HOOGHLY	1,134 & 141	6, 79, 80, 133, 135, 137, 138 & 140	CHITPORE PART OF GARDEN REACH	20%	HOOGHLY RIVER (POOR)	KEIP (PART)
MANIKHALI	128-132, 136 & 139	133, 135, 137, 138 & 140	BEHALA, TARATALA GARDEN REACH	5%	MANIKHALI CANAL AND ITS BRANCHES / (POOR)	KEIP

Source : KMC, 2005

The various industries and commercial establishment such as Garden Reach Ship Builders, Kesharm Cotton Mill, Jute Mill etc. are located along the bank of river Hugli, which causes the congestion in the flow due to waste disposal which are also responsible for water logging. These wastes are disposed in an untreated manner and thus when high tide takes place the wastes are back flushed to the area causing spreading of dirt.

6.3 Drainage Flow Behaviour and Sewage System

Garden Reach area directly flows its water to river Hooghly without help of any Canal as it is named “Hooghly System”. It has no particular canals system. It is served partly by Hooghly



canal system and partly by Manikhali canal system. Underground drainage system partially exists. The whole combined flow of water is ultimately discharged to Hooghly river through sluice gate no. 1 and 2 without receiving any treatment. This water is carried through an underground sewer along Nadial Road which is being operated by the diesel operated pumping station located at the junction of Khatal Beria and Dr. Abdul Kabir Road.

For abatement of river Hooghly, pipelines more laid along few roads under Ganga Action Plan (Gap) Scheme together with construction of interception arrangements and pumping stations. Although it was primarily meant to carry Drainage flow, but as the drainage network with the area is not fully developed, at places drainage connections have been given to the GAP sewers. As result, in reality the sewers laid under GAP are at present catering storm water flow as well.

Under the GAP system Dhankheti Canal one of the major source of pollution to river Hooghly was intercepted and the dry weather flow was diverted through trunk sewer laid along Paharpur road and Trenching Ground Road aided by two numbers of intermediaries pumping station viz. Dhankneti Sewage pumping station and Trenching Ground Sewage pumping station



The entire GAP system is under utilized at present as evident from the fact that flow reaching sewage treatment plant is about 17 mld while installed capacity is 77.5 mld. Treated effluent from sewage treatment plant is ultimately discharged to Monikhali Khal. Two pumps each having capacity of 50 lps, 7.5 m head and three pumps each having capacity of 100 lps, 7.5 m head are installed in the existing Dhankheti Sewage Pumping Station. Underground drainage system partially exists in the Nadial area. Drainage water from Satghara area pumped by the existing diesel operated pumping station located at the junction of Khatal Beria and Dr. Abdul Kabir Road to the underground sewer along Nadial Road. The combined flow ultimately discharges Hooghly river through sluice gate no 1 & 2 without any treatment

6.4 Drainage Pumping station

As the area falls under the clayey zone which prevents infiltration of water, hence to remove the water by pump force the drainage pumping station is required. The drainage water flow pumping station of Borough XV will pump the waste water to the Garden Reach Sewage Treatment plant. The treated effluent will be discharged into the Monikhali Canal. The construction of sewage and drainage network in borough XV including house connection will be made which will also cover ward no. 138. These the drainage network in this area is not fully developed.

Borough XV is located in the western part of Calcutta Municipal Corporation (CMC) covering ward no 133 to 139 and part of Maheshtala Municipality. It is surrounded by Garden Reach Road and Dr. Abdul Kabir Road in the north, Kanthal Beria Road and Railway Line Road in west, Maheshtala Municipality in the south and Ramnagar Road and Dhankheti Khal in the east.



These area includes construction of two new pumping stations and rehabilitation of one existing pumping station in ward 133 to 139 and part of Maheshtala Municipality. The new and rehabilitated pumping stations are essential to handle the increased sewage and drainage waters consequent upon the implementation of the underground sewerage and drainage in the area.

Garden Reach area which is now emerging as a perpetual water logged areas in the city and have no definite drainage and sewerage system. Borough XV

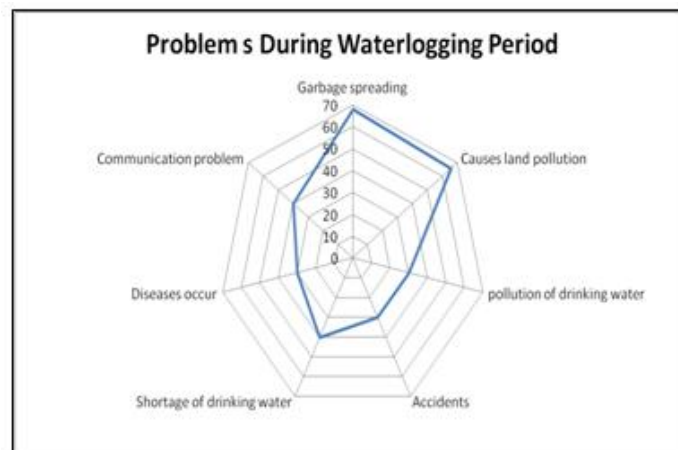
(Ward 133 – 141) had no sewers prior to the completion of GAP but Garden Reach GAP Scheme and Garden Reach Sewage Treatment Plant serve this area. But this uncovered portions of Kolkata Municipal Corporations will soon be covered under Asian Development Bank Project at a total cost of Rs. 1696 crores in 5 years, which has already started from 2001. These areas will be covered by an extensive underground combined drainage system; and if possible, some of these areas will be redeveloped with adequate road widths, in which case separate drainage system will be highly applicable for these areas.

VIII SOCIO -ECONOMIC CONDITION OF FLOOD FFFECTED VICTIMS

Among the KMC wards, ward no 138 is the ward along the Ganga with slum population. Thus, i.e. can be seen that majority of the population who reside along the river belongs the poorer section of the area. Thus, nearly 70% of the population of the ward remain vulnerable being nearest to the river side. Low lying areas near the River Hooghly such as Garden Reach are vulnerable areas of Kolkata with the hazard of tidal upsurge. People, mainly poor or lower middle class lives in shanties and old houses in congested areas near the canals.



The two major uncertainties viz., heavy rainfall and storm surge combined with high tide is a major cause for concern for the riverside dwellers of the area or ward people. This water logging during monsoon along with tidal influx in slum area lead to fast breeding of vector and quicker spread of vector borne diseases, water logging due to both rainfall and high tide also affect the slum water supply system and contamination of drinking water often leads to serious outbreak of enteric diseases among poorer section of the people. The poorer section of the people are worstly affected due to monsoonal water logging and tidal influx.



IX CONCLUSION

Water logging has become a major problem of the Garden Reach area. The area is basically situated on clay layer and younger leave and accompanied with the lack of proper drainage and sewerage facilities the problem of water logging either due to rainfall induced water logging or tidal induced water logging are increasing day by day. The most suffering people for this is the poor people who lives beside the canal in the slum area. They are largely suffering from the various kinds of vector borne diseases. Despite of certain proposed of drainage and sewage pumping stations, lack of interest for starting it is creating worst situation day by day in the area.

ACKNOWLEDGEMENTS

We are thankful to the members of the ward office providing us with the wards map and some information despite of many barriers face by the

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Debasrity Mukherjee." "Seasonal Water Logging Problem Influenced By Tidal Influx In Kolkata: A Case Study Of Garden Reach Area(Ward 138), W.B, India." International Journal of Humanities and Social Science Invention (IJHSSI) 7.05 (2018): 44-50.