

**HYGIENE CONDITION OF WATER USE
AND SANITATION FACILITIES AT URBAN SLUMS:
ANALYSIS OF PORT CITY CHITTAGONG, BANGLADESH**

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Abstract

Low income community development is the prerequisite for the overall development of a society. There are different kinds of parameters to widen community development, such as health, economic, social, a living pattern, etc. Sanitation condition is the crucial aspect that is directly or indirectly inter bond with all the parameters. To see the exact reasons behind brutal unhygienic sanitation conditions of water supply and latrine system in a low cost community, the Chittagong City Corporation area has been picked. Relevant data have been collected from field survey, consultancy with inhabitants, Chittagong City Corporation, Power Development Board, and WASA. To know the possible reasons behind the water supply and germ-infested sanitation, state of a low cost community, this paper attempts to shed some light on the tribulations behind the scarcity of safe drinking water, dirt free as well as sustainable latrine and drainage system and offensive water management.

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1. INTRODUCTION

Due to rapid urbanization, people tend to migrate from rural to urban areas and as a result the slum inhabitants are amplifying at an alarming rate over the last three decades in our country. As slum dwellers gather in urban areas for better earning opportunities, proper civic facilities should be supplied to them. But it is very unsatisfactory fact that they are deprived of their basic human facilities like water supply, sanitation, and drainage facilities, etc. In India, it is found that an extremely low water consumption pattern averaging at only 30 liters per capita-a day as well as no sewerage and safe excreta disposal facilities result in the high occurrence of waterborne diseases. Moreover, the annual malaria, diarrhea, and typhoid patients were estimated to 126, 614 and 68 per thousand population respectively [1]. Moreover, water supply and sanitation in Indonesia is characterized by poor levels of access and service quality. As reported by WHO and UNICEF, in 2010 over 40 million people lack access to an improved water source and 240 million population has no access to improved sanitation [2]. With only 2% access to sewerage in urban areas is one of the lowest in the world, among middle-income countries [3].

Since, population density of Bangladesh is approximately 1101 per square kilometer and there is no other country in the world holding this kind of high density, Bangladesh is considered the most densely populated country in the world. But in comparison with its population, the urban facilities are not increasing [4-6]. Apart from that, one-fourth of the population nowadays lives in urban areas and density of population is around two hundred times greater than the national outline and population growth is almost double from the national average [5-8]. By 2030, half the population will be living in urban areas, most of them below the poverty line [6,7]. There are 1344 slums in Chittagong city that is the second largest and the port city of Bangladesh. The current population of Bangladesh is 170 million, approximately and every day 130 million people discharge 30-50 thousand tons excreta averagely. Solid waste mismanagement is one of the leading factors for environmental degradation as well as health hazards in urban slums. In addition, solid waste misconduct is also responsible for 49 vectors borne diseases, such as dengue, in Bangladesh [4,8]. The use of hanging latrines, suspended over rivers and ponds, is three times as common in urban slums as in the country at large. This means that urban water sources are likely to be infected with unrefined sewage.

Awareness and knowledge about the cleanliness of the links between pitiable hygiene and sickness are lowest among the typically illiterate slum dwellers [9]. Pitiable hygiene contributes to towering levels of acute respiratory infections (ARIs) and diarrhea, which murders thousands of Bangladeshi children every year. UNICEF reported that, diarrhea is the cause of about 9% of infant deaths and 10% of the deaths of one to five-year-old children in Bangladesh [10]. Pneumonia is responsible for 23% of infant deaths and 26% of deaths among one to five-year-old children [10-13]. Though our basic human need is to get an adequate supply of safe drinking, yet millions of urban slum dwellers do not have complete access to an adequate and safe water supply and sanitation facilities [13,14]. According to UNICEF and WHO, in Bangladesh approximately 1.1 billion people have low or no access to improved water supplies as well as 2.6 billion people has lacked adequate sanitation facilities [10,13]. In terms of quality and quantity, water supply and sanitation facilities are supreme requirements for reviewing the living environment of the slum dwellers. Demand for services is driven by rapid urbanization, while urban poverty in fast growing slums and constricted space restrict options for interventions [14,15-18]. The presence of slums and their unhealthy environment within the Chittagong city have been an ever-present threat in terms of water supply, sanitation point of view. Improper arrangement of water supply and sanitation system is seen which have unsympathetic consequences in urban slum areas [18].

The crisis of water supply and sanitation facilities is a common feature of daily life of urban slums. So, specific investigation of the hygienic condition of water uses and sanitation facilities can provide enough information for ensuring sustainable development. In this paper, investigation of the perception and sources of drinking water, bathing purposes, washing cloth, regarding problem were investigated for all slums of the big metropolitan city, Chittagong. Moreover, several parameters of sanitation facilities were also investigated and analyzed.

2. METHODOLOGY

The topic of the study has been theorized as well as objectives have been selected. The data collection procedure, including a questionnaire survey by conducting literature reviews and sample number selection with the same procedure; and then the primary data have been collected through a household survey and the secondary data has been collected through some secondary sources (Internet, Chittagong City Corporation (CCC), Power Development

Board (PDB), WASA etc. The collected data have been analyzed through some specific statistical software (SPSS and MS Excel).

There are total 1344 slums of Chittagong City Corporation, covering approximately 565,753 households. The data were collected from 55 to 60% of slums of each ward which covers 775 slums in total. These 775 slums cover 320,000 population approximately among which 10-15% households have been surveyed covering 35,000 population. Here, No. of family is 5000 and each family has five members covering 25,000 households. The data are collected from the family head. The rest of the households are single family households.

3. PROJECT LOCATION

The total numbers of slums in the Chittagong City Corporation area are 1344 which have approximately 565753 households. For the study all slum was surveyed. Details of Chittagong City Corporation slum area are as follows in Table 1.

Table 1. Details of Chittagong City Corporation slum area

Ward No	Ward Name	No of Slum	Approx. No. of Slum Inhabitants
1	South Pahartali	17	25400
2	Jalalabad	24	33750
3	Panchlaish	30	3010
4	Chandgaon	08	4400
5	Mohara	04	4253
6	East Sholoshahar	39	12550
7	West Sholashahar	07	16500
8	Shulakbahar	45	23700
9	North Pahartali	09	32039
10	North Kattali	09	15200
11	South Kattali	12	1500
12	Shoraipara	13	14600
13	Pahartali	10	9100
14	Lalkhan Bazaar	11	47500
15	Bagmoniram	17	5595
16	Chawk Bazaar	13	3175
17	West Bakalia	08	5125
18	East Bakalia	09	7700
19	South Bakalia	293	47291
20	Dewan Bazaar	14	1640
21	Jamal Khan	50	6854
22	Enayet Bazaar	04	5236

23	North Pathantuli	13	17512
24	North Agrabad	390	17000
25	Rampur	50	6799
26	North Haliashahar	30	24650
27	South Agrabad	19	22400
28	Pathantuli	22	9621
29	West Madarbari	17	20367
30	East Madarbari	09	27500
31	Alkaran	12	8200
32	Andarkilla	08	1250
33	Firingi Bazaar	10	6040
34	Patharghata	03	21000
35	Bakshirhat	75	6921
36	Gosaidanga	17	17700
37	Haliashahar Munirnagar	03	5500
38	South Middle Haliashahar	08	2820
39	South Haliashahar	03	4580
40	North Patenga	05	9200
41	South Patenga	04	10575
Total		1344	565753

4. WATER SUPPLY AND USE

4.1.1 Perception of safe drinking water

For a maximum household of 89% of South Bakalia slum as well as 81% of the Jamal Khan slum described tube-well water can be drunk safely. On the contrary, tube well water is described as safe for only 29% of households of the South Patenga slum. Household of the Sharaipara slum (93%) is the highest who believed that boiled water was safe for drinking. For overall slums, perception of safe drinking water is shown in Figure 1.

4.1.2 Water sources for drinking purpose

88% household of the South Kattali slum as well as 79% of the Chandgaon slum use tube-well water for drinking purpose, whereas only 21.5% households of the Lalkhan Bazaar slum use tube-well water for drinking purposes. 65% household of the Lalkhan Bazaar slum uses tap water for drinking and only 8% households of the South Kattali slum drink tap water. Some other sources such Pond (3%), River (1.7%), other (0.3%) sources are used as drinking sources in few slums (Fig. 2).

4.1.3 Water sources for washing clothes

71.5% households of the Lalkhan Bazaar slum and 3% of the North Kattali slum use tap water for washing clothes. 83% households of the North Kattali slum and 2% households of the Bagmoniram slum use pond water for washing purposes as well. Furthermore, 61% households of the Chandgaon slum use tube well water for washing clothes and it is 3% in the South Pahartali slum. For overall slums, water sources for washing clothes are shown in Figure 3.

4.1.4. Water sources for bathing purpose

For bathing purposes, 62.5% households of the Lalkhan Bazaar slum and 19% households of the South Kattali slum use tap water. Along with, pond water is used by 69% households of the North Haliashahar slum. But, 79% household of the Chandgaon slum use tube well water for bathing purpose. People in these slums also use river water for the same purposes.

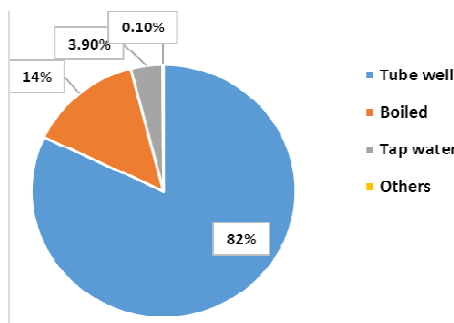


Fig. 1. Average percentage of perception of safe drinking water

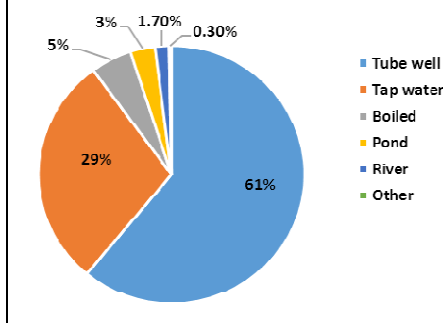


Fig. 2. Average percentage of water sources for drinking purpose

4.1.5. Storage of drinking water

Maximum households of 83.5% of the North Kattali slum as well as minimum households (1%) of the West Bakalia slum use pitcher for drinking water storage. Rampur slum (79%) is at the top of the list, whereas the North Kattali slum (13.5%) is at the bottom for the plastic bottle user to store drinking water. Among different types of containers used by the households for storing drinking water, the pitcher is the most widely used (45%) followed by the plastic bottle (39%), the cooking pot (15%), and others (1%).

4.1.6. Problems faced in fetching drinking water

Water found in a particular time in a day and particular months of the year is the main problem in getting safe drinking water in the North Agrabad slum

(88%) and this problem is listed among the least faced problems in the Lalkhan Bazaar slum (21%). For overall slums, other faced problems take more time for queue (66%), take more time for distance (43%) and take more time for less flow/discharge (51%) is shown in Figure 6.

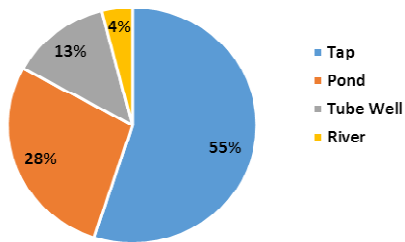


Fig. 3. Average percentage of water sources for washing clothes

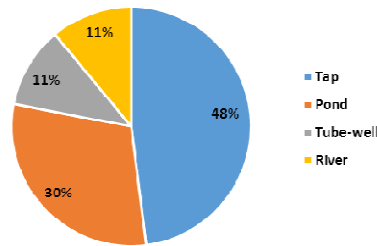


Fig. 4. Average percentage of water sources for bathing purpose

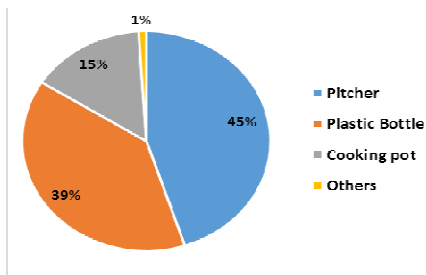


Fig. 5. Average percentage of storage of drinking water

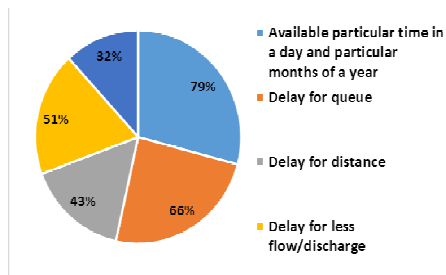


Fig. 6. Average percentage of problems faced in fetching drinking water

4.2. Latrine and Use

4.2.1 Type of latrine

On average, maximum households (62%) of the studied areas use ring slab. Most of the households (81%) of the Shulakbahar slum use ring slab whereas maximum households (66%) of the Jamal Khan slum use Ventilated Improved Pit (VIP) latrine and maximum households (51%) of the East Madarbari slum use open latrine. Very few households (11%) of the Gosaidanga use ventilated improved pit (VIP) latrine whereas minimum households (9%) of the Shulakbahar use open latrine. The average percentage of type of latrine of all slums of the Chittagong city corporation is shown in Figure 7.

4.2.2 Ownership of latrine

Most of the latrines (81%) of the Jamal Khan and the North Kattali slums are owned by the City Corporation, whereas maximum latrines (81%) of the East Sholoshahar slum are singly owned and maximum households (79%) of the East Madarbari slum are jointly owned. Very few latrines (9%) of the North Kattali slum are singly owned and at the South Patenga, City Corporation constructed only 4% of total latrines.

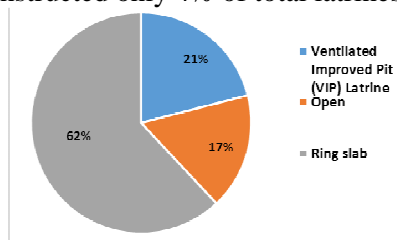


Fig. 7. Average percentage of type of latrine

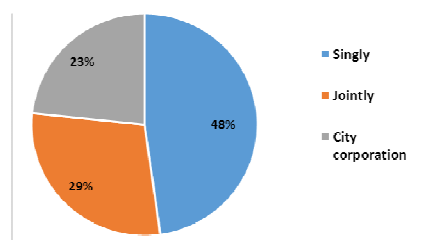


Fig. 8. Average percentage of ownership of latrine

4.2.3 Use of latrine by children less than 5 years

It is said that hygiene practice should begin from early childhood. Most children (80%) of the Jamal Khan and the Chandgaon slums dispose wastes in latrine whereas most children (71%) of the East Sholoshahar slum use latrine and most children (69%) of the Jalalabad slum throw their wastes into the road or drain. On the contrary, very few children (11%) of the Shoraipara slum use latrine.

4.2.4 Hand-Wash after using the latrine

Most of the households (75%) in the Mohara slum often wash hand, whereas most households (68%) of the Jamal Khan slum always wash their hands. Furthermore, most households (62%) of the Gosaidanga slum never wash their hands after using the latrine. Figure 10 depicts the overall condition of hand wash after using the latrine.

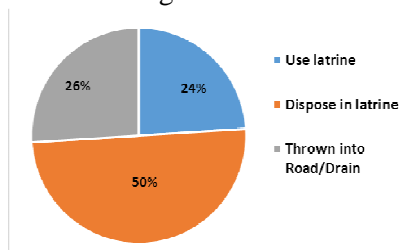


Fig. 9. Average percentage of use of latrine by children less than 5 years

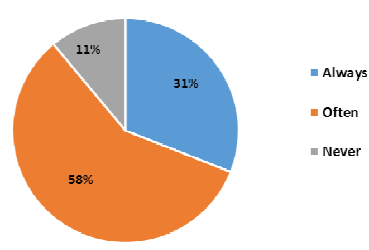


Fig. 10. Average percentage of hand-wash after using the latrine

4.2.5. Hand-Wash material

On average, most of the households (43%) use soap for washing their hands, whereas 31%, 19%, 7% of households use fly ash, soil and only water respectively. Most of the households (73%) of the North Patenga slum use only water, but the scenario is different at the Panchlaish slum because most households (69%) use soap. Regardless, the Dewan Bazaar slum is at the top (72%) of all slums where they use fly ash for washing their hands. On the contrary, very few households (16%) of the Rampur slum use soil as a hand wash material. Unexpectedly, only 9% of people of the Munirnagar slum use soap for hand washing purpose.

4.2.6 Distance of household from latrine

Most of the latrines (76.5%) of the Shulakbahar slum are 5 to 15m far from households, whereas most latrines (69%) of the Jamal Khan slum are 16 to 30m far from households. Along with, at the Chawk Bazaar slum and the Andarkilla slum, most latrines (68% and 62%, respectively) are 31-50m and 51 to 70m far from households respectively. Very few latrines (12%) of the Jamal Khan slum are 51–70m far from households, whereas minimum latrines (9%) of the Lalkhan Bazaar slum are 16 to 30m far from households. The average percentage of distance of household from latrine is illustrated in Figure 12.

4.2.7 Distance between latrine and tube-well

Most of the latrines (76%) of the South Patenga slum and few latrines (9%) of the Lalkhan Bazaar slum are 5 to 15m far from the tube-well. Furthermore, the South Agrabad slum exhibits better condition because most latrines (72%) are 51 – 70m far from a tube-well, whereas very few latrines (10%) of the South Pahartali slum are 51 to 70m far from the tube-well. Figure 13 shows an overall scenario of distance from latrine to tube-well.

4.2.8 Hygienic knowledge for wearing sandal while going to the latrine

Most of the households (46%) use sandals for having clean feet, whereas 15% of the households do not know why they use sandals. Most of the households (76%) of the South Bakalia slum and very few households (10%) of the Firingi Bazaar slum use sandal for having clean feet. Moreover, most households (71%) of the Lalkhan Bazaar slum and minimum households (7%) of the Mohara slum use sandals for keeping warm. Crucial situation exists at the South Haliashahar slum because maximum households (69%) do not know why they use sandals. On the contrary, very few households (9%) of the Enayet Bazaar do

not know why they use sandal, and only 1% of households of the South Bakalia slum use sandal for keeping warm.

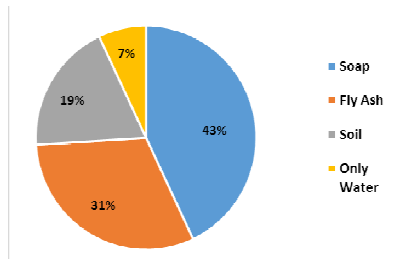


Fig. 11. Average percentage of hand-wash material

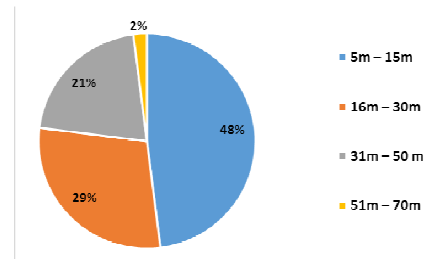


Fig. 12. Average percentage of distance of household from latrine

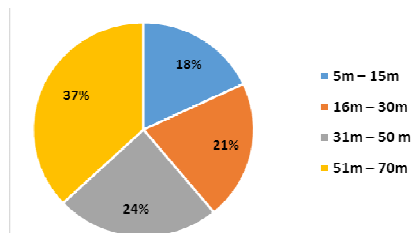


Fig. 13. Average percentage of distance between latrine and tube-well

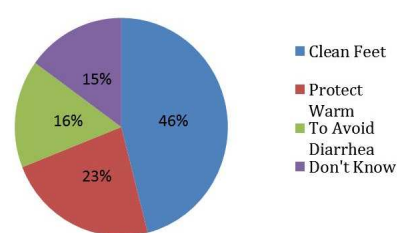


Fig. 14. Average percentage of hygienic knowledge for wearing sandal while going to the latrine

4.2.9 Knowledge of the kind of disease caused by contaminated water

On an average, most frequently occurred (40%) disease from contaminated water is Jaundice whereas 33% slum inhabitants are attacked by diarrhea, 20% people sicken by typhoid due to contaminated water. Most of the people (70%) of the North Pahartali slum are sickened by Jaundice recently. Moreover, maximum people (72.5%) of the Pahartali slum and minimum people (9%) of the South Middle Haliashahar slum are attacked with diarrhea frequently. Furthermore, most people (66%) of the Alkaran slum and a small number of people (16%) of the East Bakalia slum are attacked by typhoid as well. Though 65% people of the Jamal Khan slum are attacked by dysentery, very few people (11%) of this slum are attacked by jaundice. The overall conditions of disease caused by contaminated water are shown in Figure 15.

4.2.10 Features of hygienic latrine

Most of the people (31%) of survey slums, said that faces are not visible in latrine whereas, 25% responded that no foul smell come from the latrine. Most of the people (77%) of the West Madarbari slum report that faces are not visible in latrines, but percentage falls (17%) at the Shoraipara slum. The 68% people of the Patharghata slum, but only 8% of the Rampur slum’s inhabitants claims that no foul smell come from the latrine. Apart from that, maximum response (76%) about sealed latrines comes from the South Pahartali slum dwellers whereas the worst situation found in the Firingi Bazaar slum (6%). Interesting and healthy results obtained from maximum people of the Jamal Khan slum dwellers about hand-washing facilities (75%) and ventilation systems (73%). On the contrary, poor situation observed at the Gosaidanga slum about hand-washing facilities (11%), and ventilation systems (13%). At Figure 16, a bar chart illustrates the average features of the hygiene latrine for all slums.

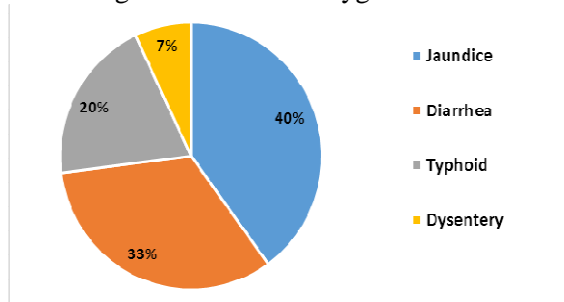


Fig. 15. Average percentage of knowledge of the kind of disease caused by contaminated water

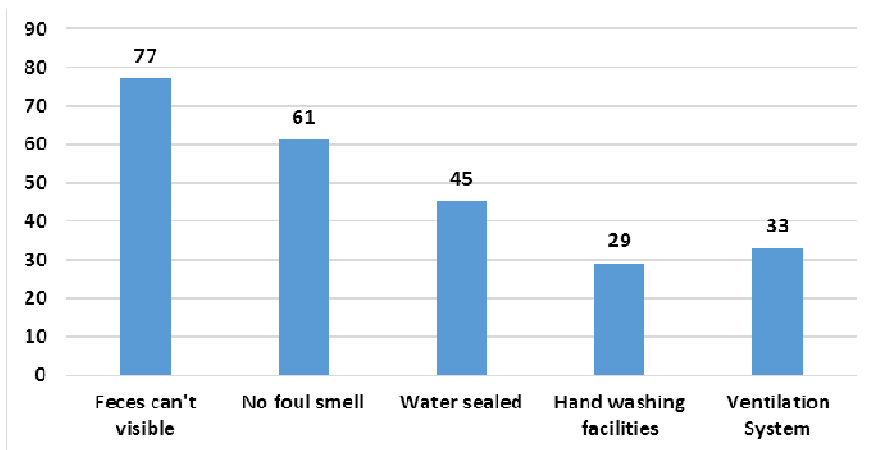


Fig. 16. Average percentage of features of hygienic latrine

5. CONCLUSION

According to the inhabitants, major water sources are tube well and tap water. Moreover, for drinking purpose maximum slum dwellers prefer tube well water. Water found in a particular time in a day and particular months of a year, is the main problem in getting safe drinking water. On the other hand, most of the inhabitants use ring slab latrines and these are singly owned mostly. Averagely, most of the children less than 5 years dispose their wastes in latrine as well as most of the households use sandal for having clean feet. The diseases caused by contaminated water are jaundice, typhoid, dysentery, and diarrhea. The Chittagong City Corporation has a great importance as a local government. Thus, appropriate legal, institutional and community action must be taken by promoting sustainable development here. Such a move will lead to regulate a well-planned settlement to improve the living environment and to reduce urban slum pollution. The data of this paper might help the local government to develop the hygiene facilities at a specific slum as a priority basis.

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REFERENCES

1. Karn S.K., Harada H.: *Field survey on water supply, sanitation and associated health impacts in urban poor communities—a case from Mumbai City, India*. Water Science and Technology, 46, 11-12 (2002), 269-275.
2. *Joint Monitoring Program for Water Supply and Sanitation of WHO and UNICEF: Indonesia data 2010*, retrieved April 21, 2013.
3. *International Benchmarking Network for Water and Sanitation Utilities: Latest*, retrieved on October 17, 2010.
4. Seraj T. M., Islam M. A.: *Detailed Area Plan: Proposals to Meet Housing Demand in Dhaka*, Dhaka Metropolitan Development Area and Its Planning Problems, Issues and Policies, Bangladesh Institute of Planners, 2013.
5. RAJUK: *Final Report of Group E, Preparation of Detailed Area Plan for DMDP Area*. Dhaka: RAJUK, 2010.
6. Islam, F.: *Town Planning and Planners in Bangladesh*, United Kingdom, Cliff Hague World View, 2011.

7. Roy T.K., Rahman S.: *Planned Urban Decentralization for Sustainable Development of Bangladesh*, Journal of Bangladesh Institute of Planners (BIP) on World Town Planning Day, 2013.
8. Government of Bangladesh: *The Millennium Development Goals Progress Report 2009*. General Economics Division, Planning Commission, Government of the People's Republic of Bangladesh, 2009.
9. South Asian Conference on Sanitation (SACOSAN): *Bangladesh Country Paper*, Ministry of Local Government, Rural Development and Cooperatives. SACOSAN IV. 4 - 7 April, 2011.
10. WHO/UNICEF: *Progress on Sanitation and Drinking Water 2010 Update*, 2010.
11. ADB: *Urban Sector and Water Supply and Sanitation in Bangladesh: An Exploratory Evaluation of the Programs of ADB and Other Aid Agencies*. Sector Assistance Program Evaluation. Manila, 2009.
12. Alam, M.: *Ecosan in Bangladesh*, UNICEF, Bangladesh, 2010.
13. AusAID: *Water and Sanitation Initiative Identification Mission - South Asia*. Concept Document. August 2009.
14. WSP: *An Overview of the Economic Impacts of Inadequate Sanitation in Bangladesh*, World Bank Water and Sanitation Program, ADB and Australian AID, 2011.
15. Government of Bangladesh: *Millennium Development Goals: Needs Assessment and Costing 2009 - 2015*. General Economics Division, Planning Commission, Government of the People's Republic of Bangladesh, 2009.
16. World Bank Dhaka: *Improving Living Conditions for the Urban Poor*, Bangladesh Development Series Paper No. 17. World Bank Office, Dhaka, 2007.
17. Bangladesh Bureau of Statistics: *Preliminary report on Household Income and Expenditure Survey*, Statistics Division, Ministry of Planning, 2011.
18. WSP: *Long Term Sustainability of Improved Sanitation in Rural Bangladesh*, World Bank Water and Sanitation Program., 2011.

WYPOSAŻENIE SANITARNE W ŚLAMSACH MIEJSKICH -
ANALIZA NA PODSTAWIE MIASTA PORTOWEGO CHITTAGONG,
BANGLADESH

Streszczenie

Obszary takie jak rozwój gospodarczy, bariery społeczne, standard życia i zdrowie, ściśle związane są ze stanem wyposażenia sanitarnego. W artykule dokonano analizy warunków sanitarnych związanych z zaopatrzeniem w wodę i odprowadzeniem ścieków dla społeczności o niskich dochodach w obszarze Chittagong City Corporation. Dane zostały zebrane podczas ankietowych badań terenowych, rozmów z mieszkańcami, z bazy Chittagong City Corporation, Power Development Board i WASA.

Słowa kluczowe: niskie dochody, higiena, warunki sanitarne, zaopatrzenie w wodę, system odprowadzania ścieków

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