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RESEARCH ARTICLE

DYNAMICS OF POPULATION AND PLANNING FOR WASTE WATER MANAGEMENT: A CASE STUDY OF BILASPUR CITY

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ABSTRACT

Wastewater may even contain bacteria and other organisms which, when eaten by animals, may in turn infect the people who eat the contaminated meat. The health risks in relation to the level of contamination and the re-used wastewater control measures. The Sanitary workers will be allotted some specified area and after sweeping they would collect the waste in the form of heaps on the street side. In the Bilaspur city, office complexes etc. sweeping should be carried out by the sanitary workers daily. For proper solid waste water management, suitable tools, equipment & vehicles in sufficient numbers are necessary for handling, lifting and transportation of waste. The sanitary workers involved in drain cleaning may be given tools like seamless handcarts and shovels. It is also recommended to maintain separate roster for cleaning of drains. Burning of waste causes hazardous/toxic gaseous pollutants and must be avoided.

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INTRODUCTION

The Study will take sufficient precautions for developing per system for sewage treatment in the labourer and worker colonies. For this purpose septic tanks and soak pits shall be provide for individual dwellings Water pollution is one of the most serious environmental problems facing the world. Water pollution exacerbates the problem of water scarcity at local and regional level by reducing the amount of water available for productive purposes. Water pollution comes from many sources, including untreated sewage, chemical discharges, and spillage of toxic materials, harmful materials leached from land disposal sites, and atmospheric pollutants dissolved in rainwater. The Municipal Corporation authorities will ensure proper waste disposal by adopting various disposal methods like incineration, composting, etc. No dumping of solid waste should be allowed near any water body or a stream. The organic waste will be suitably processed to form compost, which can be used as Bilaspur city. In addition to the above-mentioned activities, proper sanitary facilities would also be provided at the labour / staff colonies. Septic tanks of appropriate size will be constructed. The wastewater generated from the colonies will be collected and disposed in specifically designed soak pits. Therefore, waste water and sewage generated will not be allowed to flow into the river, or any stream. Proper sanitary facilities will be provided at the colonies as the standard municipal design.

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Ten community latrines of at least 8-seat facility each will be constructed at the suitable locations in the colony area. Water and sanitation services are basic necessities of a community and are most essential conditions for development, as they play an important role in improving health and quality of life (Maeda *et al.*, 1996). Inadequate water and sanitation coverage is one of the most serious environmental problems.

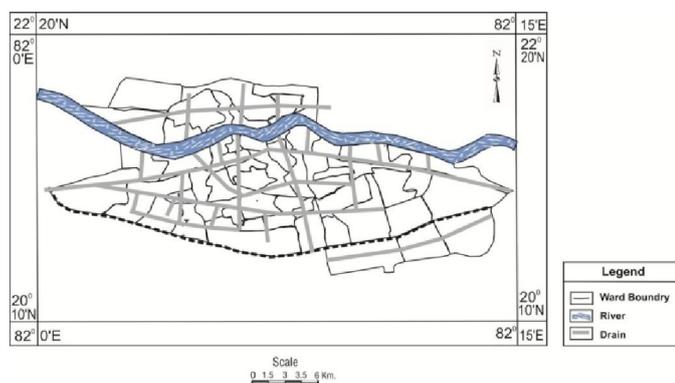
Object of the Study

- Waste Water characteristics are expected to change due to urbanization, increased commercialization and standard of living. Present trend indicate that uncontrolled growth in urban area has left deficient in infrastructure service such as sewerage, water supply and solid waste management.
- The study is to develop an action plan for effective solid waste management for providing clean and hygienic conditions in the cities and reduce the quantity of solid waste, which has to be disposed off in sanitary landfill facility after recovery of waste materials and energy from solid waste.
- To assess the quantities and types of solid wastes generated, assess the efficacy of present disposal method and to propose suitable methods of disposal.
- To assess the amounts of sewerage generated and its quality.
- To assess the efficiency of existing sewage system and propose sewage treatment facilities.

Study Area

Bilaspur city is the district headquarter of Bilaspur District, situated in the Eastern part of Chhattisgarh State. The Bilaspur city is approximately 400 years old and the name "Bilaspur" has been originated from the Fisher Woman named "BILASA". The city is located at a distance of 120 Km. away from the capital city Raipur on the North and is the second biggest city of the Chhattisgarh State. The city administration is through Bilaspur city Municipality. In the year 1867 the Bilaspur Municipality was established and later upgraded to the Bilaspur Municipal Corporation (BMC). Bilaspur city is set up at the southern part of Bilaspur District and located at 22°05' N latitude and 82°13' E longitude. The city is on the bank of Arpa River which flows from North – West to South – East directions, thus dividing the city in two land mass. Total geographical area of Bilaspur city is about 46.12 Sq.Km. and it extends 8 Km. from North-West to South-East on the both side bank of Arpa River. The city is 262 meters above the mean sea level. According to census of India 2011 total population of city is 3,35,293.

Bilaspur City: Major Drain



Map No. 1 Bilaspur City: Major Drain
Source: Municipal Corporation, Bilaspur (C.G)

Boundaries

During the last 50 years and many village located on the fringe, now form a part of the urban agglomeration. Other villages situated in close vicinity of Bilaspur are also gaining urban character.

Boundaries of Bilaspur city:

North: Khamtarai, Birkona, Koni, Mangla and upto the northern limit of village Uslapur.

West: Ameri, Tifra, Sirgitti and up to the Western limit of village Fadhakhar.

South: Mahmand, Dheka, Domuhani, Deorikhurd, Lingiyadih and upto Souther limit of village Mopka.

East: Mopka, Bhatarai and upto Eastern limit of village Khamtarai.

Source of Waste Water

Domestic

Pond: To assess the condition of ponds in the City, after survey some of the ponds I found that

In all there are 9 ponds out of which 6 ponds have low water level and have no water almost throughout the year. Some of the encroachment is noticed around these ponds. About 3 ponds are good in condition and some beautification work already completed in these ponds. It is found that the ponds that are located in the Bilaspur city core areas and densely populated areas do not have water or the water level is decreasing as the built up masses around the ponds reduces the runoff into the ponds. For example: in Bandha Talab the water level is dried up because of their close proximity to the settlements or slums like in ward no.12, slum settlements are found all along the Bandha Talab. The same situation also seen in Jharabar Jatia Talab area of ward no. It is noticed that some drains have their outlet directly into the ponds without any treatment which results in pollution of pond water. It is observed in slum areas, most of the areas along the ponds are encroached and there is hardly any space left. Households along the ponds dispose their septic outfall directly into the ponds, which results in unhygienic condition. It also noticed that people use ponds for open defecation which causes unhealthy sanitation condition (Patterson, 2000). In some areas, it is noticed that the whole of the pond is covered with water hyacinth plants and people face difficulty in using the water of the ponds. It has been observed that people also bath and wash their clothes in pond's water. Based on the primary survey analysis and consultation with the stakeholders, some of the suggestions that are come out for the conservation of the ponds are:

- Utmost care should be taken to conserve the ponds and prevent from encroachment.
- The water storage of the ponds can be improved by deepening the pond and removing the water hyacinth from the ponds.

Ponds location

Jatia Talab – Jarhabhata, Talapara Talab, Talapara. Magarpara Talab, Magarpara. Tarbahar Talab, Tarbahar. Mama- Bhanja Talab, Near Shiv Takies Karbala Talab, Behind Telipara. Torwa Talab, Bandhwapara

Sweeping of Streets, Public Spaces & Drain Cleaning

In the Bilaspur city colonies, office complexes etc. sweeping should be carried out by the sanitary workers daily. Sweeping should be carried out between 6 to 8 am in the morning and between 2 to 4 pm in the afternoon. The Sanitary workers will be allotted some specified area and after sweeping they would collect the waste in the form of heaps on the street side. These heaps would be loaded into handcarts and these handcarts will be emptied at waste collection points. (Kumar, 2005) For proper solid waste Solid Waste Management, suitable tools, equipment & vehicles in sufficient numbers are necessary for handling, lifting and transportation of waste

Sanitation system

The entire City is divided into four sanitary zones. There are 14 wards, in sanitary zone 1, 10 wards in sanitary zone 2, 15 wards in sanitary zone 3 and 09 wards in sanitary zone 4 and the remaining 07 wards comes in the area of South Eastern

Ward No.	Status
1.	Most of the drains in the ward do not have proper slope which results no flow of waste water. In some areas it is also found that the drains are not channelized properly. All the drains are of open type which invites dumping of waste in drains results blockage in the flow of water.
2.	In this ward all of the drains are of open type. Most of the drains are damaged which results improper flow of waste water.
3.	Most of the drains in this ward are of open type. In Thetha debris Slum, there is no coverage of drainage system resulting blockage of water on road.
4.	Most of the drains in this area do not have proper slope and depth. In Talapara basti, there is no proper outlet of the drains and the drains are not channelised properly. The entire outlet in this area is finally disposed into the debris creating unhealthy conditions.
5.	All the drains in this ward are of open type. In some areas the drains are damaged and very narrow. So it is found difficult to clean the drains.
6.	In ward No.6, the major drains are directly disposed into the river Arpa. In areas like Nauapara Slum and Chatapara, the drains do not have proper depth resulting over flow of the waste water from the drains.
7.	From the primary survey it is found that in many areas the drains are damaged resulting no proper flow of water. People also dump their garbage in the drains resulting choking of drains.
8.	The survey team visited Tehsil Gali, sheetla Mandir basti area and it is found that most of the drains are choked due to household wastes. It is also found that in some areas, there is open defecation in the nallas basically by the children.
9.	In Ageynagar, all the drains are of open type. The water in the drains gets blocked because of the garbage in the drains. In Bharti Nagar of the ward, very less area is covered under drainage system.
10.	In Mother Teresa Nagar Ward, most of the drains are damaged and not maintained properly. Due to improper slope, there is no flow of water.
11.	In Satnami Slum, Ambedkar Mohalla, and Police lane area the ward, it is found that there is no proper slope in the drains. Some of the areas also not covered with drains in the slum areas.
12.	In slum areas like Fakir mohalla, Mini mata Mandir areas, there is no proper outlet for the drain water. In some areas the houses gets flooded due to improper discharge of water, which creates unhygienic condition.
13.	In ward No.13 many areas are not covered with proper drains. Most of the drains are of Kutcha type. People dump their household waste in the drains resulting blockage of drains in many places.
14.	In ward No.14, all of the drains are open type and invites dumping of garbage, which results improper flow of water. Due to improper slope and depth of drains many areas get flooded during rainy season.
15.	It is found that in areas like Ghasidas Mohalla, Nawapara, FCI road basti areas the drains are not properly constructed. The drains do not have proper outlet and gets choked with garbage in it.
16.	Most of the drains are not constructed properly with good slope and depth. People also dump their waste in the drains mainly in slum areas. All the households have direct overflow of the septic tanks into the drains.
17.	Most of the drains do not have proper outlet. People dump their garbage into the drains resulting improper flow of waste water in the drains.
18.	I visited Lohar gali, telipara of the ward and found that in the slum areas of the ward people dump their waste in the drains which results in choking of drains in many places.
19.	In ward No.19, it is found that in Salim galli, Akbar Khan bada and Suruchi Bhojanalaya lane the drains are not cleaned properly. There is also choking of drains in many areas due to garbage in the drains.
20.	From the primary survey it is found that in ward no.21, many areas do not have proper drainage system and people dump their waste in the drains. In Gondpara, most of drains are choked with mud and garbage and there is no proper flow of water.
21.	In Subhas Nagar of Ward No.21, all the HH have direct outflow of the septic tanks into the drains. In these areas also open defecation is done along some nallas by the children.
22.	In areas like Pachright, Kadampara Basti and bazar ward all the wastes including organic waste from bazar area also dumped into the drains results in blockage of water in drains.
23.	In this ward it is found that many areas the drains are encroached. So the sweeper of the Nigam faces problem in cleaning these drains. Also the drains do not have proper slope.
24.	In Nirala Nagar of ward No.24, the drains do not have proper outlet, depth and slope results water logging in many areas. In Chandua Bhatta, the water is not flowing properly because of slope and garbage in it.
25.	It is found in Karbala area of ward No.25 many drains are covered with mud which results water logging in many areas. The drains do not have proper outlet and gets collected in a vacant plot in the area.
26.	In ward No.26, the drains are not proper. There is no flow of water due to improper slope. Some of the drains also get blocked due to the household waste which people generally dump in the drains.
27.	It is found from the primary survey that in many areas in Baniyapara the drains are covered with mud and garbage. The drains also do not have proper slope and depth.
28.	In the primary survey it is found that in Pokhatpara of the ward most of the people use the drains for open defecation. In other areas of the ward, most of the drains do not have proper slope and there is not proper flow of water.
29.	Some areas are not covered with drains in the area. In some areas, the tertiary drains disposed in the big nalla which is flowing in the ward.
30.	All the drains in ward No.30 are of open type. And it is found that most of these are damaged and not maintained properly. People dump their household waste in these drains resulting blockage in many areas.
31.	Most of the drains in this ward are not having proper slope, so there is no proper flow of water. Dumping of garbage also results blockage of drains in many areas.
32.	All the drains are of open type which invites dumping of waste in drains results blockage in the flow of water. In some of the areas, proper drains have not constructed yet.
33.	In ward No.33 all the areas are covered with open drainage system. The drains are also very narrow and some of the areas along the drains are encroached which results in difficulty in cleaning the drains.
34.	I visited Yadav bada, Tikrapara and Munsiram galli areas of the ward and it is found that most of the drains are damaged. In some areas due to improper flow of water, waste water spills over to the roads.
35.	In Sitaram Mandir mohalla of ward No.35, most of the drains get choked up due to garbage in it. The waste water gets stagnant as there is no flow of water and creates unhygienic condition.
36.	In ward No.36 all the drains are of open type. I visited Yadav mohala, Patel para of the wards and found that there is no proper flow of water due to improper slope and most of the drains are blocked due to garbage in it.
37.	In ward No.37, from the primary survey it is found that most of the drains are choked due to the dumping of waste into the drains.

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38. In slum areas along railway line of ward No.38, most of the drains do not have proper outlet. All the drains are of open type in the ward and people complained about the improper cleaning of the drains.
39. It is found in ward No.39 most of the drains are damaged and not maintained properly. In areas like Chuchuhiyapara, Annapurna Vihar there is no proper flow of water. The waste water gets choked in drains.
40. The survey team visited Subhas Chowk area and Lav Kus galli of the ward and it is found that most of the drains get choked with garbage. In some areas the drains are damaged and not maintained properly.
41. Most of the drains are in damaged condition. Due to blockage of garbage in drains water overflows from the drains into the roads. Most of the drains do not have proper slope.
42. Many areas in ward No.42 are not covered with proper drainage. In most of the places the drains are damaged and there is no proper flow of water in the drains.
43. In ward No.43, I visited Patan para, Chantidih areas and it is found that most of the drains are damaged.
44. I visited Sanjay Nagar, Chantidih of ward No.44 and it is found that in interior areas of the wards most of the drains are damaged and do not have proper slope results blockage of water.
45. In Imlibhatta area of the ward, some of the drains are in incomplete stage which results overflow of waste water in the roads. In other areas it is found most of the drains are damaged and not maintained properly.
46. In the visit to Oriya basti, Kapil Nagar, Jhopadapara of ward no.46, it is found that in some areas there is no proper drains which results water logging in many areas.
47. In Ward No.47, all the drains are of open type. Some drains do not have proper outlet, so in some areas the outlets are directly disposed in open fields or debris.
48. In ward No.49, I visited Mata Choura Area, Dahyanpara area and it is found that most of the drains do not have proper slope. In some areas the drains are damaged and not maintained properly.

Problems and Suggestions

S. No.	Issues/ Problems	Suggestions
1	Road from CMD Chowk to Science College (Ward No. 42) Poor condition of roads due to excavation for laying sewer	Construction of good quality roads to make convenient to travel and would add to the City's aesthetic look.
2	Water Supply. Poor quality of water due to old pipe lines (Ward No. 47) insufficient supply of water near Naya Bridge in New Sarkanda	Replacement of old water supply pipes Replacment of new pump house in Const Chatterji Gali (Ward No. 47)
3	Drainage Absence of drains jammed drains from Blocke Devender Nagar to Auraya Chowk	Volume of the drain should be decided The visa per requirements is to be constructed according to the Drain
4	Spread of garbage near Muktidham Poor maintenance of public toilet (Ward No. 41) Dumping of collected garbage near Naya Bridge Garbage collection and transportation do not take place in an organised manner Not enough sweepers	Related to sanitation should be Works given to local self-help groups (SHG). meetings should be held between Month BMC officials and citizens on the issues related to waste management lent of dust bins at suitable places Place
5	Others Requirement of community hall (Ward Nos. 40 & 47) Spread of garbage around pond (Ward No. 41) Due to encroachments Municipality faces difficulty in service delivery No infrastructure services like road, drain, water supply line, available in slum areas of Ward No. 42 I logging at some places in Water Ward Nos. 45, 46 & 48	Nets and participation among Aware citizens inset management to make the City clean. fiction of on in Ward No. 41 Beauti Laying of red sand on roads in slum areas of Ward No. 42 nets among citizens about their Aware rights and duties with respect to the BMC

Identified Issues/Problems & Suggestions in 3rd Zonal Consultation

S. No.	Issues/ Problems	Suggestions
1	Waste Management I solid waste management, mostly due to Poor shortage of man power	Places should be marked, garbage bins should be provided for waste collection. persons to be appointed for efficient Two management
2	Water Supply Wastage of water supplied by BMC. Poor quality of supplied water	And good quality taps should Strong be placed Duration of water supply water should be reduced.
3	Drainage Sizes of drains are not as per requirement. At some places they are too wide or narrow Slope of the drains does not follow the slope of the area.	Volume of the drain should be decided as per requirement. should be constructed according Drain to the slope of the area
4	Encroachment Water recharging system gets disturbed due to encroachment on ponds (e.g. mama- bhanja). It eliminates open spaces element on drains makes it difficult to clean them elements on roads make movement difficult	should be beautified. The pond Encroachers on the roads should be strictly punished
5	Transport Bad condition of roads makes it difficult to run vehicles on the road	Road Construction of new roads maintenance of old roads Proper Quality of roads should be taken care

Source: Based on field Survey, 2012

Central Railway Administration. The zone wise details of the Bilaspur town are given in brief in Bilaspur Municipal Corporation (BMC) has constructed a small underground sewerage system with the help of Public Health Department of the State Government. This sewerage system caters to about 45-50% of the wards in the Bilaspur city and the remaining

part flows through surface drain and nalas. An open drain Jawali Nala has been constructed for this purpose, which covers about 25 wards. The organization structure of the sanitary/solid waste management system of Bilaspur Municipality is given below

City Sanitation Scenario

As per the data provided by the Municipal Corporation, all the wards are covered with open drains. Therefore the entire population has access to drainage system. However the problem is that all the drains are open and therefore subject to abuse (Clark, Viessman and Hammer, 1977). Along some of the main roads, the Corporation has covered the drains. Jawali and Torwa in Bilaspur city, the combination of natural and constructed drains forms a rectangular drainage pattern ultimately discharging into Arpa River. Some of the drains are unable to discharge in the river and end up in local depression thus creating Dabri.

Table 1. Bilaspur City: Arpa Basin Drainage with Tributaries

Sl. No.	Driange Basin	Length (K.M)	Area (km2)
1	Maliniy Nallaha	95	623
2	Sonkachr Nallaha	64	506
3	Phoolwari Nadi	10	83
4	Moti Nallaha	28	236
5	Madobe nallaha	23	188
6	Jawos Nallaha	8	90
7	Kadal Nallaha	14	145
8	Sakari Nallaha	46	211
9	Sat Nallaha	30	168
10	Gahila Nallaha	12	46
11	Chapi Nallaha	15	85
12	Kharang River	118	1238
13	Gokhani Nallaha	9	25

Source: Pollution Control Board, Bilapur (C.G)

Environment Management and Sustainability

Sustainability includes environmental, ecological, socioeconomic, physical, technical aspects and this requires new education and training awareness and political will. Urban governance with participatory development process is emphasized in management (Ghosh and Mukherjee 1998). A sustainable development of the region depends on abatement of pollution which in turn must involve community and youth participation. Integrated water management is most vital for poverty reduction, environmental sustenance and sustainable economic development in world because water has the potential for both disease causation and prevention.

Availability of water in any parts of the world is under tremendous stress due to growing population, rapid urbanization, increase in per capita consumption, Industrial growth and other demands for maintaining ecology. It is to be stressed that no development of water storage is not a viable or available option in Bilaspur city, due to the large temporal variations in the river flows in Indian monsoonal climate.

Conclusion

Growing Bilaspur city today are coming to recognize that waste water problems cannot be addressed effectively by conventional approaches which are geared merely to collecting and disposing of wastes. Waste water removal also varies by neighborhood, with the poorest neighborhoods generally reporting the greatest problems with inadequate or non-existent waste removal, reflecting the general pat- terns of social segregation. Poor drainage and clogged gutters ran a close second, which is also the result of improper waste disposal.

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