RIVER GANGA ROUTINELY RECEIVING SEWAGE FROM ASHRAMS AND HOTELS IN RISHIKESH AND HARIDWAR CITIES-A CASE STUDY

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Abstract: From how many Ashrams and Hotels, how much quality of sewage loaded into main stem of river Ganga in Rishikesh and Haridwar is main intention of this study. Total number of people in individual Ashram and Hotel and water demand per person per day, have measured the quantity of fresh water consumed. In Rishikesh and Haridwar, 150 to 200 litters of fresh water required per person per day and bore well and Jall Sanstha are the sources of fresh water. Individual Ashrams and Hotels, which consumed fresh water from bore well and Jall Sanstha also have not installed flow meter, confirmed loaded over sewage into main stem of river Ganga routinely. Total 68 and 84% of individuals Ashrams and Hotels are connected with STPs for sewage disposal. But Identified 12 sewage carrying Nallahs and 46 MLD of over flow raw sewage falling into main stem of river Ganga routinely in both Rishikesh and Haridwar and suggested year of the STP established and performance of the STP is inversely proportional.

Key word: Ashrams, Hotels, Pollution load, River Ganga, Sewage, Trapping, Upper stream and Water demand.

INTRODUCTION

Rishikesh and Haridwar populations are around 1, 02, 138 and 2, 28, 832 respectively (Census, 2011 and Kazmi *et al.*, 2013). Although being a famous religion and tourist place, the floating population is much more that it shows through census. Therefore, Ashrams and Hotels has also been considered for the study to find out the domestic load. The first-ever water pollution audit in India carried out by the Comptroller and Auditor General (CAG) has found several legislative, administrative and institutional lacunae in the way that the issue of water pollution is dealt with by Indian states and the Central Government. The audit said that despite 27 years of implementation of the programme to control pollution, water in major rivers is critically polluted (CAG, 2011). Therefore, it could be inferred the alarming situation for most of the 14 major, 44 medium and 55 minor river basins in India (CPCB, 2009).

Unplanned water resource consumption and releasing of untreated sewage by Industrial clusters, Ashrams, Hotels and Apartments set threat to the main stem of river Ganga in the regions of Rishikesh and Haridwar. Most of the industrialist and developers granted aquatic ecosystem are taken as the dumping grounds for domestic and industrial waste. The major sources of sewage which contribute to water pollution of river Ganga in the region of Rishikesh and Haridwar are Ashrams, Hotels and Apartments as well as industries, urbanization etc. These Ashrams, Hotel and Apartments produce large amount of sewage and main cause of water quality degradation of river Ganga (Trivedi, 2010).

A variety of activities related to development, industrializations, Ashrams, Hotels, Apartments, Rafting, tourism and religion-touristic activities contribute towards increasing quality deterioration within Rishikesh and Haridwar cities.

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The municipalities of these cities established before 47 years, so far could not use any modern technique effectively for the Sewage Treatment Plant (STP) in Rishikesh and Haridwar cities and large quantity of this sewage is routinely disposed directly into the main stem and tributaries of river Ganga. Therefore, the major source of river Ganga pollution is discharging of untreated sewage from the fast growing urban centers located along the river which is mostly organic waste, sewage, trash and food item.

More than thousands of Ashrams, Hotels and Apartments domestic sewer drains are routinely falling directly into river Ganga within Rishikesh and Haridwar cities (Sushil Bhadula and Joshi, 2012).

METHODOLOGY

Study Area

Present study was carried out on the stretch of about 23 Sq. Kilometers from Rishikesh (30.103°N 78.30°E and 372m above the sea level) to Haridwar (29.956°N 78.17°E and 314m above the sea level), river Ganga front cities of Uttarakhand, India. The state of Uttarakhand is primarily a mountainous region, consisting of thirteen districts of predominantly area and lies from 200 to 7,800m above mean sea level. The geo-graphical boundary of the state goes with Tibet in the North, Himachal Pradesh in the West and North-West, Gangetic plains of Uttar Pradesh in the South and Nepal in the East. River Ganga after travelling of more than 140 Km from Gaumukh pass through Rishikesh and emerges into Indo-Gangetic plains at Haridwar where it swells into a might system of about 750 meters wide.

Figure 1: Study Area (Rishikesh and Haridwar) river Ganga front cities of Uttarakhand, India.

Investigation

In this context, Department of Forest and Environment, Jal Nigam, Jal Sanstha and Environmental Protection and Pollution Control Board, Uttarakhand with Central Pollution Control Board, Delhi formed a team of their officials to conduct reconnaissance survey for assessment of sewage load of various Ashrams and Hotels from where discharges reaches the main stem of river Ganga in the region of Rishikesh and Haridwar cities. Dry inventory was conducted based on background information available in-house and survey of India topo map with officials of State Pollution Control Boards. During dry inventory, monitoring scheduled, sites and monitoring form were finalized. Particulars documentation was performed keeping in view of continuous flow is taking place at the visit.

Two hundred ninety-seven Ashrams (34 for Rishikesh and 263 for Haridwar) and one hundred sixty-nine Hotels (78 for Rishikesh and 91 for Haridwar) were visited and documented the information. The officials have conducted the documentation of the Ashrams and Hotels located in Rishikesh and Haridwar, during March to April, 2015, and following methodology were adopted by the officials during the inspection.

- The team prepared a details questionnaires for collection of dry information including total number of rooms and occupancy, details of other facilities like laundry, cooling tower etc., source of the water and consumption (KLD), quantity of the waste water generation (KLD), status of the sewage treatment plant and its capacity and operational condition, any other mode of treatment of waste water, any other recommendation if any, details of inspection and name of designation of inspection team.
- Ashrams and Hotels having more than 10 rooms were only considered.
- Based on the information of total number of rooms. Source of water supply, approximate quantification of domestic waste water generation based on 150 liters per person per day factor (Vishwanath, 2013; Census, 2011 and Kazmi *et al.*, 2013 and BIS1172: 1993).

RESULT AND DISCUSSION

The Ganges suffers from pollution levels, which affect the 331 million people of Rishikesh and Haridwar, who's live close to the river front town and an around (Census, 2011). Sewage from many cities along the river's course, industrial waste and religious offerings wrapped in non-degradable plastics add large amounts of pollutants to the river as it flows through densely populated areas. The problem is exacerbated by the fact that many poorer people rely on the river on daily basis for drinking, bathing, washing and cooking. Haridwar, a city of million people that many pilgrims visit to take a 'holy dip' in the Ganges, releases around million litres of untreated human sewage into the river every day, leading to large concentrations of faecal coliform bacteria. Sacred ritual is also major source of pollution (Md. Iqbal Sultan, 2015). The main source of contamination is organic waste (sewage, trash, food, and human and animal remains). One result of this situation is an increase in waterborne diseases, including cholera, hepatitis, typhoid, and amoebic dysentery (Satyaprakash Pandey and Prasad, 2014).

Previous studied by Nitin and Ravinder, 2015; Jiban Singh, 2015; Goswami, 2014; Ruby Pandey *et al.*, 2014; Sushil & Joshi, 2012 and Dhirendra *et al.*, 2009 on river Ganga in the region of Rishikesh and Haridwar significant variance was found in the water quality. Physico-chemical

and biological parameters of river Ganga in the Rishikesh and Haridwar are affected by solid waste generation, household products, rural community, mismanagement of municipality, urbanization, and other anthropogenic activities (Basant Rai, 2013). The Ganga Action Plan, an environmental initiative to clean up the river, has been a major issue, due to lack of co-ordination among the technical experts, environmental planners and support from religious authorities.

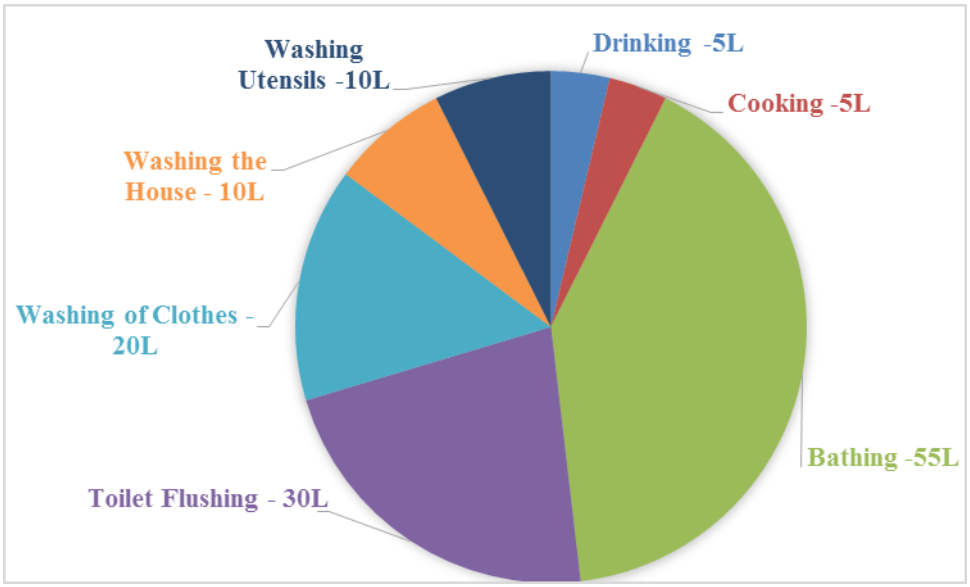

Figure 2: As per BIS1172: 1993 water demand per person per day in India (Vishwanath, 2013).

In this study, how much quantity of sewage being generated from Ashrams and Hotels, mode of disposal and quantity of untreated sewage falling into main stem of river Ganga was the main objective. Since, none of the Ashrams and Hotels have installed flow meter for water consumption and sewage generation per day, the information about how many rooms are occupied by number of people in particular Ashram and Hotel and water demand per person per day with standard have been used for calculation of the approximate quantity of fresh water consumed and sewage generated from individual Ashram and Hotel.

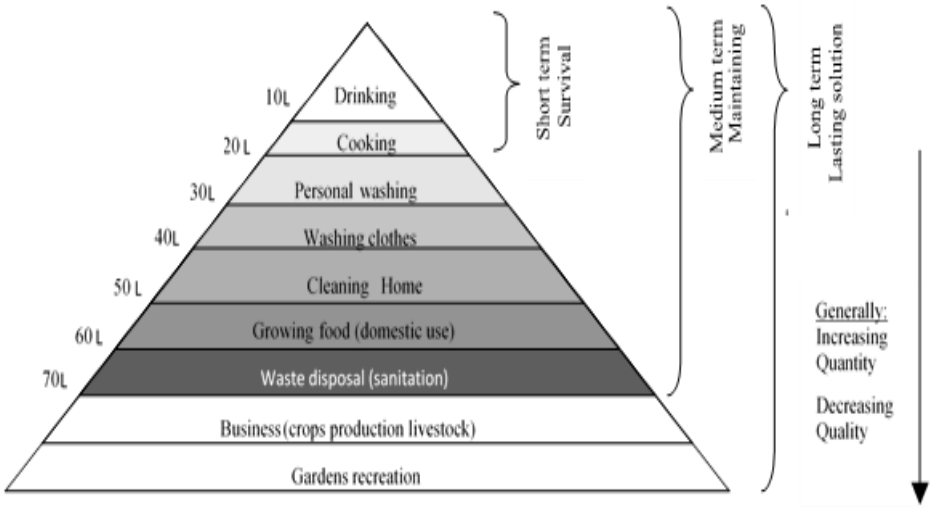

Figure 3. Hierarchy of water requirements (Inspired by Abraham Maslow's, 1908-1970) hierarchy of needs).

Water shortage in other nations such as Germany are driving down consumption to 100 litres per persons per day. In India also, water supply systems has been done with certain standards. Presently, the standard being used is BIS1172: 1993, reaffirmed in 1998. For communities with a population of between 20,000 to 1, 00,000, 100 to 150 litres per person per day and for communities with a population of over 1, 00,000, 150 to 200 litres per person per day (Vishwanath, 2013). In its previous suggestion there was also an attempt made in BIS1172: 1993 to understand the break-up of this demand which was then put as 150 litres per person per day (Fig. 2).

Figure 4: Fresh water sources and various utilization in Rishikesh and Haridwar.

With reference from David and Alessandro, 2009; WHO/SEARO, 2010; MoWRI, 2011; Census, 2011; Vishwanath, 2013 and Kazmi *et al.*, 2013, Rishikesh (1, 02, 138) and Haridwar (2, 28, 832) population also over one lakh, recognised 150 to 200 litters of fresh water required per person per day (Figs. 2 and 3). In this study, bore well (installed within the premises) and Jall Sanstha (supply by Government) are the main sources of fresh water in study area. Sixty-eight and 33% of bore well, 21 and 34% of both bore well and Jall Sanstha and 12 and 32% of Jall Sanstha ware the fresh water sources for used in individual Ashrams of Rishikesh and Haridwar respectively (Fig. 4). Similarly, 31 and 42% of Bore well, 9 and 21% of both bore well and Jall Sanstha and 12 and 37% of Jall Sanstha ware the fresh water sources for used in individual Hotels of Rishikesh and Haridwar respectively (Fig. 4). Treacherously, most of the Ashrams and Hotels are not having any consent from relevant authorities to establish the bore well within the their premises and not installed water flow meters at inlet and outlet to measure the quantity of water extract and released, suggested over extracting of groundwater as well as over releasing of sewage into main stem of river Ganga illegally. Similarly, individual Ashrams and Hotels which are connected with Jall Sanstha also not installed any flow meter at inlet and outlet to measure the quantity of water consumed and sewage generated, confirmed disposed over generated sewage into main stem of river Ganga routinely.

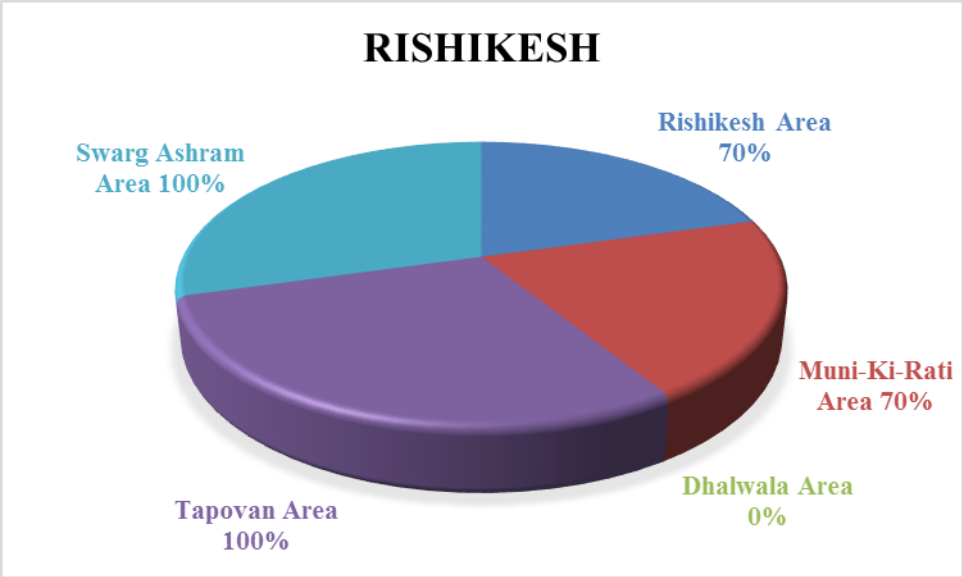

Figure 5: Zone wise Individual connected with sewer line in Rishikesh.

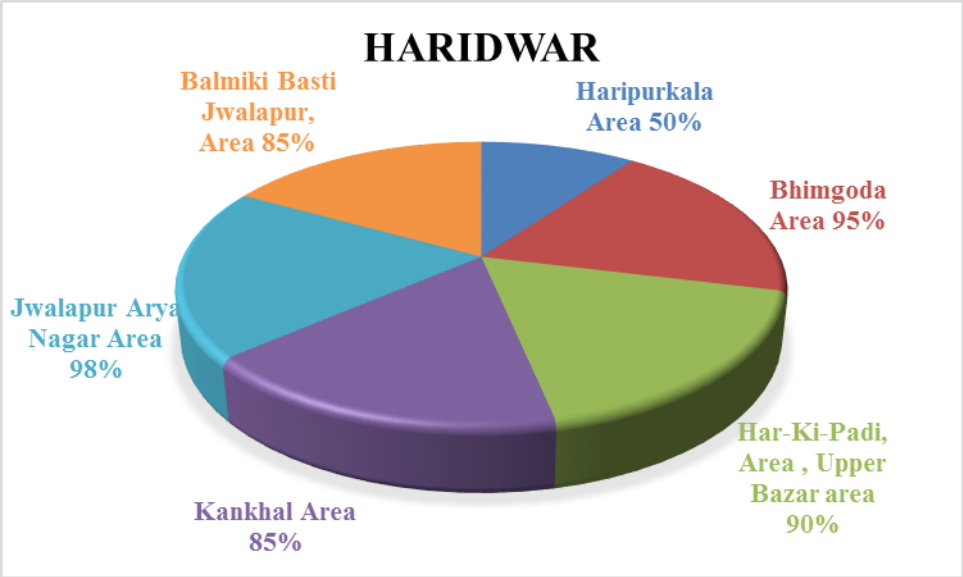

Figure 6: Zone wise Individual connected with sewer line in Rishikesh.

Further, answers of same question asked to individual Ashrams and Hotels during the investigation, zone wise, 70% in Rishikesh and Muni-Ki-Rati, 0% in Dhalwala and same percent in Tapovan and Swarg Ashram have connected with sewer line (STP) and total 32% of individuals connected with Septic Tank and Soak pit in Rishikesh (Fig. 5). Similarly, 50% in Haripurkala, 95% in Bhimgoda, 90% in Har-Ki-Padi and Upper Bazar, 85% in Kankhal, 98% in Jawalapur Nagar and 85% in Valmiki Basti Jawalapur have connected with sewer line (STP) and total 16% of individuals connected with Septic Tank and Soak pit in Haridwar (Fig. 6). There are 39 and 21 Nallahs has been identified, carrying the domestic effluent from the Ashrams, Hotels, small Dhabas, Restaurants, old houses, Apartment and slum areas, which are ultimately joint to the main stem of river Ganga in Rishikesh and Haridwar respectively. Among them 8 nallahs in Rishikesh like Sai Ghat Nala, Khara Sorot Nala, Dalwala Nala, Muni-Ki-Rati Park Nala, Ganga

Resort Nala, Chandraswar Nala, Samshan Ghat Nala and Sant Sewa Ashram Nala and 4 Nallahs in Haridwar like Lal Mandhir Nala, Kasai Nala, Ramrakkha Park Nala and Pandey Wala Nala are not trapped by STPs, confirmed sewage from these 12 Nallahs are directly goes to main stem of river Ganga routinely.

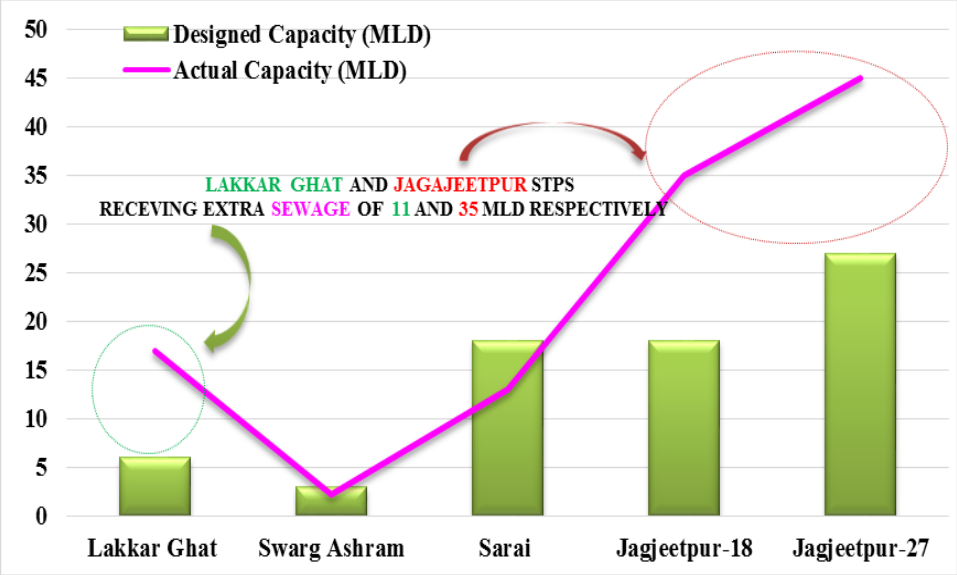

Figure 7: Variation of designed and actual capacities of STPs in Rishikesh and Haridwar.

In this study, 2 STPs in Rishikesh, Lakkar Ghat (6 MLD of designed capacity) and Swarg Ashram (3 MLD of designed capacity) as well as 3 STPs in Haridwar, Sarai (18 MLD of designed capacity) and Jagjeetpur (18 & 27 MLD of designed capacities), which are found operational during the investigation (Fig. 7). Even though, Oxidation Pond, Sequential Batch Reactor and Activated Sludge Process technologies are using performance of these STPs, poor maintenance and over load (actual capacity) of sewage from more than designed capacities, performance of STPs are very precarious condition except Sarai (Fig. 7). Remarkable, at Lakkar Ghat and Jagjeetpur STPs, 17 and 80 MLD of sewage have overloaded, confirmed 11 and 35 MLD of additional untreated sewage falling into main stem of river Ganga routinely from Rishikesh and Haridwar respectively (Fig. 7). Further, evaluation between designed capacity and actual capacity of Lakkar Ghat and Jagjeetpur STPs, additional STP's of appropriate capacities (11 & 35 MLD) is required to be installed in Rishikesh and Haridwar respectively. Concentration of Total Coliform and Faecal Coliform in treated sewage sample in various STPs ranged from 94 to15, 54, 53, 214 and 4 to 14, 67, 93, 214 respectively (Fig. 8). Variation between the concentration of Total Coliform and Faecal Coliform in treated sewage samples during the study period is very incredible, suggested year of the STP established and performance of the STP is inversely proportional (Fig. 8).

CONCLUSION

Even for not having exact measured quantity of domestic sewage being generated by Ashrams and Hotels based on total numbers of rooms occupied by total number of people in individual Ashram and Hotel and water demand per person per day with standard, have measured the approximate quantity of fresh water consumed and sewage generated seems to be quit acceptable. The population of Rishikesh and Haridwar population also over one lakh, recognised

150 to 200 litters of fresh water required per person per day and bore well and Jall Sanstha are the sources of fresh water. Further, most of the Ashrams and Hotels are not have any consent from Central Groundwater Board (CGWB). Individual Ashrams and Hotels which are connected with bore well and Jall Sanstha also not installed flow meter, confirmed loaded over sewage into main stem of river Ganga routinely.

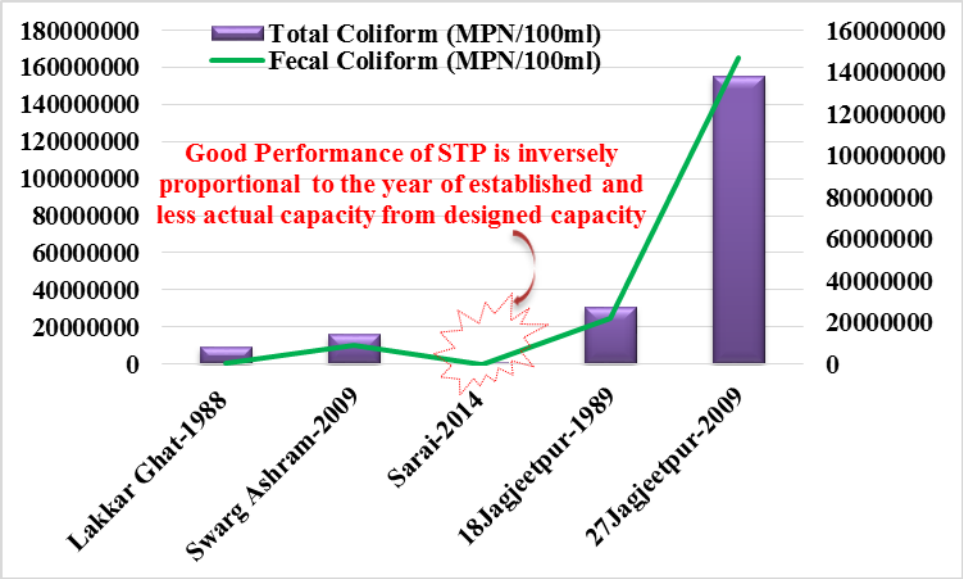

Figure 8: Co-relation between year of the STP established and performance of the STP.

Zone wise, total 68 and 84% of individuals Ashrams and Hotels are connected with STPs for sewage disposal. Identified 8 out of 39 and 4 out 21 sewage carrying Nallahs, which are ultimately joint to the main stem of river Ganga are not trapped in Rishikesh and Haridwar respectively by STPs, confirmed sewage from these 12 Nallahs are directly goes to main stem of river Ganga routinely. Even, 6 and 45 MLD are the designed capacity of Lakkar Ghat and Jagjeetpur STPs, 17 and 80 MLD of sewage have overloaded in these STPs respectively, confirmed 46 MLD of raw sewage falling into main stem of river Ganga routinely in both Rishikesh and Haridwar. Concentration of Biological parameter in different STPs, which are established in different year is varied, suggested year of the STP established and performance of the STP is inversely proportional.

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