



## Water Pollution and Its Impact on Human Health: A Case Study of Allahabad City, Uttar Pradesh

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**ABSTRACT:** Allahabad is developed in different pockets some of its areas are extremely posh while others are having mixed land use pattern and life style so different areas are facing different type of health issue due to water pollution and environmental degradation. The underdeveloped area is facing the lack of safe drinking water supply. Many health problems and diseases in villages are due to use of polluted water. Improper disposal or lack of disposal of excreta adds to the sanitation problems. This area lacked proper drainage systems which lead to contamination of groundwater and other source of drinking water. These areas covered by economically poor people due to haphazard housing systems, lack fresh air, many rural households are single room units which get filled with smoke from burning of firewood and biomass and do not get adequate sun light. Allahabad is, in his transition period of development so except the core area of the city the other area also facing problem due to lack of urban and rural planning, lack of proper drainage and sanitation system which led to increase the pollution in the city. Rapid growth of urbanization has adversely stressed the environment. Allahabad City have unplanned and haphazard area with inadequate infrastructure. Industries are established without environmental assessment. Inadequate planning in the city led to chaos and environmental degradation which hamper the health well being issues.

**Keywords:** Disease, Environmental Assessment, Health, Pollution and Water.

### I. Introduction:

Water quality issues are a major challenge that humanity is facing in the twenty-first century. Over the last three decades there has been increasing global concern over the public health impacts attributed to environmental pollution [1]. Today, about 25 per cent of all known human disease occurs due to environment related pollution. Untreated waste materials generally altered soil and groundwater properties which may cause of degradation in its quality.



Majority of river of India are facing acute water pollution problem and river Ganga one of them. Due to excessive industrialization and urbanization, the Ganga River especially in Allahabad and Kanpur, have now become a drain. The water pollution of the river has gained large heights. Now it become imperative to yield a plan identifying viable remedial options and strategies for the Ganga River clean up. Efforts will be made to resort to a bottom up approaches rather than a top down one to help this highly polluted river, which is the major life supporting artery of Allahabad and many other cities in India.

Human health related issues are one of the prime concerns for sustainable development. The UN General Assembly's Open Working Group (OWG) proposed 17 goals with 169 targets covering a broad range for sustainable development issues for improve human lifestyle and protect our earth for future generations. In which, goal 3 “Ensure healthy lives and promote well-being for all at all ages” aims at securing a healthy life for all. There are 9 sub-goals in this goal and sub-goal 3.9 targets to substantially reduce the death rate including illnesses from hazardous chemicals along with air, water, and soil pollution and contamination by 2030 [2].

Polluted water is the main cause of a number of diseases. Polluted water not only affects the life of present generation but it also affects the life of upcoming generations because its effect remains for long. Water borne diseases of human or animal contain pathogenic microorganisms which are increasing continuously recent decades. So, purified and clean drinking water is becoming a one of the most important indicator to evaluate health status of human being. Now in these days about 2.3 billion people suffer from water borne diseases worldwide [3].

The quality of drinking water is essential component for good health and it is play a major role in the overall well-being of the people, with a significant bearing on infant mortality rate, longevity and productivity [4].

In developing countries most of the diseases such as gastroenteritis, diarrhoea, dysentery, cholera, enteric fever and typhoid prevails due to impure drinking water clubbed with poor sanitation. Superfluous ratio of chemicals and metals particles in groundwater due to climatic and geologic properties and



anthropogenic activities are another big problem of water pollution which may responsible for many diseases.

As mentioned in “Agenda 21” of the UN conference on environment and development (UNCED), “an estimated 80 per cent of all diseases and one-third of deaths in developing countries are caused by the consumption of contaminated water, and on an average, much as one tenth of each person's productive time is sacrificed to water related diseases [5].

## **II. Objectives of the Study:**

The objective of the paper is:

To asses Water Pollution and Its Impact on Human Health in Allahabad City.

## **III. Database and Methodology:**

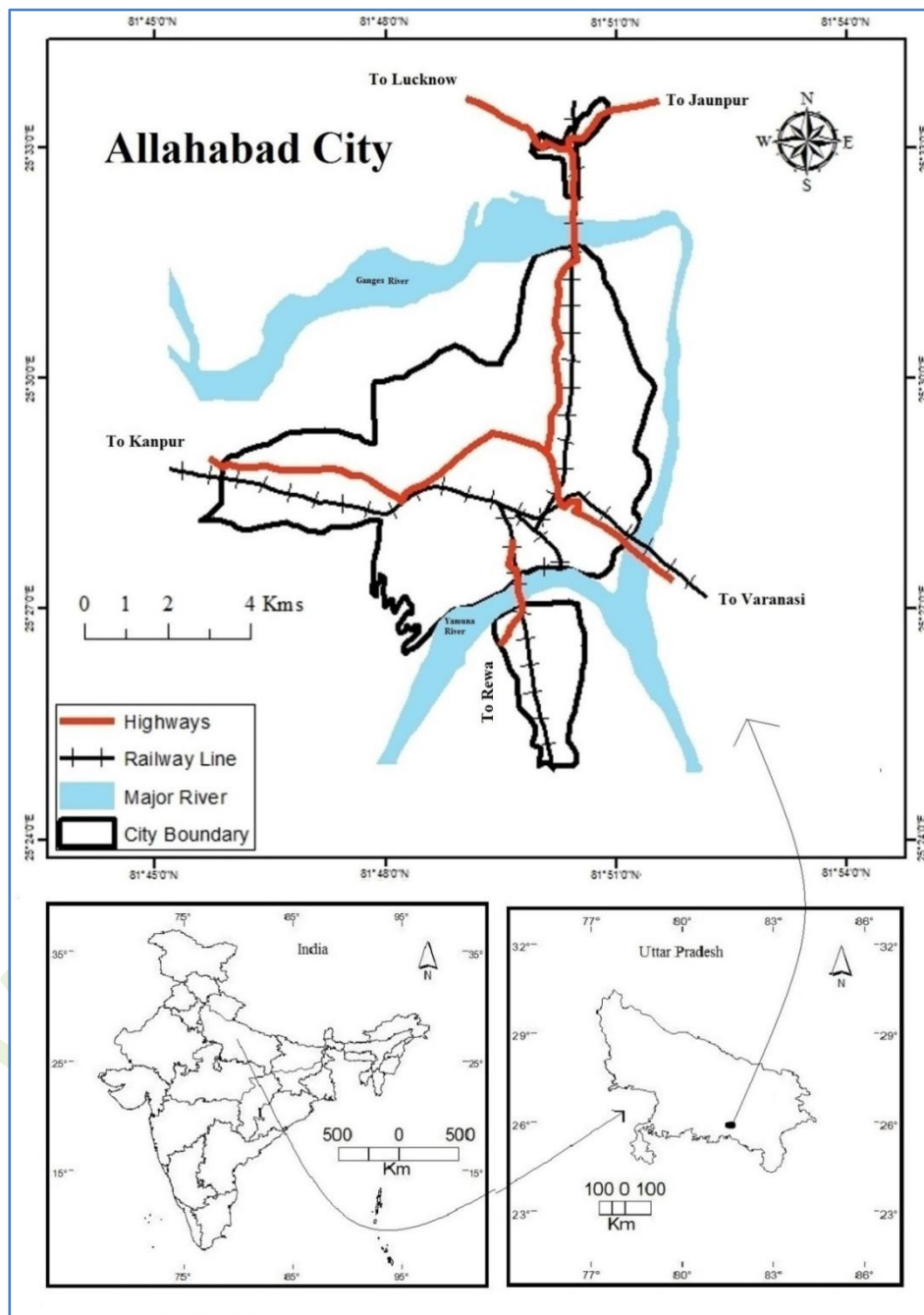
The study has based on the primary and secondary data. For the collection of primary data, the questionnaires have been used as well as detailed interview has been taken of different medical officers and members of pollution control Board of the city who are dealing with the issue of environment problems and health issues. The empirical observation to know the behaviour of locals towards polluted environment has been done before generating data for analysis. Different photographs have been taken from Google to put the real picture of the city about the issue of pollution. Secondary data were taken from the regional branch of State Pollution Control Board, Allahabad and Central Pollution Control Board, Delhi. Location map of the study area has been retrieved from census of India, 2011 which is needed to show the actual location of the city.

## **IV. Study Area:**

Allahabad city is located at 25° 28' 22.9224" N 81° 52' 42.0852" E in the southern part of the Uttar Pradesh at an elevation of 98 meters (Fig.1). The city situated at the confluence of the Ganges River and Yamuna River. It covers an area of 5,482 sq. km [6]. The city known as the judicial capital of the state of U.P. Allahabad now became the seventh most populous city of Uttar Pradesh and thirty sixth in India, with an estimated population of 1.11 million and [7]. As per basic living standard especially in housing concern about 5,672 families are homeless who live on footpath or without any roof cover. This historic city has



numerous industries activities in present days which generate lots of and different kinds of waste disposals including domestic sewage/wastes. The indiscriminate dumping of wastes and untreated industrial chemical water release wide variety of organic and inorganic pollutants.



Source: Sen et al., 2016. [8]  
 Figure 1: The Study Area, Allahabad city



## V. Result and Discussion:

Each day more than 2.9 billion liters of untreated wastewater are dumped in Ganga by nearby industrial areas of Allahabad. One of the major challenges at the *Kumbha* is managing the water flow for the millions of people who come to bathe. The clean water availability could not meet the requirements of the huge mass, predominantly on the special days [9].

At *Sangam*, Allahabad, Biochemical Oxygen Demand (BOD) of Yamuna and Ganga is generally less than 6mg/l which is generally due to the discharge of effluent of pulp and paper industries into the tributaries of Ganga (Ram Ganga and kali). Defecation in or nearby Ganga had lead to various diseases. Dips and the materials used for carrying the holy rituals like candles, flowers, etc further degrade the water quality of the river [11]. Data from the state pollution control board shows by 6 pm on the day of Shahi Snan, BOD levels in the water of the confluence had risen to 7.4 mg/l, up from 4.4 mg/l from the previous day.

The pressure of development and urbanization increase the amenities in the city but the improper disposal of wastage of the city is degrading the quality of water in Allahabad. Water Pollution is broadly classified into two categories in Allahabad city:

- Surface water pollution
- Ground water pollution

Major responsible causes of surface water pollution are suspended solids, organic matter, biological decomposition of waste organic matter, inorganic dissolved salts and responsible cause of groundwater are heavy metals, high total dissolved solids (TDS) from the industries, high salinity, fluoride, arsenic, nitrates denoting organic pollution, pesticides, etc.

The quality of river water at Allahabad is most unfit for drinking and bathing purpose. Water becomes vulnerable for drinking and bathing if the Biochemical Oxygen Demand (BOD) level exceeds 3 mg/litre. In fact, in the entire stretch, from Gaumukh to sea, Allahabad is the most polluted point and most unfit for drinking and other daily purposes with BOD level at 6.4 mg/litre. It



is found that it is difficult to bath in Allahabad as water appeared so polluted and dirty

According to Central Control Board Pollution [13, 14] standard for bathing waters, 500 mpn (most probable number)/100 ml, the levels on *shahisnan* days January 14 and 15, 2016 were 13,000 and 11,000 mpn/100 ml respectively 26 and 22 times the standard. For the duration of the *maghmela*, the court ordered tapping two major sewage drains emptying into the Ganga in the immediate vicinity of the *sangam*. As per the City Development Plan (CDP) of the Allahabad administration, during 2015, the city's sewage output was 250 million liters per day. Only 60 million liters per day is treated, so 190 million liters of untreated sewage from Allahabad flows into Ganga and Yamuna every day. The *maghmela* itself has a significant impact upon the river quality (Plate 3). Toilet arrangements included 25,000 glazed and cement seat lavatories, 50,000 deep trench pattern lavatories and 4000 urinals [15].

What was lacking, however, was treatment and disposal of sewage collected in these toilets. Though the officials claimed to have installed soak pits and septic tanks, but several sewage cesspools were visible at many places, sewage flowed into the river at others. The pilgrims, who come from all over India, bath in the river, most drink a few drops of the Ganges water and many fill bottles to take home with them.

River Ganga is spread in Allahabad and its interlinked with the different river shows that if pollution spread in the Ganga, it will pass to other rivers also and hence all the river of the city comes under the grip of pollution. The trend of dissolved Biological Oxygen Demand (BOD) is continuously increasing in the river at nearby Allahabad city. The level of dissolved oxygen in the river of Ganga is fluctuating in both the upstream and downstream but still it is always above the neutral level [17]. The level of biological dissolved Oxygen then it is found that in the downstream its amount is increasing tremendously (Figure 2).

Level of Chloride in Allahabad is 250 mg/ liters. Most of the sites have higher value of chlorides than the permissible level. The presence of chloride in higher amount is found in some of the area due to industrial pollution. High level of chloride is dangerous for human being health. The pH value of water is

ranging between- 6.9 to 8.2. Factors which are contributing in depleting the groundwater are industries and the solid waste [18]. The mountain of solid waste generates toxic elements into the soil which penetrate deep into the ground and reach to ground water [19].

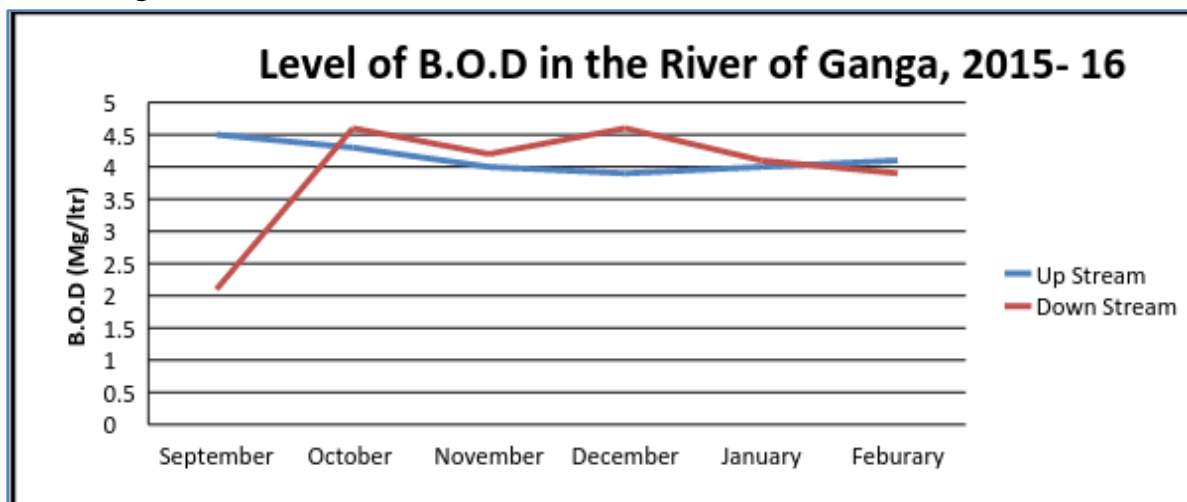


Figure 2: Biological Oxygen Demand, Ganga River at Allahabad  
Source: Uttar Pradesh Pollution Control Board, 2015 – 16

Many part of the city as Rajapur, Mamrez, Khuldabad, NakhasKohna, sarayinayat, Kalyani Devi, Meerapur, Mauaima, Dariyabad, Shahganj, Rani mandi, Jhunsi, Saray, ,Naini of the city are facing contaminated water supply related problems. There are many pollutants including oils, greases, plastics, plasticizers, metallic wastes, phenols, toxins, acids, salts, dyes, cyanides, pesticides residual substance frequently can be seen in water resource. Many of these pollutants create serious pollution problems because it is not easily susceptible to degradation. As well as, reduction in dissolved oxygen and reduction in light penetration that's tends loss in self-purification capability of river water.

Allahabad city has only 22 per cent coverage by a sewerage network, with 44,300 households practicing onsite sanitary disposal methods [20]. Many households have *septic tanks or kunddis*. There is a lack of sewage treatment facilities in the city and therefore most of the sewage goes into open *drains and nallas*. In most of the households, the toilet flushes are not connected to soak pits



and the water from septic tanks goes directly into *drains*, which is very unhygienic [21]. Most of the city drainage system is clogged with polythene bags and is not cleaned regularly. The condition of the city drainage system is poor and needs immediate repairs and regular upkeep/maintenance. Many large drains are being encroached by dwelling units, milk dairies, shops, etc. and thus difficult to clean and maintain [22].

There are six major drains passing through the municipal area, viz. – Ghaghar, Chachar, Morigate, Allenganj, Rajapur, and Mumfordganj. These drains carrying bulk of domestic wastes including other municipal garbage and toilet water and falling in Yamuna River. These open drains passing from the residential areas create drastic unhygienic environment. In the year 1999, it has been found that total drains discharge is 120 MID (35 drains discharge to Ganga River and 11 drains to Yamuna). Total 7 drains (6 completely and 1 partly) have already been tapped in Ganga Action Plan-I diverting 90 mid [22]. Usage of acceptable quality of drinking water in Kasari-Masari is about 20 Per cent and in Beniganj is about 35 Per cent out of total. Availability of toilets are also in poor condition as example in Gaughat area only six percent out of total households having toilet facilities, likewise at only 20 per cent toilet availability in Pasana and Rasulpur area. So, in average; around 36 Per cent of slum dwellers have household toilet facilities rest 62 Per cent defecate in open places [20]. 62.7 per cent of water supply was from piped water and rest from tankers and hand-pumps. In addition, 36 per cent of the population does not use protected water source.

### **Health Problem due to Water Pollution**

Diarrhoea, Typhoid, Cholera, Jaundice, Liver and Kidney damage are some of the critical and dangerous water borne diseases which are experienced in Allahabad city. So, there are number of cases related water-borne diseases which are continuously rising in term of numbers of cases due to unabated supply of contaminated water in several areas of the city. The residents of the city pointed out that the bad quality of drinking water is supplying any many parts of the city which has a bad odour and dirty yellow





colour. Due to supply of contaminated water many children are suffering from jaundice, diarrhoea and other water-borne diseases and have been hospitalized.

Water pollution generated diseases are spreading easily in monsoon season due to bad quality of drainage systems as well as less awareness of people as do not take into consideration these issues very seriously [23]. Many locals source of drinking water are also lies the dumpage site and people compel to take water and use it at their homes hence suffered from deadly diseases. The PH value of drinking water is high so it may cause various stomach disease if intake without purification. Higher concentration of arsenic matter causes skin problem to the locals. Problem such as malaria and *dengue* are generating in the city due to Water logging which are the reason of thousands of deaths in the city.

Residents of Chowk, Shahganj, Kareli, Dariyabad, Beligaon and adjoining areas of Allahabad city are suffering from waterborne diseases for past few days owing to supply of contaminated drinking water in several localities. As a result, hundreds of patients were reportedly found suffering from diarrhoea, jaundice and other water-borne diseases in local hospitals including Motilal Nehru District Hospital. Private hospitals and nursing homes are also flooded with cases of diarrhoea, jaundice and other water-borne diseases.

### **Adaptation Techniques (*Ecological Sanitation*) for Water Quality Improvement**

These are also known as eco-san, it is a form of sanitation that usually involves the recycling of water and nutrients contained within human wastes back into local environment. Ecological Sanitation is based on an overall economic, environmental, sustainable wastewater management system which has been developed to fulfil the need of users as well the local conditions. It provides a flexible framework where the centralized elements can be combined with the decentralized ones, waterborne with dry sanitation high-tech and low-tech etc. by considering a much larger range of options, optimal and economic solutions can be developed for particular situation.

The basic advantages of Ecological Sanitation are:



- (1) Improvement of health by minimizing the introduction of pathogens from human excreta into the water cycle.
- (2) Promotion of safe, hygienic recovery and use of nutrients, organics, trace elements, water and energy.
- (3) Preservation of soil fertility
- (4) Contribution to conservation of resources through lower water consumption, substitution of mineral fertilizers and minimization of water pollution
- (5) Improvement of agricultural productivity and food security
- (6) Preference for modular, decentralized partial flow-systems for more appropriate cost-efficient solutions adapted to the local situations
- (7) Promotion of holistic, interdisciplinary approach
- (8) Material flow cycle instead of disposal of valuable resources

## **VI. Conclusion:**

Even there is no proper management of government supply, public wells and other resource. Large amounts of waste are present near the source of water which is polluting the water and affecting the health of the people. The waste scenario in the city is affecting the health of locals and but no proper steps are taken at the ground level, neither by the government nor by the locals. It is very difficult problem for the municipality to dispose the waste of the city because of unavailability of land in the city. It is the problem which cannot be solved by the government only. It is the time when every resident should understand their responsibility and try to use Recycle, Reduce and Reuse scheme to deal with the waste problem. Increasing cases of waterborne diseases were reported from both areas higher being in Trans- Yamuna area and Trans-Ganga river area. Diarrhoea, Typhoid, Cholera, Jaundice and Liver infection seems the significant health hazards in Allahabad city with higher health risks are posed in. Continuous monitoring with seasonal variability and intensive health studies are recommended in order to determine the other pollutants and water borne diseases to investigate long-term effects

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