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Water Pollution Preventive Measures in Noida

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Abstract: *This study focuses on water pollution prevention measures for Noida city. We all know Water is a basic need for every living organism and also a primary source for human-related works etc. The major sources of water are rivers, lakes, and other surface impoundments, the others are groundwater which gets by different mechanism systems. The groundwater quality depends on the water quality of water channels. Unfortunately, the surface water is polluted due to direct waste disposal into the water bodies and rainwater is polluted due to pollution. So, ultimately the groundwater quality and quantity both are getting polluted. Due to the contamination of solid wastes and factory effluents (directly disposed into the rivers), it is affecting the groundwater. By the use of wastewater segregation system or wastewater management system, we will be able to save around 80% water for future need.*

This paper makes an attempt to highlight the measures for controlling the water pollution, by controlling water pollution in the city. The city will have water scarcity in the next 10-15 years as per the water management indicators. So by using some improvement and management programmes on existing parameters, It can help in fulfilling the future demand. It can be possible by framing and designing better policies frameworks, awareness programmes among citizens, water schemes etc.

The paper focuses on the physical, chemical and biological water pollution prevention measures also. The treatment of household wastewater is possible with the use of algae and some different kind of water plants are considered as eco-friendly and economical way. The treated 50%water of a community level can be reused in the community itself and remaining send to the drains. This paper deals with the removal of water pollutants at large and small scale.

Keywords: *Water Pollution, Noida city ,Urbanization, Water management system , Segregation of water , Water future demand, Eco-friendly.*

I. INTRODUCTION

Rapid urbanization plays a role in the land use and land cover change, leading to changes in ecological processes and hydrologic resources on local to the global arena. Cities in the developing countries would more vulnerable to damage caused by wastewater and water scarcity. Groundwater and surface water quality is getting dilapidated due to the interference of illegal activities. Water is a basic necessity for people in rural and urban areas for various purposes (Bassi, 2011). The water should be clean, safe, sufficient, affordable, acceptable for domestic and personal uses. The safe water is a need for everybody in our society for better health and future. A healthy and eco-sustainable environment is depended on the better quality of water. So, it is needed to spread awareness among people towards water conservation, water pollution prevention, water management etc. The resources of the water system in the country are surface water (Rivers, Lakes and waterbodies etc), groundwater etc. so it is required to reduce the pollution level in surface water and groundwater for better future.

Many satellite towns have evolved in order to accommodate industrial development. The 1990s saw huge growth in the Indian economy and additional migration to the capital city Delhi exceeded planning estimates. As a planned expansion, Noida's infrastructure and utilities were carefully laid out. It was developed to accommodate additional population growth of Delhi for 20–25 years. This city has “Yamuna-Hindon-Delhi Border Regulated area” under the provisions of U.P. Regulation of Building Operations Act, 1958. This city was planned due to overcrowding in Delhi and this was planned for the major population from old Delhi area. But this is not happening and the image of the city is different. The Noida Plan has 3 major objectives as:

-Provide developed sites for about 10,000 small-scale industrial units;

-Provide employment to about 41,000 industrial workers; and

-Achieve a conducive living and work environment for the workers engaged in manufacturing and allied activities (authority, 2011).

So the population is increased with the time, But, with the massive influx to Delhi, it became overloaded in just 15 years. The ecology of this site is relatively unsuited to the purpose of industrial development. The site, being formerly a river basin, is low-lying and hence prone to various problems of drainage, disposal of liquid waste and waterlogging. Noida city is bounded by two rivers Yamuna and Hindon. The water level of the city is fine but the quality of water is not suitable for use. The quality of groundwater and surface water is not appropriate,so water is not used for domestic purposes. The water quality is damaged due to the direct disposal of wastes into the river or water bodies. The solid waste is also directly disposed of into the drains (which carry

stormwater and wastewater). The contamination of wastes in the water bodies affects groundwater quality. The unregulated and exploitation of water has led to the decline of the water table and quality. The water supply is done through tube wells 80% and Ganga water 20% (Matto, 2017). There are 182 tube wells generating 146 mld water, 6 Rainey wells generating 54 mld water, and 48 mld Ganga water for which 40 overhead tanks, 39 underground reservoirs and 38 underground reservoirs for Ganga water are in place (authority, 2011). The present demand for water is 225 mld and future demand will be 668 mld by 2030. 80 % water is extracted from the ground, it has a hardness above the permissible level due to the heavy metals and pesticides, lead, magnesium and calcium (Matto, 2017).

The rivers are lost their real value due to the direct disposal of waste into them. The evidence is therefore clear that the elevated levels of toxic contaminants found within the drinking water source at these villages will be having a devastating effect on the health of the local population.

Contaminated water is used for domestic and personal uses. The quality of groundwater is a pressing issue in Noida. The different hydro-geochemical processes, such as dissolution, mixing, ion exchange processes along with the weathering of silicate and carbonate minerals, control the chemistry of groundwater, the major contributor in Noida's water supply. So, this water is directly affecting the health of people, different type of diseases are found here like Cholera, Amoebiasis, Hepatitis A, Polio, Fluorosis, Typhoid Fever etc. The samples of metals are identified in the city and the villages (Lewis, 2007).

II. METHODS

A. Study Area

Noida city, in Gautam Budh Nagar district in the state of Uttar Pradesh, is a major satellite city of the NCR. The city is bound by the river Yamuna and the national capital city of Delhi in the west and the southwest, National Highway 24 and the city of Ghaziabad in the north, the river Hindon and Greater Noida in the east, and the confluence of the rivers Yamuna and Hindon in the south. The developed urban area of Noida occupies its northern half. The southern half is predominantly rural, with scattered settlements. It is, however, also urbanizing at a rapid rate. Presently Noida City has 17lakh population. City's demand for water in 2010–11 was around 225 million litres per day and future projected water demand is 668 MLD by 2031. Noida requires a paralleled infrastructure of sustainable water management (uppcb, 2012). The water quality is not good for human health. Although the city is surrounded by two major rivers and it has one natural drain which carries rainwater, the city does not have safe water for present and future. The city has three major wastewater carrying drains. The paleochannels were also there for storing the water in past and there was one drain which used as irrigation purpose (Matto, 2017). As we can say that the city has appropriate channels for water management but the planning is not done properly so the flooding problems are facing by the city nowadays.

The contaminated water is very harmful to human health, it affects the human age due to infection by different types of diseases. The water quality of the city is majorly affected by human interference with nature.

B. Physiography

The city has 10% of the water area of the total areas. This city is bounded with 2 rivers on two sides. The terrain of this city is plain with a gradual slope varying between 0.2-0.1 % from north-east to south-west. The maximum level is 204 meters above MSL near in the northeast and the minimum level is 195 meters above MSL in the southwestern part of Noida. Most part of Noida is below 200 metres MSL (Regeneration, 2016). Noida is located at the lowest point which is lower than the high flood level of river Yamuna. So this affects the stormwater and sewage disposal of the city. Therefore, sufficient measures have to be taken to avoid these issues.

C. Drainage

The Natural flow of channels is from the northeast to the southwest slope. The storm water from Noida area drains mainly in the river Yamuna and partially in Hindon.

Sewerage & Waste Disposal:

Noida has 2 sewage treatment plants, have a capacity of 61 mld and the oxidation pond has the capacity of 14 mld. There is a total of 15 sewage pumping stations (SPS) and 4 main sewage pumping stations. NDA proposed 2 waste disposal sites in the city but this not happening. The waste is disposed into the drains, along with the drains in open areas. The City has the provision of Effluent Treatment Plants (ETS). Treated water from ETPs may be recycled and can be supplied to industries for their industrial uses instead of throwing the wastewater into drains.

D. Source of Data

The sources of data are divided into two categories i.e. primary and secondary. The primary data is collected from the field and site-specific visits. It is collected with the help of interviewing people and surveying. The policies, administrative, awareness, and management related issues are found on the site with the help of site images, sampling data, interviews of people and field observation etc. The secondary data are collected with the help of similar implemented studies. Some data is collected from books, papers, articles and journals etc. The maps, information are collected from the Noida Development Authority, this is only one management authority in the city as an urban local body.

The surface water and groundwater have the hardness of metals. Majorly water is affected by metal - based water so the water has metal content. The factors are listed as pesticides, chemical compounds, different metals etc. These results are found on the basis of water samples which were got by experiments. The main point of focus of this study was groundwater, surface water pollution and their prevention measures with framed policies. Generally, heavy metal concentration analysis needs a sample from a deeper section (Joshua Nizel Halder^{1*}, 2015). With the help of samples, we just get to know that the most polluted water is found in the dry season and during wet season due to rainfall the flow of water is more but the quality is relatively better.

E. Preventive Measures

1) *Policies Improvement*: We know the present demand for water in the city is 298 mld which is too high as compare to other cities (Matto, 2017). The present water demand is sufficient here but in future, it would be affected. Even the 20% water is supplied from Ganga water supply to fulfil the requirement along the daily supply water for domestic uses. The Water management system of the city is regularly monitored by the authority. The sectors which have the blockage and seepage problems should be resolved within the time so that the water could not be ruined.

The present water demand would be low by spreading awareness among users towards saving water for the future, it should reduce to 130 lpcd. For this consideration as guidelines should be followed by the high and middle classes of the society in the city for saving the water for the future.

The industries should be charged if these are found to dispose of wastes directly into the water bodies or in the water channels. The industries should be regularized and provision of the recycling plants individuals level to make their industries zero-D. If any industry is not following these guidelines, that should be stopped by the concerned Authority. The central groundwater board must take action to remediate groundwater metals contaminants by applying the Bureau of Indian Standards criteria for safe drinking water in the city (PEARL, 2011). This is possible when regular inspection of water bodies and drains is done by the concerned Authority.

The policy should be for soften the hard water. The calcium filtration system should be installed in the sectors, so the soft water can reach to people for domestic purposes.

There should be a policy for Hindon and Yamuna rivers to keep a check on the surface water run-off from agriculture belts which has pollutants, chemicals. There is a need to regulate the waste generation and prohibition of direct disposal of wastes from mills, small and large scale industries and stone cutting industries into the rivers (CPCB, 2011). The policies should be for waste water reuse with guideline frameworks under the water act of 1974 prevention and control of pollution, National Urban Sanitation Policy, 2008 which is for minimum 20% reuse of wastewater and National Water Policy 2012 suggests preferential tariff to incentivize reclaimed water over fresh water (Regeneration, 2016).

These policies can also work in a different format like subsidy benefits to the communities. If a particular community is saving and reusing the water at 50 % level, this will be benefitted in terms of electricity subsidy and other benefits.

The UP government has made RWH mandatory for all the buildings (government and institutional) with or more than 1,000 sq. m area, it should be followed everywhere in the city. In residential areas, every 200sqm above plot area should have an RWH system. Implementation of RWH systems in Noida can contribute significantly to addressing the water demand-supply gap, dealing with waterlogging/flooding and recharging depleting aquifers. As per the master plan 2031, The Green Belt is increasing 12%, but it should be on the ground level as well. By this, the ground water level would enhance and establish the ecology.

F. Awareness Programmes

The municipalities would provide training to the rag pickers and municipal workers by making them aware of the consequences of dumping solid waste into the non-designated areas especially in the water bodies. NGOs would be encouraged to conduct awareness programs within the riparian communities to involve them in the process of rejuvenating the drains and water bodies and spreading the value of water for the future.

G. Technology System Based

Soil bio tank, bio swales, rainwater gardening, permeable concrete these are the methods for collecting the water and this collected water is reused in the community and remaining 50 % water throw into Nallahs or drains with the help of mechanism system. These plants reeds and algae and other trees and landscape areas act as the open recreational areas, green patches, softscape along nallahs. Wastewater treatment technologies are crucial for urban water systems. Some of the new technologies being used and introduced for wastewater treatment globally to reclaim the resources:

- 1) Membrane Filtration
- 2) Nanotechnology
- 3) Automatic Variable Filtration (AVF)Technology
- 4) Microbial Fuel Cells (Shah, 2010)

For rainwater preservation, RWH system would be placed. water-management relies heavily on the cost-intensive long-distance transfer of water to meet the widening gap between demand and supply and includes overexploitation of in-situ groundwater resources (BEGUM, 2008). By this ground water table would be enhanced. For this, green scape would be placed along drains, water areas and open areas. This green scape would help into recharge the ground water (Chevalking, 2008). Apart from green areas, there is the provision of rainwater pits for recharging the ground water table. There are other systems for storing and conserving the rainwater as:

- a) Filter strips
- b) Swales
- c) Bio-retention areas and rain gardens
- d) Filter drains and trenches
- e) Detention Basins
- f) Infiltration Basins
- g) Porous pavement

Water is a basic necessity for people in rural and urban areas for various purposes. For drinking purpose, the water should be clean , safe, sufficient, affordable , acceptable for domestic and personal uses. The safe water is a need for everybody in our society for better health and future (Mohammed, 2016). A healthy and eco-sustainable environment is depended on the better quality of water. So, it is needed to spread awareness among people towards water conservation, water pollution prevention, water management etc.

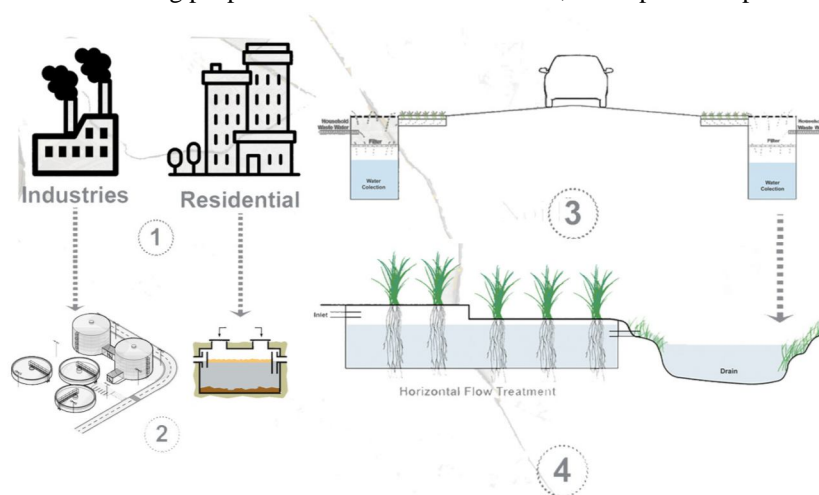


Figure 1 System for clean water (Regeneration, 2016)

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III. RESULTS

The water pollution prevention measures are various types as improvements at policies level, technology advancements, awareness programmes towards the water. The study makes highlights the reasons for water pollution and the present conditions. On the result outcomes of experiments, we get to know about the hardness level and other pollution levels of water in the presence of calcium and magnesium. The problems can be resolved with the help of above mention preventives. The overall result will be to affect the demand and quality of water in future.

Above water prevention measures would be applied to a sector 109 as a pilot project. Here this whole process is saving 80% water and this saved water 50% would be used in neighborhood level and remained to throw into drains.

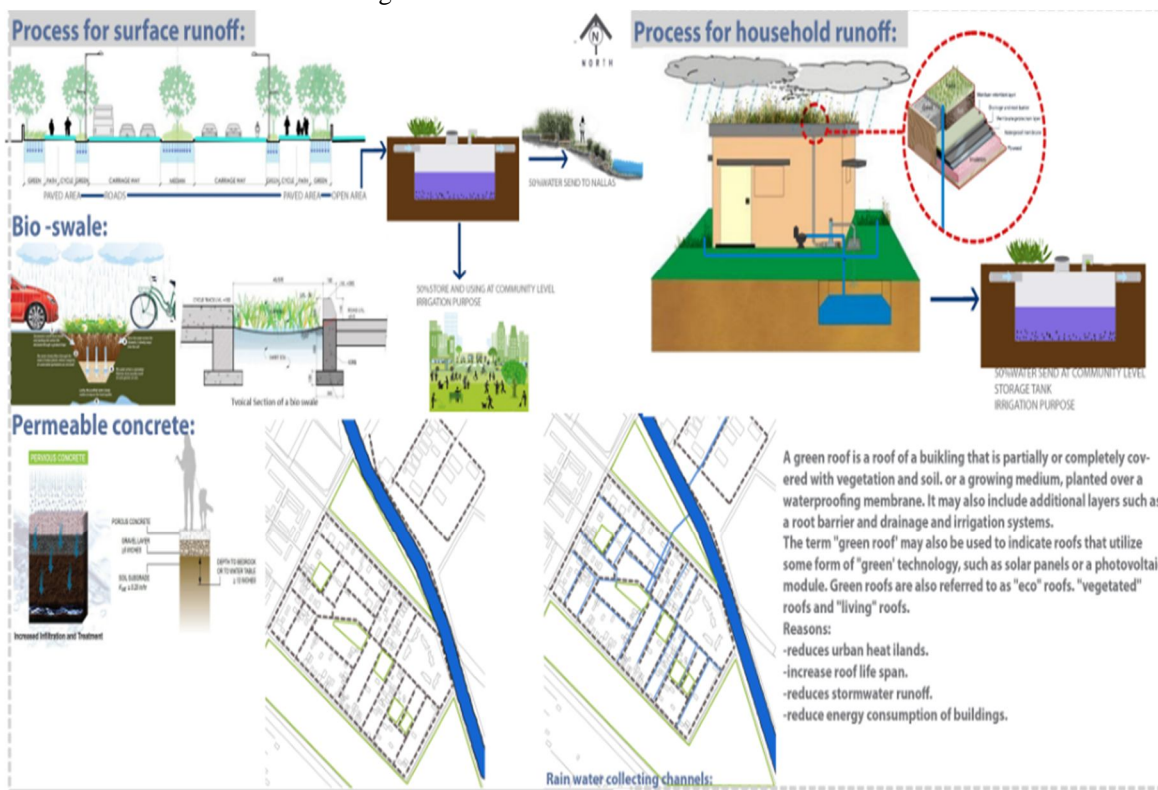


Figure 2 Process applied in city (Regeneration, 2016)

A. Impacts

Around 80% of water can be reused by this process. The various Impacts of Wastewater Reuse :The wastewater reuse is the most promising alternative to augment water supply and means of alleviating the anthropogenic impacts on the environment. The wastewater reuse schemes have the potential to extend existing water supplies, lessen the demand on sensitive water bodies, lower the cost of developing new water supplies, reduce disposal costs, lessen the discharge of pollutants to the environment, and provide water to serve a variety of beneficial uses.

IV. CONCLUSION

In conclusion, the results of this study provide major ecological positive changes in the city due to improved quality and increased quantity of water. Noida city is surrounded by two major rivers and the water level is high. The present water quality is not suitable for health and future demand and quantity is in critical conditions. The water quality can be improved with the help of improvisation in policies level, technological advancements, awareness programmes etc. By these, we would be able to fulfil the future water demand and with the time the quality of water as well.

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