An Approach of Sustainable Futuristic Urbanism for Waste Water Management and Treatment: Case of Kali Deh, Aligarh city

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Abstract : This paper is focusing on wastewater management and treatment by using a sustainable approach for future cities. With Urbanization, around 6 billion people will move towards the cities by 2050, Sothe major focus should be on enhancing the infrastructure capabilities for the better ecological environment. Unprecedented population growth has increased the demand for water and put stress on the infrastructure. The developing countries have the problem of water crisis due to climate change and population growth in an unplanned manner. There is a need to create healthy and sustainable wastewater management and treatment. The main concern is about the wastewater, and the need to reuse it for conserving the water for future generation. Wastewater management is essential for a city like Aligarh where organized town planning could never place. Most of the water bodies are transformed into wastewater carriers, polluting the environment due to contamination. The development has been leaning towards centralized wastewater treatment system. This paper highlights decentralized wastewater treatments in a sustainable manner for Aligarh city. This research paper is based on fieldwork and design-based approach where the water would be treated at the source level, it would affect the overall system as in ecologically, economically, socially. The aim of this paper is to analyse the urban water management and green cityscape scenario, by recognizing the need, issues and alternative sustainable approaches. This paper proposes a sustainable strategy that can be implemented for Wastewater treatment. The cities like South Korean, Australia where wastewater management has been done in an effective manner. In India, due to a lack of financial, institutional support, it could not possible. In India, management is the big issue for placing this service, it includes controlling and monitoring on the system.

IndexTerms **- Wastewater management, Water crisis, Climate changes, DWATS, Contamination, Sustainable development, Green Cityscape Scenario, Financial and Institutional Supports.**

I. INTRODUCTION

Due to rapid urbanization by 2050, cities will have the double population which is about 6 billion. Water is a natural asset which needs to conserve and protect for future generation. At the present time, the natural water resources of like rivers, drains, lakes, ponds etc are getting ruined, some are dried up and some have become sewerage carriers. By this, the whole water cycle is affected as in highly polluted and watershed fragmentation (akhtar, 2018).

Water a natural asset is getting polluted by industrial, domestic wastes and the groundwater level is depleting due to climate changes. So there is a need to conserve the water through a sustainable approach. The wastewater can be treated along the management of water areas.

The wastewater and sewerage are collected centrally and thrown in a place, from where this is carried by the drains and nallahs without treating and finally discharged into the tributaries (Senger and Karban rivers)of rivers Yamuna and Ganga. The central system is having high capital value and not an efficient use of this system in the reuse of wastewater, But other option has its proper uses and benefits with less cost and compromising the environmental sustainability. There are various types of systems for wastewater management like decentralized(SBT, Phytorid Technology, Reedbed zone, SBR, MBR etc) and for stormwater like RWH, bioswales, green areas etc to trap Rainwater. The wastewater can reuse around 80% by using the DWATS system. This solution would be able to develop the convection among socio, economic and ecologic setup in the city.

This paper proposes sustainable development after analyzing the city level issues based on site visits, surveys and sample collections. For the city level implementation, the typical areas and types of use are also determined.

2.Ecological Background and Parameters of Wastewater for Aligarh city:

This city is originated since 3rdBC, the earlier name was Kolis referred as a place name, mountain, sage, demon and jhil (lake). The most striking feature of Koil was the BalaiQila Upper Fort, i.e, a Fort was on the Great Mound. There was a tribe known as Kolis who engaged into weaving, this area is also known for cotton cultivation. Jhils and depressions abound in this area, which have silted up in the course of time, might have existed and a settlement coming up at the bank or in the vicinity of a Kol (Jhil) is also likely and that could have given the place its name (Parikh, 1912)

The city has 3% of the water layer in the city, there are 3 major drains and around 50 small drains (Mariya, 2017). The Jafri drain has a maximum capacity 2.3 cumecs, it passes through the cultivated land and ultimately joins to Lahtoi drain near Adaun village and finally tapped into Sengar River. It has total length is 17.5 km and Aligarh drain has maximum capacity 50 cumecs, it joins Karban(Jhima) river near Sadabad town, it has total length is 62.5 km. The city does not have a segregated system for drainage and

sewerage, both are carried by the same drains. The Stormwater Runoff: =659520000l/m , Pumping station discharge =164880000l/m (singh, 2018).

As per the topographical analysis, the city has the highest contour is 208 m(old city) and lowest is 178m(outskirts of the city), and the city is in bowl shape from the district. Aligarh has a suppositional sewerage system, where the open drainage system of the city is polluted by sewage, contaminated groundwater and garbage thrown into the drains. The drains are lying at the periphery of the city which are not laid as per slope (singh, 2018). In Rainy season, the city faces flood issues especially in low lying areas due to the inadequate infrastructure of drainage and sewerage system and severe health risk to its population and shows a heavy cost for repairing the existing system. The city is divided into 4 zones for the sewage system,3 zones are partially sewered but 4th zone is unsewered. The existing system needs more no. of pump stations (abha lakshmi Singh, 2001).

The city is divided into 70 wards, with the municipal boundary area of 4985 hec and city has 12.4 lakh population (Ministry of Home Affairs, 2017). The water demand is 196.2MLD(including 15% wastage) and supply is 110MLD. There are 111Tube wells are located in different areas which fed to the 20 OHTs, 8 CWRs. Apart from the municipality water supply, the city is dependent on illegal ground extraction for meeting the demand (singh, 2018).

With the above figures data, the sewage is around 156.96 MLD. The individual segregation of sewage generation, 99.5MLD is generated from domestic households, 24.6MLD from Institutional and Commercial entities, and 32.86MLD from Industries. There is a proposal of 40 MLD STP on Mathura Road as per the 2021 Master Plan (Authority, 2001). Now, Sewage is channeled to septic tanks that are emptied at intervals and direct connections with drains.

Pilot Area For Wastewater Treatment:

The sewage and wastewater of Aligarh city remain typical. Moreover, various sewerage schemes are working but without considering the need for water and efforts are done in isolation. Thus, it is important that the strategies and implementation need to be made on ground level on considering the earlier/proposed/future schemes for the city.

Kali Deh pond, Gambhirpura area Ward-21, this pond is used for bathing, washing and toilet-related activities and sewerage are directly connected to this pond and pumped out to drains with the help of 2 pump stations. There are many sewage discharge points from various sources into the pond from nearby households and slum. The population of this area is 13765, the sewage generated from this area is about 1.9MLD. There are open lands available that can be acquired for placing the treatment systems in 7 places. On-site treatment systems, beautification and other requirements can be placed along pond's surroundings. Smart city proposal is preparing a plan for beatification area along with other ponds without considering alternatives for a sustainable approach for the treatment of wastewater.

3.Method:

For low cost, the soil Biotechnology is the process for treatment of wastewater as "Treatment through Service System of Nature". This is a built-in-recycling process in nature, which would be searched out to meet the challenge of management. The wastewater comprising of sewage and sullage needs purification before its recycling in order to reduce environmental hazards. The challenge of management of wastewater produced mainly by human action. There is another one technique construct wetland system in which storm water can be treated and reuse it (Patnaik, 2014).

The sustainable approach for treating the wastewater system, the future cities would not have the scarcity of water. The system will have the natural process, SBT system. This system would also help in increasing the greens.

Soil Biotechnology:

The combination of physical processes like sedimentation, infiltration and biochemical processes are carried out to remove the suspended solids, organic and inorganic contents of the wastewater. It consists of a raw water tank, bioreactor containment, treated water tank, piping and pump. The overall time of operation is 6-7 hours per day. The soil biotechnology system bed is dried prior to next cycle of use. This Sustainable water treatment approach: 1.Low on energy consumption, 2. Low on mechanization, hence zero downtime, 3.no disposables or process residues, it has Potential for Zero Discharge, free from foul odour, 4.no use of synthetic chemicals, 5.scalable to any size of operation, 6.landscape as a by-product 7. Water recovery - 80%.

Working principle :

It is an ecology of SBT system configured as a packed bed reactor with multi-grade media consisting of different sizes of stone, gravel and formulated soil enriched with micro flora and esophagus earthworm culture.

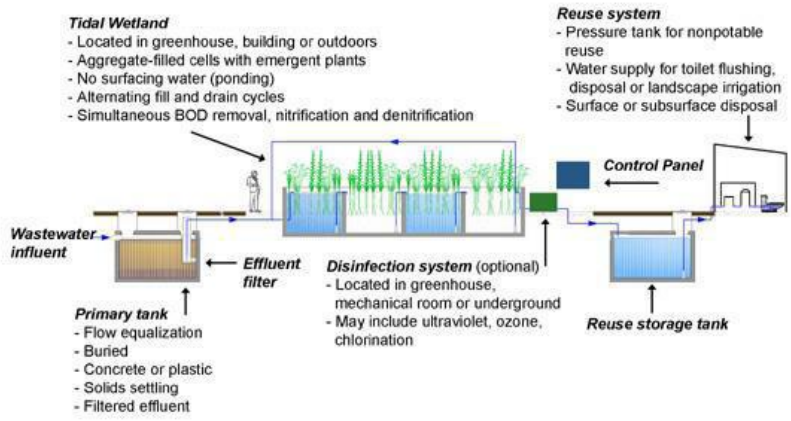

Table 1SBT Sites (singh, 2018)

Figure 1 SBT System (Estimated wastewater generation at AAETI, 2015)

4.Results:

The introduction of REs reduce, reuse, recycle and rethink at the city level for wastewater management and treatment.

The Outcomes would be 80% Lower O&M costs than comparable technologies, No electricity required, No chemicals added Minimal maintenance, Integrated with landscaping, Produces biogas and nutrient-rich water that are re-usable, Capacity 1,000 - 1 Million litres per day (1-1,000 KLPD) (Netherland, 2017)

The wastewater would be treated at the household level, treated water would be used for irrigation, household and dispose into ponds and drains and remaining waste would be used as fertilizer.

Figure 2Ward level SBT zone plan(singh, 2018)

Water demand	90lpcd
Waste water generated	75lpcd
Black	25lpcd
grey	50lpcd
Size of sbt system /capita	.23 cum.
Construction cost	4-5 lak
Annual O&M cost	50k

Table 2 Waste Water (singh, 2018)

Total greywater/D=4458kld
Total Reused water/D=4100kld
Total Treated greywater left =358kld(+/-)

Stormwater:

There is a pilot project (ward-21) for stormwater management in Aligarh city by placing the rainwater trapping systems like pervious pavers, bioswales and increasing the greens. The collected rainwater will be disposed into drains, ponds, stored in RWH and reuse for households level and irrigation. Apart from this, there will be design policy for rainwater harvesting system, in which every household (larger than 100sqm. area)should have the RWH system for this these houses would get subsidy 10% in water supply and electricity bills.

By the above process, the whole city would save around 60% water for future use and by applying the policy level intervention for water resource management, the water resources can be protected and preserved (Singh, 2018).

5.Impacts:

Around 80% of water can be reused by this process. The Environmental 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.

6.Conclusion:

In order to reuse the wastewater and development by preserving the water resources. Now Indian cities are facing the water crisis, the water resources are in a dilapidated condition due to rapid and unplanned development. Wastewater management is essential for Aligarh city, where sewage drains pollute the environment and put the population at risk. The existing wastewater management policies are not reflecting on the ground due to the high cost. This Paper will resolve this problem through cost-effective strategies. Thus the option of less-cost decentralized wastewater treatment proposes the direct benefits for ensuring sustainability and reusing around 80% wastewater. It is easier to propose the decentralized low-cost wastewater treatment and management for Aligarh city after recognition of the areas where it can be placed. Local community participation is also important for Implementation. Overall, the decentralized practical approach of wastewater management reflects to be innovative, location specific, keeping the socio-cultural importance in view.

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