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Sewage Treatment Plants And Technology Usages In India

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ABSTRACT:

Sewage and wastewater contain bacteria, fungi, parasites, and viruses that can cause intestinal, lung, and other infections. Bacteria may cause diarrhea, fever, cramps, and sometimes vomiting, headache, weakness, or loss of appetite. Some bacteria and diseases carried by sewage and wastewater. Recent studies reveal that untreated and poorly treated sewage elevates concentrations of nutrients, pathogens, endocrine disruptors, heavy metals, and pharmaceuticals in natural ecosystems.

Keywords: Health impact, waterborne diseases, poor treatment facilities.

INTRODUCTION:

The volumes of wastewater have been steadily increasing over time with the growing population, improvements in water supply, enhanced living standards and economic growth. According to WHO each year, 380 billion m^3 of municipal wastewater are generated globally every year.

Nearly 3.1% of deaths at the world are due to unhygienic and poor quality to drinking water. The World Health Organization (2020), estimates that 80% of diseases worldwide are waterborne, unsafe water source resulted in 1.2 million deaths and 71.7 million disability-adjusted life years, including 1.1 million deaths and 61.1 million from diarrheal diseases have resulted

In India the estimated of wastewater generation is approximately 39,604 (MLD) in the rural regions, while in the urban centers the wastewater generation has been estimated around 72,345 MLD for the year 2020-21. The estimated volume of urban wastewater is almost double that of rural and the availability of more water for sanitation has increased the living standards in urban cities. While 8.75 lakh people were affected by water-borne diseases in 2019, the number was dropped to 4.9 lakh in 2020 and 4.6 lakh in 2021. Waterborne

illness is caused by recreational or contamination in drinking water source of disease-causing microbes or pathogens.

REVIEW OF LITERATURE

Y. Y. Tan, et. al (2023), This paper presents an overview of the sludge treatment reed bed is a sustainable sewage sludge management technology that offers promising sludge dewatering and stabilization, due to its low energy and labour requirements, and minimal operating and maintenance costs. Despite numerous existing studies and increasing applications of sludge treatment reed bed in both developed and developing countries, the lack of standard system configurations and operating regimes led to several operational problems, including bed clogging and poor dewatering and mineralization efficiency.

Ramendra Soni, et al (2021), In this paper, reviewed environmental and public health issues associated with the use of untreated wastewater in agriculture. This paper focused on the current state of affairs concerning the wastewater treatment model and computational approach. Given the dire need for rounded approaches for cultivation, proposed the ideas to tackle the issues related to wastewater treatment and the reuse potential of the treated water. Water resources are under threat because of the growing population. Increasing generation of wastewater (municipal, industrial, and agricultural) in developing countries especially in India and other Asian countries has the potential to serve as an alternative of freshwater resources for reuse in rice agriculture, provide appropriate treatment, and distribution measures are adopted. Wastewater treatment is one of the big challenges for many countries because increasing levels of undesired or unknown pollutants are very harmful to health as well as environment.

Iheukwumere S. Oji, et al (2018), Domestic wastewater can be viewed as an important resource when properly managed; it requires adequate management practice aiming at efficient treatment and distribution for reuse. Treated domestic wastewater reuse with acceptable quality plays a crucial role as an additional water source considering groundwater protection and conservation. The main objective of this study was to investigate treatment and reuse of domestic wastewater, as well as the wiliness and awareness of the public on domestic wastewater treatment, personal reuse and for other purposes such as irrigation in Awka urban of Anambra State, Nigeria. Survey method of research was applied, while statistical analysis involved use of Percentage, Weighted mean, and Mann Whitney test. The researcher found that there is no form of domestic wastewater treatment and reuse in the study area. About 51.39% objected to treatment of domestic wastewater, while 53.40% and 56.68% will not want to use treated wastewater or support agricultural products irrigated with treated wastewater respectively. The research concludes that Wise investments in wastewater management will generate significant returns, as addressing wastewater is a key step in reducing poverty and sustaining ecosystem services. It is recommended that centralized wastewater treatment be initiated and public enlightenment on safety and use of properly treated domestic wastewater be organised.

OBJECTIVES:

- To find out the sewage generation and treatment capacity in India.
- To analysis sewage treatment technology in India.
- To examine the health impact due to contamination in water supply.

METHODOLOGY:

In this study is based on secondary sources of interpretation. Secondary source of data were collected from various sources i.e. journal, newspaper, books, electronic sources, WHO, WB, CPCB, NHP, etc. The data which is relevant to the study has been collected and used for analyzing purpose.

SEWAGE TREATMENT TECHNOLOGIES:

1. **Activated Sludge Process (ASP)**

Activated sludge process is the activated sludge process for removing carbonaceous pollution begins with an aeration tank where air (oxygen) is injected into the waste water. This is followed by a settling tank to allow the biological flocs (sludge blanket) to settle, thus separating the biological sludge from clear treated water.

2. **Extended Aeration (EA)**

The Extended Aeration process is one modification of the activated sludge process which provides biological treatment for the removal of biodegradable organic wastes under aerobic conditions. Air may be supplied by mechanical or diffused aeration to provide the oxygen required to sustain the aerobic biological process.

3. **Fluidized Aerobic Bed (FAB)**

The fluidized bed allows for high concentrations of attached biomass and consistent performance under steady-state conditions without backwashing. As the microorganisms acclimate and grow, the number of attached microbes per media particle increases creating an expanding “living” media bed.

4. **Moving Bed Biofilm Reactor (MBBR)**

The moving Bed Biofilm Reactor (MBBR) solution is a biological wastewater treatment and biological water treatment processes where biofilm grows on carriers suspended in wastewater that removes pollutants in a cost-efficient way. It can be used across almost all municipal and industrial market sectors.

5. **Sequencing Batch Reactor (SBR)**

The sequencing batch reactor is a fill-and -draw activated sludge system for wastewater treatment. In this system, wastewater is added to a single “batch” reactor, treated to remove undesirable components, and then discharged.

6. **Up flow Anaerobic Sludge Blanket (UASB)**

Up flow anaerobic sludge blanket technology also known as **UASB** reactor is a form of anaerobic digester which used in wastewater treatment. UASB reactor is a methane-producing digester, which uses an anaerobic process and forming a blanket of granular sludge and is processed by the anaerobic microorganisms.

7. **Waste Stabilization Pond (WSP)**

Waste stabilization pond (WSP) is natural technology which can be installed in centralized or semi-centralized sewerage systems for treatment of domestic and industrial wastewater, septage and sludge, etc. WSPs are highly efficient, simple to construct, low cost and easy to operate

8. Aerated Lagoons (AL)

Aerations is the process of adding air into wastewater to allow aerobic biodegradation of the organic materials. The principal secondary treatment techniques used are the trickling filter and activated sludge process and are often classified as fixed-film or suspended- growth system respectively.

9. Trickling Filter (TF)

A trickling filter is a type off wastewater treatment system. It consists of a fixed bed of racks, coke, gravel, slag, polyurethane foam, sphagnum peat moss, ceramic, or plastic media over which sewage or other wastewater flows downward and causes a layer of microbial slime(biofilm) to grow, covering the bed of media.

10. Biological Filters (BT)

The term biological filters or biofilters used in wastewater treatment includes all the process that combine biological purification through attached growth with the retention of suspended solids. This technique applies thin biological films that are regularly renewed by washing (12 to 48 hours cycles)

11. Electrocoagulation (EC)

Electrocoagulation is a method that has a great ability on various waste water and leachate treatment. It has a potential in removing various pollutants such as chemical oxygen demand, turbidity, ammonia, color, and suspended solid

12. Memberane Bioreactor (MBR)

MBR is a process that combines a membrane ultra / micro filtration process and activated sludge process. The MBR process is used in place of the secondary sedimentation tank and sand filter used for tertiary treatment in the conventional activated sludge process.

13. Fluidized Media Bioreactor (FMBR)

Fluidized media reactor is a attached growth waste water treatment process. Flock forming organism's form clusters or attach to available surfaces.

14. Root Zone (RZ)

The root zone plant is a biological filter, where the biological treatment of waste water takes place in a soil volume, which is penetrated by roots. The root network is composed by suitable plant species; it is even beneficial if the optimum varieties of these species are selected.

ANALYSIS AND INTERPRETATION OF SECONDARY DATA:

Table: 1 State-wise Sewage Generation, Installed Treatment Capacity and Actual Treatment

Zones	State U/Ts	Total sewage generation (MLD)	Operational Treatment Capacity in MLD	STP installed	Installed capacity		Actual quantity treated / capacity utilized		
					MLD	(MLD) % sewage generated	MLD	% total sewage generated	% installed capacity
West Zone	Rajasthan, Madhya Pradesh, Gujarat, Daman & Nagar Haveli, Maharashtra, Goa	21194	11259	474	13283	304	7975	155	282
South Zone	Andhra Pradesh, Karnakata, Kerala, Tamil Nadu, Puducherry, Telangana, Lakshadweep	20851	4908	313	6114	185	3873	113	341
North Zone	Jammu & Kashmir, Himchal Pradesh, Punjab, Chandigarh, Uttarakhand, Haryana, Delhi, Uttar Pradesh	16894	10228	597	11026	703	8088	451	483
East Zone	Bihar , Sikkim, Mizoram, Tripura, West Bengal , Jhakhand, Odisha, Arunachal Pradesh, Chhatisgarh	13406	474	85	1418	103	85	32	24
	TOTAL	**72345**	**26869**	**1491**	**31841**	**44%**	**20236**	**28%**	**64%**

Sources: CPCB, 2021

From the table:1,The sewage generation in the urban centers of India, as per the recent assessment by Central Pollution Control Board (CPCB) in 2020-21, was estimated with 72,345 Million Liters per Day (MLD). Currently, the installed sewage treatment capacity is 31,841 MLD, but the operational capacity is 26,869 MLD, which are much lower than the load generated. The total urban sewage generation was estimated with 72,345 MLD, but only 28% of it is (20,236 MLD) of sewage water of gets treatment facility. Entire water is not connected with underground sewage system the estimated sewage generations is not setting treatment facilities, both treated and untreated waste water direct in water bodies or open space. This implies that almost 72% of the wastewater remains untreated wastewater largely finds its way out through nearby rivers, lakes, and groundwater aquifers, thus causing contamination and deterioration of water quality.

Table: 2 Technology Adopted in for STPs in Indian state

Zones	STPs and Capacity	ASP	EA	FAB	MBBR	OP	SBR	UASB	WSP	AO	Total
West Zones	No. Of STPs	57	11	1	51	12	197	18	22	195	564
	Capacity in MLD	2719	206	1	1011	112	4650	764	315	6636	16414
South Zones	No. Of STPs	90	15	5	23	22	57	13	15	78	318
	Capacity in MLD	2196	199	29	207	172	1536	779	204	811	6100
North Zones	No. Of STPs	156	4	9	125	18	192	45	20	46	615
	Capacity in MLD	4033	69	153	814	115	3523	2020	81	308	11116
East Zones	No. Of STPs	18	0	6	2	9	44	0	10	43	132
	Capacity in MLD	441	0	61	2	63	934	0	195	1202	2898
Total	**No. Of STPs**	**321**	**30**	**21**	**201**	**61**	**490**	**76**	**67**	**364**	**1631**
	Capacity in MLD	**9492**	**474**	**244**	**2034**	**462**	**10647**	**3563**	**795**	**8957**	**36528**

Sources: CPCB, 2021

From the above table 2 various the technologies employed for treatment of domestic wastewater in India. It is observed that Sequential Batch Reactor (SBR) and Activated Sludge Process (ASP) are the most prevailing technology adopted by Urban Local Bodies (ULBs). Technological distribution with respect to number of plants and capacity of STPs are shown in the above table. As mentioned earlier, sewage generation is estimated as 72,345 MLD and capacity utilization is only 20,236 MLD, 28% of the total generation and remaining quantity of untreated sewage is 52,109 MLD is let which is stated 72% of total sewage generation.

Utilization of treated sewage wastewater has following positive impacts:

- Re-use of treated sewage will minimize the water demand from aquatic sources like river, ponds, lakes and also groundwater resources.
- Less consumption of water will help in conserving protecting natural water resources.

Table: 3 Diarrhea Diseases Affect in India 2016-2020

Zones	Diarrhea	2016	2017	2018	2019	2020	Total
West Zone	**Cases**	3431521	3011825	2840270	2242076	1260263	**12785955**
	Death	197	77	76	16	372	**838**
South Zone	**Cases**	4088329	3545450	3642049	3772331	1651252	**16699411**
	Death	63	78	96	142	413	**792**
North Zone	**Cases**	2665832	4895697	2791063	2784730	1273320	**14410642**
	Death	601	553	522	518	272	**2466**
East Zone	**Cases**	3980919	3604947	3921393	4282715	2378237	**18168211**
	Death	694	520	756	602	549	**3121**
Total	**Cases**	**14166601**	**15057919**	**13194775**	**13081852**	**6563072**	**62064219**
	Death	**1555**	**1328**	**1450**	**1278**	**1606**	**7217**

Source: National Health Profile 2016-2020

From the table:3, Diarrhea disease from 2016-2020, 62064219 cases was registered in India and 7217 deaths was accounted. In the year 2016 nearly 1,41,66,601 cases and 1555 deaths were recorded. Respectively 2017 onwards the slightly Diarrhea disease cases was recorded which 1328 and death ratio was low. And 18168211 Diarrhea cases and 3121 deaths was reported in East Zone alone, from this individuals are spending huge amount for health expenses in the state. Due poor sanitation facilities and Population growth rate people was affected in diarrhea in the respective states. Followed by North Zone, West Zone and South Zone with 2466, 838, and 792 respectively.

Table: 4 Impact of Typhoid in India from 2016-2020

Zones	Typhoid	2016	2017	2018	2019	2020	Total
West Zone	Cases	398903	317579	341281	211523	109209	**1378495**
	Death	23	10	13	7	17	**70**
South Zone	Cases	461658	406061	375314	439772	258653	**1941458**
	Death	3	35	10	8	24	**80**
North Zone	Cases	738341	882055	1015005	1138440	436652	**4210493**
	Death	429	290	262	110	8	**1099**
East Zone	Cases	616900	615453	576937	600846	265258	**2675394**
	Death	57	158	114	22	76	**427**
Total	**Cases**	**2215802**	**2221148**	**2308537**	**2390581**	**1069772**	**10205840**
	Death	**512**	**493**	**399**	**147**	**125**	**1676**

Source: National Health Profile 2016-2020

From the table:4, Highlight case & death recorded due to Typhoid disease in India from 2016-2020, 1,02,05,840 cases was registered in India and 1676 deaths was accounted. In the year 2016 nearly 2,215,802 cases and 512 deaths were recorded. Respectively 2017 onwards the slightly Typhoid disease cases and death ratio was low. In North Zone 4,210,493 Typhoid cases and 1099 deaths was reported, from this individuals are spending huge amount for health expenses in the state. Lack of sanitation and contamination of water play a vital role in the health condition of the individuals. The unavailability of heath care centers is main the reason for increase in death cases.

CONCLUSION:

The outcome of this paper based on secondary data. It reveled clearly that in India sewage generation per day nearly 72,345 MLD and capacity of utilization is only 20,236 MLD and remaining quantity of 52,109 MLD is let-out as untreated sewage. The almost 72% of the wastewater is untreated and finds its way out through the nearby water bodies, and groundwater thus causing contamination and deterioration of surface and ground water quality. The untreated sewage generation lead to affect the human health and environmental dramatically.

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