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Abstract: Water pollution from biological, toxic, organic, and inorganic sources affects 70% of Pune's surface and groundwater resources. Untreated sewage is the most significant source of water contamination in Pune. Small-scale, unregulated industry is another source of pollution. Industries, untreated sewage, and solid waste pollute the majority of Pune's rivers, lakes, and surface waters. The rising socioeconomic cost of poor water quality is the result of this enormous problem. Every day, a million litres of wastewater enter rivers and other bodies of water without being adequately treated. The less fortunate members of Pune's society are the most adversely affected by water pollution because they typically live close to major water sources. Pollution slows economic growth in downstream areas, which in turn slows GDP growth in these areas. Controlling water pollution near rivers, lakes, and oceans is necessary. The city's continued growth will be fueled by clean water bodies, especially for the most disadvantaged members of society.

Keywords: Water Pollution, GDP, Surface Water, Pesticides, Fertilizers

1. Introduction

The Khadakwasla dam provides Pune with water, but the distribution within the city is extremely uneven. While some areas receive as little as 100 litres per person per day, others receive as much as 600. Despite its installed capacity to treat 599 million litres of sewage per day, Ethiopia's two main rivers, the Mula and Mutha, continue to be severely polluted. This results in enormous amounts of waste water and sewage. "The main rivers have still not receded at some stretches. It will take some time for the water level to go down. As of now, the speed of water flow has reduced considerably. The solid waste that has become mixed with the river is one of the main reasons for the reduced water flow," 150 MLD of untreated waste water enters the Mutha in Pune, contaminating its water.The consequences are all too obvious. There are a lot of weeds and water hyacinth on the riverbed; noxious gases and a foul odour are common. In addition, when the Mutha reaches the Bhma River system, people downstream consume Pune's sewage. SERI has recommended to Pune Water Pollution Control the establishment of sewage treatment plants at individual houses, colonies, apartments, and slums at a cost of Rs 10,000 for 1,000 litres per day and the treatment of the city's 150 nallahs at a cost of Rs 85,000 for 10 lakh litres per day.

We all know how bad our trash problem is, and we have to deal with the fact that garbage isn't always picked up on time every day.Everything unrelated to human consumption or sustenance was thrown out[1)]. It is estimated that between 0.5 and 2.2 pounds of trash are thrown away daily[2)]. It may be argued that all organisms, alive or otherwise, need air and water to function properly. Water and air pollution[3), 4)] are both on the rise as a result of the increasing problem of solid waste management in India. Garbage and other forms of solid waste are produced every day by urban society. But, in recent years, environmental degradation has negatively impacted human health[5)]. These pollutants are substances found in nature that become toxic when released into the atmosphere in large amounts. The rapid increase in human population, urbanisation, and industry has made solid waste management a global issue[6)].Inadequate solid waste management causes health, economic, environmental, and biological problems in most developing nations[7)]. The harmful outcomes of trash depend on the waste's composition and on any improper disposal practises that may have been used. Polluting the environment with trash has both immediate and long-term consequences for human health[8), 9)]. Infections, asthma, and birth abnormalities are short-term consequences[10)]. Other symptoms include tension, anxiety, headache, dizziness, nausea, ocular and respiratory irritation, and others[11)]. Trash may cause chronic respiratory and cardiovascular disorders, cancer, brain, nerve, liver, lymphohematopoietic system, and renal problems[12)].

The characteristics, creation, collection, transportation, and disposal of trash in Indian cities have been studied to assess the situation and highlight the key challenges[7,13]. Solid waste management has become a big problem in India's most populated cities because the amount of municipal solid waste produced per person has grown as living standards and socioeconomic status have improved[14].The growing amount of rubbish that must be disposed of at the end of its life has made solid waste disposal difficult[15]. Even though India has made a lot of progress in social, economic, and environmental areas, its solid waste management practices have stayed mostly the same[16]. Management of solid waste doesn't work well and hurts people's health, the environment, and the economy[17]. India's Ministry of Environment and Forests wrote the Trash Management and Handling Regulations[18]. Solid waste releases SO_2, NOX, CO, RSPM, and SPM (SPM). Dust from several sources may transmit germs and cause colds and cancer, according to[19]. Short- and long-term respiratory problems are caused by air pollution[20]. During the dry season, smoke from the dump site is a major source of air pollution for people living far away, and populations living in polluted areas with high suspended particulate matter have been linked to an increased risk of cardiovascular disease. Due to this, several people experienced chest discomfort, coughing, allergies, irritation, stress, and breathing problems[21),22]. Landfill gas is produced during anaerobic decomposition of solid waste in developing countries due to the trash's high density and moisture content. Gases such as methane (CH_4) and carbon monoxide (CO_2) dominate in landfill gas, with additional trace gases and volatile organic compounds present at very low concentrations. Both methane and carbon monoxide (CO_2) are considered greenhouse gases (GHGs), but the global warming potential of CH_4 is 25 times greater than that of CO_2, and the atmospheric residence period of CH_4 is only 123 years[23].

Pollution is defined as any unwanted chemical or physical substance in water that may harm aquatic life. Toxic chemicals such as copper, manganese, lead, cadmium, phosphate, and nitrate exist. The absence of physical and chemical contaminants in groundwater is a matter of public health. Ground water is used for drinking and other domestic needs by those living close and on the waste site. Those who live in close proximity to a landfill or who have had their drinking water contaminated by rubbish dumped or leaked from landfills also face an elevated risk of injury and sickness[4]. In particular, household garbage is a favourable environment for the growth and survival of infectious microorganisms[24]. When solid waste isn't removed, stagnant water might breed malaria, chest pains, diarrhoea, and cholera[21]. Plants and animals that ate unwashed trash in streams absorbed toxic chemicals[25]. Cyanides, mercury, and PCBs may kill if released improperly. Many studies have shown higher amounts of organic and inorganic contaminants, as well as heavy metals, in surface and subsurface water and water near solid waste dumps[26]. There are 120,000 tonnes of solid garbage produced daily in India's metropolitan areas, and almost all cities have environmental degradation due to poor solid waste management[27]. Improper waste management might be harmful to people's health. It's not only unsightly; it also contributes to air pollution, water pollution when tossed into water, and ozone depletion when burnt, all of which exacerbate the impacts of global warming. Waste management is often ineffective when using conventional methods[28), 29]. Garbage is incinerated, left on the side of the road, and flushed down drains and sewers[30]. These practices promote the proliferation of pest insects and rodents, release offensive odours, have an adverse aesthetic impact, and exacerbate climate change (during combustion). It's possible for aerobic or anaerobic processes to be used in the transformation of organic (biodegradable) waste. When organic matter is broken down in an aerobic setting, compost is the result[31]. Biogas and effluents that may be used as biofertilizers are both byproducts of anaerobic treatment[32]. If you need to get rid of garbage, composting is a safe option. Aerobic decomposition, or composting, is the process by which microorganisms break down and transform organic and inorganic waste into usable nutrients and soil amendments[33]. The byproducts have humic substances, which set them apart from things like regular dirt, coal, and peat. With composting, you may turn a wide variety of biodegradable wastes into compounds that can be used in a controlled environment as biofertilizers and soil additives[34),35),36].

Wastes that have been composted contain organisms that help plants grow and the right nutrients, which boost agricultural productivity and increase the amount of organic matter in the soil[37), 38]. This helps ensure the safety of our food supply. Beyond fertiliser, compost can be used for bioremediation[39], plant disease management[40], weed control[41], pollution avoidance[42], erosion control[43], landscaping[44], and restoring wetlands[45].The environmental impacts of synthetic fertiliser may be reduced by composting[43], and composting also increases soil biodiversity. Composting, in contrast to what occurs in nature, is initiated and maintained in a controlled environment[44]. Composting may be distinguished from decomposition (which occurs spontaneously) by its more managed nature[45]. Although composting has many potential benefits, it has a number of drawbacks as well. It takes more time to prepare, it produces an unpleasant odour, it takes a long time to mineralize, it may contain pathogens that can survive at temperatures above normal, and it lacks sufficient nutritional content. Despite the growing body of research on compost's agronomic value, microbial contamination, and nutritional content[46), 47), 48), 49], researchers have largely overlooked the challenges presented by prolonged composting times and the opportunities presented by the elimination of odours,

pathogens, and heavy metals. Whether solid, liquid, or gaseous, anything not wanted is considered garbage[50]. Negative effects on human health, animal welfare, plant life, and environmental quality result from improper waste management[51]. As around half of all trash[52],[53],[54] is organic, properly handling organic wastes may greatly reduce pollution from improper trash disposal. Trash pollutes the environment. Smoke, odours, and particulates pollute. Solid waste combustion produces greenhouse gases such as carbon dioxide and nitrous oxide, which deplete ozone and cause the greenhouse effect[55]. Airborne methane and hydrogen sulphide may escape. These drugs are dangerous.

Trash also has a negative effect on the ecosystem by contaminating water sources. Over 1400 people each day lose their lives as a direct consequence of water and water-related issues or diseases[56]. Decreases in pH and toxicity to aquatic life and people who use the water may result from wastes entering water bodies like rivers, streams, and seas. A number of these contaminants are highly lipophilic and thus less soluble in water[57]. Reports indicate the presence of toxic metals in aquatic environments[58],[59],[60]. It's possible that garbage- contaminated water from one location may be used as a water source at another. Soil contamination may also be caused by improper waste management. Unorganised garbage dumps are unsightly and may become breeding grounds for pests that spread illness. Iron-derived metals, radioactive waste, and similar pollutants are toxic to plants and soil organisms, reducing crop output[61]. Poor waste management facilitates the breeding of disease vectors, which in turn leads to human diseases. Stagnant water, plugged drains, tyres that collect rainwater, empty food cans, plastic, etc. are all breeding grounds for mosquitoes. Refuse workers are vulnerable to skin and parasite infections from working with trash, as well as injury to tissues and organs from broken glass, razor blades, and syringes[29]. Modern automated systems should be encouraged to protect garbage workers from waste-related accidents, in addition to staff taking safety precautions like gloves and nose masks.

Organic contaminants in composted solid municipal waste in Australia were studied by Langdon[62]. They were able to assign relative levels of importance to the risks based on their potential impact on human health. In this way, measures may be taken to guarantee that the harmful substances included in these wastes are properly eliminated. Another study that looked at how e-waste affects people's health found that it contributed to air pollution by putting a lot of toxic metals into the air. Gangwar[63] conducted this study. Several reports[64-67] have addressed the dangers of these trashes to people and the environment. Untreated industrial and municipal wastewaters may endanger human health and ecosystems in 80% of cases[68]. To keep up with the growing number of novel contaminants in water, we need improved monitoring technologies[69]. Carstea have stressed the need for wastewater quality monitoring to detect waterbody contamination early and ensure regulatory compliance during wastewater treatment and disposal[70]. Receiving rivers are often exposed to a wide range of human wastewaters, making it difficult to trace the origin of toxins in such rivers. It is difficult to effectively enforce environmental standards on the responsible parties due to the lack of standardised water quality monitoring methodologies. This illustrates the need for an all-encompassing monitoring tool to better evaluate the impact and locate wastewater sources, allowing for the implementation of appropriate remedial and preventive measures for particular chemicals discharged into the river[71]. When DOM-containing wastewater effluents are released into the natural aquatic environment, either via discharge or reuse techniques, they may affect the native chemical make-up of the receiving water bodies[72]. disinfectant by-products removed during wastewater treatment. Differing characteristics of DOMs generated from wastewater include a greater organic nitrogen and aliphatic content[73],[74],[75]. Several investigations have found aromatic polymers with oxygen, nitrogen, and sulphur functional groups in DOM, notably in specialised treatment systems[76]. Foreign or allochthonous chemicals from industrial wastewaters and urban or precipitate runoffs cause DOM composition variation in the natural aquatic environment, which disrupts ecological function[77]. Pharmaceuticals and endocrine-disrupting substances from industrial, agricultural, hospital, and wastewater treatment plants (WWTPs) are commonly considered as new contaminants[78],[79].

2. Dynamics of River Pollution

India has 12 major, 46 medium, and 55 minor river basins. Rivers with a combined length of approximately 45,000 kilometres traverse nearly the entire nation. Increasing urbanization and industrialization are irreparably depleting ecosystem goods and services. Pollution from industries, cities, agriculture, seawater intrusion, and geological sources (fluoride, arsenic) is also occurring in an increasing number of areas.

2.1 Mula River the Mula is a river in Pune, India.

The Mutha River flows eastward from its source in the Western Ghats until it joins the Mula River in Pune. The boundaries of the Pimpri-Chinch wad Municipal Corporation and the Pune Municipal Corporation are separated by the river. The first time it was dammed was at the Panshet Dam, which is on the Ambi River and supplies irrigation and drinking water.

2.2 Survey of polluted rivers in Pune city

2.2.1Mula Mutha River [10 km]

For the purpose of simulating water quality, a 32-kilometer section of the Mula-Mutha River in Pune, India, was utilized. By 2041, the current simulated scenarios clearly demonstrate that the water quality will rapidly

deteriorate and will not be suitable for many aquatic life by comparing the simulated parameters of the water quality. Population growth and climate change are the primary drivers of global change. According to the findings of the scenario with mitigation measures, the planned wastewater treatment plants and policies that are currently in place are insufficient to achieve the desired river water quality, requiring immediate and comprehensive action.

2.2.2Mula River [22 km]

In Pune, Maharashtra, India, the Mula Rivers are extremely filthy and unhealthy. According to the Maharashtra Pollution Control Board, it is the second most polluted river in Maharashtra in 2018 and flows 22 kilometers through the city of Pune. It contains three times the safe limit of human and animal excrement.

2.2.3Pawana River [58 km]

About 6 km (3.7 miles) south of Lonavala, the Western Ghats are where the Pavana River gets its name. It initially flows east, then turns south and travels through Ravet, Thergaon, Chinchwad, Pimpri, and Dapodi before joining the Mula river near Sangvi.Industrial waste that is flushed into Pimpri Chinchwad's water bodies has increased, making the Pavana river the most polluted of the three that run through the area. The pollution levels in the Pavana, Mula, and Indrayani rivers have all increased, but the Pavana, which runs 20 kilometers through the city, is now the most polluted of the three. According to the Pimpri-Chinchwad Municipal Corporation (PCMC)'s environment status report, the Pavana River is significantly more polluted than the other rivers that pass through the industrial town. Additionally, the report states that the Indrayani and Mula rivers are less polluted and that the oxygen level in the river has decreased significantly.

2.2.4Bhima River [861 km]

Indapur is a city and municipal council in the Pune district of the Indian state of Maharashtra. The Bhima River flows southeast for 861 kilometers through the states of Maharashtra, Karnataka, and Telangana. There are approximately 7000 industries, including large, medium, and small businesses, along the river stretch. Industry pollution accounts for 80 percent of the river's pollution, and domestic wastewater accounts for 20 percent. As a result, the water in a river contains a lot of organic, inorganic, and dissolved matter, making the water unsuitable for drinking. This study aims to examine the water characteristics and analysis of the Bhima River's stretch from Paragon to Indapur to determine the Bhima River's monthly variation in water quality. Technology and Society, 2018, pages 751–762].

2.2.5Indrayani river

Residents claim that industrial buildings in the PCMC limits release pollutants into the PUNE River: Residents of the temple town of Alandi have expressed alarm and concern about the presence of a thick layer of toxic foam on the surface of the Indrayani river waters, which many of them use for drinking and domestic purposes.

2.2.6Kundalika River [74 km]

Industries use more than 90% of Kundalika's water, including the THAL Project of RCF and numerous MIDC across the region. Sadly, this has led to pollution, particularly as a result of the chemical industries in Roha releasing a lot of effluents (chemical waste) into the river. The upcoming Reliance and Essar projects in the Villa MIDC are expected to use 9000 Quiesces of water. In addition to significantly lowering the river's downstream water levels at Kolad, this could result in the death of rafting. The river will continue to die off a little bit longer and become calmer and shallower.

2.2.7Nira river

The Bhima River is a tributary of the Shivaganga, which joins it at Pune's southern border. The water supply in Pune district for agriculture, drinking water and Industrial use is supplied from 23 minor, medium and major water reserves. Total storage capacity of these 23 water reserves is 4543.34 million cubic meters. The main water supply for villages and towns situated on the banks of river is from river water or well.

2.2.8Karha River

The Indian state of Maharashtra is traversed by the Karha River. Its basin is in Pune's neighborhoods. On the banks of this river are the towns of Baramati, Saswad, and Jejuri, where Lord Khandoba lived. The Karha is a Nira River tributary. Among all Nira River tributaries, the Karha's water is said to flow the fastest.

2.2.9Ulhas River [122 km]

The Indian state of Maharashtra is home to the Ulhas River. It is in that state's Thane, Raigad, and Pune districts. It divides into Vasai Creek and Thane Creek near Thane and flows north and west from there. The Ulhas is crucial to Mumbai's water supply because it separates Salsette Island from the mainland. Polluted rivers are shown in Fig. 1 to Fig. 9 in pune city.

Fig. 1: Mula Mutha River

Fig. 2: Mula River

Fig. 3: Pawana River

Fig. 4: Bhima River

Fig. 5: Indrayani River

Fig. 6: Kundalika River

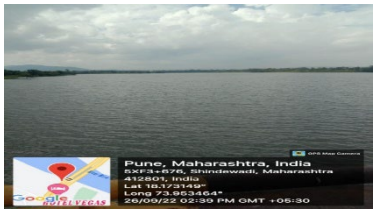

Fig. 7: Nira river

Fig. 8: Karha River

Fig. 9: Ulhas River

2.3 Facts of Water Pollution

a) Every day, more than 3000 children worldwide die from drinking contaminated water.
b) Each year, about 1.2 trillion gallons of untreated sewage, industrial waste, and a substantial volume of surface water from heavy rain enter the lakes, according to the United States Environmental Protection Agency (EPA).
c) According to UNICEF and WHO estimates, nearly 2.5 billion people do not have access to proper sanitation.
d) Diarrhea-related diseases kill about 3.2 million children under the age of five each year as a result of poor sanitation and polluted drinking water, according to the World Health Organization (WHO).
e) According to a World Watch Institute assessment on nuclear waste, decades of nuclear waste disposal have rendered Russia's Lake Karachay the world's most contaminated area. One person may perish for an hour there.
f) According to a Food & Water Watch poll, drought will impact two-thirds of the world's population and five times as much territory by 2025.
g) According to the Food and Water Watch assessment, agriculture and livestock activities, industrial weed killer usage, and toxic waste render the water in 40% of the United States' rivers, streams, and lakes unfit for drinking, swimming, or fishing.

3. Main Sources of River Pollution

a) Point Sources

Point Sources are the sources that produce pollution from a single source. For instance, industrial wastewater discharges.

b) Non-Point Sources

Non-Point sources include things like pesticides, fertilizers, household waste, and other everyday human activities like riding a bike, driving a car, breathing smoke from a chimney, fertilizing your garden, and so on.

c) Chemical and Industrial waste

Additionally, industrial waste is a significant contributor to water pollution, frequently resulting in contamination with numerous organic compounds and heavy metals like lead, mercury, arsenic, and cadmium.

d) Solid Waste

Pune has emerged as a center for automobile, information technology, and educational institutions, making it one of the fastest-growing cities. The solid waste that is collected by the Gram Panchayat, Municipal Corporation, and Municipal Council is stored in the dumping ground without any process. When it rains, the solid waste and rain water percolate into the river, causing serious water pollution.

e) Agricultural Run-offs

On the banks of Bhima River and its tributaries there is fertile land which is used for cultivation of sugarcane, paddy and other crops. There is excess use of inorganic fertilizers and pesticides, insecticides and fungicides to increase the yield of crops, this is finally entering into the rivers along with runs-off water during rainy season and cause severe pollution in river. Nitrogen and phosphorus are abundant nutrients in pesticides and fertilizers; Potassium contributes to the enrichment of water bodies, which is referred to as eutrophication or hypertrophication. This process results in the glomming of aquatic plants, algae, and phytoplankton, which secrete toxic substances that can harm or kill both humans and animals.

f) Mining Activities

Heavy metals, sulfide compounds, and other metals are exposed at mining sites. Rainwater leaches the waste that mining activities produce, which eventually pollutes soil, ground water, and surface water. mercury, cyanide, and Arsenic, sulfuric acid, heavy metals like lead or cadmium can all be highly polluted in the water sources as a result. Due to excess activities of mining many lower portions of the river bed created by dressing activities and due to this there is lot of water logging and the natural river flow become stagnant. Due to water logging percentage of minerals, salts increases and it disturb the PH level of the water. Indonesia has a mining law that governs mining business permits (MBPs) for exploration. MBPs are business permits given to carry out the phases of operations for general investigations, exploration, and feasibility studies[6]. Sources for Polluted rivers are shown in Fig. 10 to Fig. 15 in pune city.

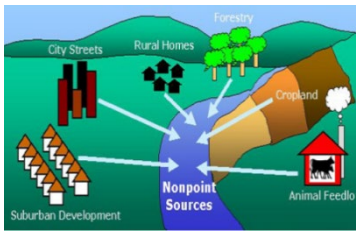

Fig. 10: Point Sources

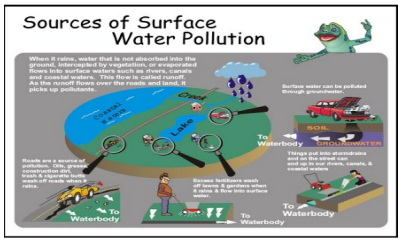

Fig. 11: Non-Point Sources

Fig. 12: Chemical and Industrial waste

Fig. 13: Solid Waste

Fig. 14: Agricultural Run-offs

Fig. 15: Mining Activities

3.1 List of industries that release the most waste water into the river

- Industries related to food
- iron and steel
- mines and quarries
- Battery manufacturing
- Organic chemicals industries
- Electric power plants
- Textile industries
- Petroleum refining and petrochemicals industries
- Paper and pulp industries

4. Effects of Pollution

4.1 Effect on Physical Properties of Water

4.1.1Colour

May be possibly due to substances of mineral origin, such as iron or chromium, or to organic dye stuffs. Colour may not necessarily be harmful, and natural water of peaty origin is often highly coloured, but colour can adversely affect photosynthesis.

4.1.2Temperature

The rise in temperature caused by warm effluents can cause reduction of dissolved oxygen and also leads to an increased use of oxygen by biochemical reactions occurring in the water. Fishes may be directly affected and die and there may be an adverse effect on fish eggs.

4.1.3Odour

People may experience a persistent odor that can cause coughing, wheezing, or other breathing issues. People who smell strong odors may experience headaches, dizziness, or nausea.

4.1.4Taste

Peculiar tastes may be imparted to water by various substances such as oil, iron, chlorophenols, etc. Algae and other flora and fauna of water may decompose and give rise to unpleasant test.

4.2 Chemical pollution of water

This is probably the most striking aspect of pollution at the present time and merits more consideration. This type of pollution is divided into pollution caused by organic wastes and inorganic wastes.

By Organic waste

The grossly polluting character of many of these effluents is due to the protein content, examples being sewage, food processing, tannery and dairy wastes. Fats and oils prevent aeration of water and occur in wool washing, fat refining, and laundry wastes; but it may often be economical to recover the fat. If there are sufficient dilution most organic compounds can be broken down, but dissolved oxygen is used up during the process hence with heavy pollution putrefaction occurs and when the dissolved oxygen falls below a level of about 57 per cent saturation then fish mortality is likely to occur.

4.3 Chemical mixed waters Effect on the soil

The soil may be affected in various ways, and thus affect the crops produced on it. This latter is difficult to prove as some substances are metabolized by plants and hence undergo change, whilst others may be absorbed in small or large quantities. However, has experimented on the watering of soils, with plants in acid, neutral and alkaline, soils treated with waters which have been lime-soda softened, treated with zeolite to give various grades of water, and also with distilled water. The results produced showed that the various waters used had no detectable effect on soil reaction or plant development.

4.4 Other Effect

4.4.1Destruction of biodiversity

Eutrophication, caused by the unchecked growth of phytoplankton in lakes as a result of water pollution, depletes aquatic ecosystems.

4.4.2 Pollution of the food chain

Fishing in contaminated waterways and using waste water for agricultural and livestock production could harm human health by introducing toxins into food. Compensation in the form of compensation for the death of fish and polluted agricultural land, as well as the development of a clean water network, is granted[5)].

4.4.3 a scarcity of pure water

The United Nations estimates that billions of people worldwide lack access to clean water and sanitation, particularly in rural areas.

4.4.4 Disease

Over 2 billion people are forced to drink urine-contaminated water, which puts them at risk for cholera, hepatitis A, and dysentery, according to the World Health Organization.

4.5 Effects of improper solid waste management

Mainly as a result of inadequate waste disposal systems implemented by municipal waste management teams; the waste builds up and becomes a problem. Method of disposing of waste causes biodegradable materials to decompose in unsanitary, uncontrolled conditions. After a few days of decomposition, a foul odor develops and the area becomes a breeding ground for numerous infectious and disease-carrying insects. What's more, it additionally ruins tasteful worth of the area. Toxic metals, hazardous chemicals, and solid waste from industries are all sources. Solid wastes have the potential to have an impact on soil productivity and fertility as well as physicochemical and biological issues for humans and the environment when released into the environment. Because of increasing population and contamination of water sources, humans on this planet are completely reliant on cleaned or desalinated water. Many industrial enterprises and research groups have developed various types of desalination systems with the end objective of meeting the demand for consumable water[8)].

4.6 Methods of Disposal of solid waste and its management

There is legal provision for disposal of toxic / hazardous solid waste for hospitals, dispensaries, laboratories, bio-medical waste (Management & Disposal rule 1998), this enactment has promo regulated for disposal work toxic and hazardous solid waste from hospitals. The solid waste which is originated from Industrial units is governed by the rule. Solid waste management and disposal is hazardous handling rule 1989. Pune is a major hub for IT Industries. E-solid waste mainly constituting of old computers disguised mobiles batteries where licaium and canadium metals are used. Pune, Pimpri-Chinchwad and municipal council in the basin of Bhima River still have not developed proper system for disposal the solid waste.

4.7 USE OF 3R APPROACH

It is very rational way of solid waste management, reduction reuseds and recycle are cardinal implementation of solid waste.

- **Reduction:** The management of solid waste is continuous basis. When they will reduce solid waste in our technological procedure are bound to reduce solid waste will be treated as eco-friendly processes. Reduction of solid waste is better than solid waste. This procedure will reduce the pressure of solid waste.
- **Reuse**: The solid good products are generated from

solid waste organic solid waste if properly used can be useful for agriculture sector to maintain the fertility of the land. There is also new creation method from inorganic & organic solid wastes. Preparing for reuse is also decongesting the pressure of the natural resources.

- **Recycle:** Recycling also very economical eco-friendly way of solid waste management. Solid waste management will recycle products and by-products are also usable alternative resources of energy. But main construct of recycling is whether it is an economical physical or no.

5. Separation of Solid Waste from River

This is a better method for Solid waste management. In this method wet & dry bio-degrading solid waste and dry solid waste inorganics are divided and put separately. Accordingly, wet bio-degraded solid waste can be processed and used as a manure or in few countries it is also used for organic chemicals. As per rule 2000 Municipal Corporations should divide the solid waste divided in 3 broad categories;

a. Organic solid waste
b. Re-used after recycling solid waste
c. Inorganic solid waste

5.1 Implementation of water pollution measures in primary flows and its tributaries:

When small tributaries, small springs, confluence with big river and makes volumes flow to treatment is not economically, mechanically and logistically physical. The assessment of pollutant shall be estimated at the tributary or small springs and the efforts shall be made to water pollution in initial phase of the water flow. This system is also tried and tested in various corner of the world.

5.1.1Phyto-remediation

It is technique where Phyto-technology for filtration is used. It is also used in natural marshy land. In this technique plant roots are used. These roots absorb most of the pollutants in sewage water and provide purified water to various crops. It also plays an important role of protection in environment. This is low cost, eco-friendly, low maintenance system.

5.1.2De-Silting

De silting can be done by mechanically or manually. This alternative provides very good flow for the water and flowing water gets more surface area for dissolvement of the oxygen. In Pune, Mithi river & Mula river this system was used for prevention of water pollution. At the time of removing silt aquatic plants are also removed which also enhance, absorption of oxygen and reducing Biological Oxygen Demand.

5.1.3Mechanical Churning/Mechanical Agitation

It is a not so important system used for sewage treatment. In Bhima River to reduce the BOD it will approximately require 67.4 ton/year to need the BOD or to neutralize the BOD. Especially, Mula, Mutha, Pauna & Indrayani require such type of mechanical churning. In this system air is dissolved in river water with high pressure. After dissolving the air in water, the BOD of the aquatic system get reduces.

5.1.4Biological Re-Genuvation

Biological re-generation is very simple but time consuming and of permanent nature. It is a process to reconstruct balance of eco-system by the natural mean, which is disturb by human encroachments. Benefits of this process are one of the most eco-friendly sewage treatment systems, not so costly and easy to maintenance.

5.1.5Removal of Phytoplankton and Aquatic plants

In major portion of Mula, Mutha, Indrayani, Pauna River at many places there is a growth of aquatic plants and unwanted plant like Jalapeno. Due to these plants the oxygen dissolved in water is consumed by plants and BOD of the water increases so removal of these plants decreases proportionally biological oxygen demand. Even these aquatic plants disturb the eco-system and pose serious threats for flora and fauna.

6. Treatment of Industrial Wastewater and its Management

6.1 Treatment with brine

A technique for removing dissolved salt ions from waste streams is brine treatment. Despite similarities to desalination of saltwater or brackish water, industrial brine treatment may contain unique combinations of dissolved ions, such as hardness ions or other metals, requiring specialized equipment and methods. Brine treatment systems are frequently designed to either enhance fresh water and salt recovery or reduce final discharge for more cost-effective disposal. Additionally, brine treatment systems can be set up to reduce power, chemical, and physical footprint consumption.

Additionally, the wastewater was diluted prior to processing using the ozone method[15,16].In order to ensure that the produced water meets the requirements of government regulation, this study proposed treating the tofu wastewater using a combination of coagulation-flocculation and ultra-filtration (UF) membrane separation processes. The UF is chosen because it is easy to use, uses less energy, and is good for the environment[17].

6.2 Hydrocyclone oil separators

When wastewater enters a cyclone chamber and is spun under extreme centrifugal forces greater than 1000 times gravity, hydrocyclone oil separators are utilized. The force

causes the droplets of oil and water to separate. One end of the cyclone discharges separated oil, while the other discharges treated water for further filtration, discharge, or treatment.

6.3 Removal of oils and grease

The state of the oil suspension and the size of the droplets, which have an impact on the choice of separator technology, are crucial to the successful removal of oils and grease. Oil can be free light oil, heavy oil that sinks, or emulsified oil, also known as soluble oil, in industrial effluent. To separate soluble oils, also known as emulsified oils, from their emulsion, cracking is typically required. Typically, this is accomplished by lowering the aqueous matrix's pH.

6.4 Solids removal

Simplified sedimentation methods are used to remove the majority of solids, and the solids are recovered as sludge or slurry. Special issues arise with solids with densities close to those of water and very fine solids. In such case, ultrafiltration or filtration might be required.

7. Conclusion

Air and soil pollution are equally harmful as water pollution. Every one of them has a negative impact on the lives of both humans and animals. Germs, solid and liquid waste, and other contaminants pollute water both directly and indirectly. These contaminations change its tone, taste and fragrance and make it unsuitable for utilization. There are numerous types of contaminants in water. Physical, chemical, biological, and radiological pollution are the most significant. Each of these kinds is extremely dangerous and causes a number of diseases in animals, plants, and humans. Bacteria, viruses, and parasites are the most important pollutants. They originate from humans and animals whose wastes enter the water. Numerous diseases, including cholera, are brought on by wastes mixing with sewage or agricultural drainage water. In order to sterilize it, chlorine must be used. Acid rain is a major factor in the pollution of lakes and rivers. Sulfuric and nitric oxides are produced when sulfur oxides and nitrogen react, and its acidic water plays a role in this process. Two of the factors that contribute to water pollution are the use of pesticides and the application of fertilizers and chemical fertilizers to agricultural crops in order to accelerate their growth. The proliferation of aquatic plants and weeds in waterways contributes to the obstruction of water flow. Disease transmission also relies heavily on snail growth and stagnation. Groundwater is polluted by a lot of things; the extensive use of pesticides and chemical fertilizers, the digging of land to bury waste and industrial waste, and the rising salinity percentage brought on by the sea's intrusion are just a few examples.

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