Experimental Study On Impact of Soild Waste Effect On Ground Water And Soil Quality In Tirunelveli Corporation Dumping Station At Ramayanpatti

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Abstract - Soil and water is the vital medium in natural environment. Its pollution has grown in to global issue. The amount of solid waste increased every year and the disposal is also occur a serious problem in Tirunelveli corporation. This paper will review the study of soil contamination and underground water pollution, It's risks and surface due to the effect of solid waste dumping in Tirunelveli Corporation dumping station at Ramayanpatti village.Samples of groundwater and soil will be collected from the nearby sources like pond,lake,well and bore well of 5km surrounding of Ramayanpatti village. The sample will be tested in the laboratory to find out the composition and the results will be compared with Indian standards to find out the ill effects of solid waste dumping.

Keywords - Solid Waste Effects, Ground Water, Soil, Dumping Stations.

1.INTRODUCTION

1.1 GENRAL

Improper MSW disposal and management causes all types of pollution: air, soil, and water. Indiscriminate dumping of wastes contaminates surface and ground water supplies. In urban areas, MSW clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of MSW and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in landfills, and untreated leachate pollutes surrounding soil and water bodies. Health and safety issues also arise from improper MSWM. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants. The U.S. Public Health Service identified 22 human diseases that are linked to improper MSWM. Waste worker and pickers in developing countries are seldom protected from direct contact and injury, and the co-disposal of hazardous and medical wastes with MSW process serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also contribute to overall health problems. People know that poor sanitation affects their health, especially in developing and low-income countries, where the people are the most willing to pay for environmental improvements Accurate information in these areas is necessary in order to monitor and control existing waste management systems and to make regulatory, financial and institutional decisions.

Water resources development is essential for economic and social progress of mankind. Rapid growth of population and ever increasing living standards in India have resulted sharp rise in requirements of water resources and proper management. Since ancient times, wells have been dug or drilled into the surface to access groundwater. Prior to the development of drilling technologies, buckets were used to collect water from shallow hand – dug wells. Modern groundwater can be thousands of feet deep and allow extraction of large quantities of water with electric pumps.

Drinking water is obtained in many communities from groundwater. As water is extracted from a well, the water level within the well drops. Water in the surrounding aquifer flows towards the well causing a lowering of the water level extending outward from the well. The drop in water level is greatest immediately adjacent to the well and decreases radially outward creating a feature called the cone of depression. As pumping continues, the cone of depression extends out farther gathering water from a larger cylindrical volume surrounding the well. The expansion of the cone of depression will continue until the volume of water intercepted or drawn by the well equals the pumping rate. Besides aquifer water, the water drawn by a well can also be recharge from the ground surface, adjacent aquifers, streams, lakes or oceans. Impermeable boundaries formed by low hydraulic conductivity materials (bedrock, faults, etc.) will halt the progression of the cone of depression at their location.

Knowledge of the drop in water level and pattern of groundwater flow resulting from well pumping is necessary for assessing environmental impacts in many situations. Excessive drops in groundwater levels over regional scales can result in adverse impacts to stream flow, vegetation and the use of shallow wells. At sites of groundwater contamination, the cone of depression can expand outward from the pumping well and "capture" the contaminated water. While the well capture of contaminated water is desired with a remediation well, the situation could be disastrous with a drinking water well. In a worst- case scenario, contamination of drinking water wells can go undetected for long time periods resulting in illnesses.

I.STUDY AREA

Ramayanpatti is a significant village in Tirunelveli district. It cites 5 km north east of Tirunelveli junction. The Sewage Treatment plant of Tirunelveli Corporation and solid waste dump site are located in this village.

1.2 OBJECTIVE

The main objective of this project is to investigate the soil and groundwater in and around Ramayanpatti due to effect of solid waste dumping and treatment plant.

II CHARACTERIZATION OF WASTES

- Their sources
- By the types of wastes produced
- By generation rates and composition.

III. TYPE OF SOLID WASTE

Depending on their source the solid waste may of different such as Residential waste type

- Industrial waste.
- Institutional waste.
- Construction and demolition waste.
- Municipal services waste.

IV. CHARACTERISTICS OF SOLID WASTES

- Corrosive: these are wastes that include acids or bases that are capable of corroding mental containers.
- Ignitability: this is waste that can create fires under certain condition, e.g. waste oils and solvents.
- Reactive: these are unstable in nature, they cause explosions, toxic fumes when heated.
- Toxicity: waste which are harmful or fatal when ingested or absorb.

V. SOLID WASTE TREATMENT

Current treatment strategies are directed towards reducing the amount of solid waste that needs to be landfilled, as well as recovering and utilizing the materials present in the discarded wastes as a resource to the largest possible extent. Different methods are used for treatment of solid waste and the choice of proper method depends upon refuse characteristics, land area available and disposal cost.

- Incineration.
- Compaction.
- Pyrolysis.
- Gasification.
- Composting.

Incineration

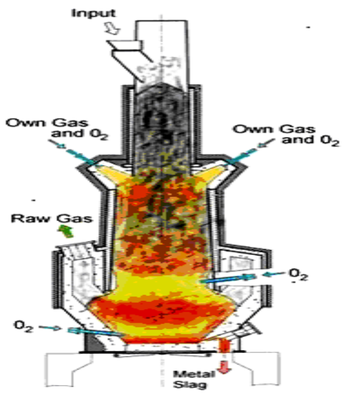
It is a controlled combustion process for burning solid wastes in presence of excess air (oxygen) at high temperature of about 1000 oC and above to produce gases and residue containing non-combustible material. One of the most attractive features of these incineration process is that it can be used to reduce the original volume of combustible MSW by 80–90%.

Compaction

The waste is compacted or compressed. It also breaks up large or fragile items of waste. This process is conspicuous in the feed at the back end of many garbage collection vehicles. Deposit refuse at bottom of slope for best compaction and control of blowing litter.

Pyrolysis

Pyrolysis is defined as thermal degradation of waste in the absence of air to produce char, pyrolysis oil and syngas, e.g. the conversion of wood to charcoal also it is defined as destructive distillation of waste in the absence of oxygen. External source of heat is employed in this process. Because most organic substances are thermally unstable they can upon heating in an oxygen-free atmosphere be split through a combination of thermal cracking and condensation reactions into gaseous, liquid and solid fraction.



Gasification

Gasification is a process in which partial combustion of MSW is carried out in the presence of oxygen, but in lesser amount than that is required for complete combustion, to generate a combustible gas (fuel gas) rich in carbon monoxide and hydrogen e.g. the conversion of coal into town gas. When a gasifier is operated at atmospheric pressure with air as the oxidant, the end products of the gasification process are a low-energy gas typically containing (by volume) 20% CO, 15% H_2, 10% CO_2 and 2% CH4.

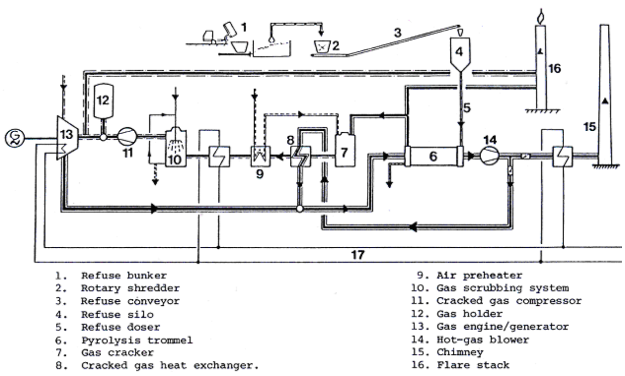


Fig.1. 2 High temperature gasification process for MSW treatment

Composting

Composting is the most responsible technical solution for many developing countries especially, where the climate is arid and the soil is in serious need of organic supplements. The composting process usually follows 2 basic steps as shown in Fig. 2.13**,** which may be preceded or followed by pre- or post treatments (crushing, sorting, humidification, mixing with other waste), etc….

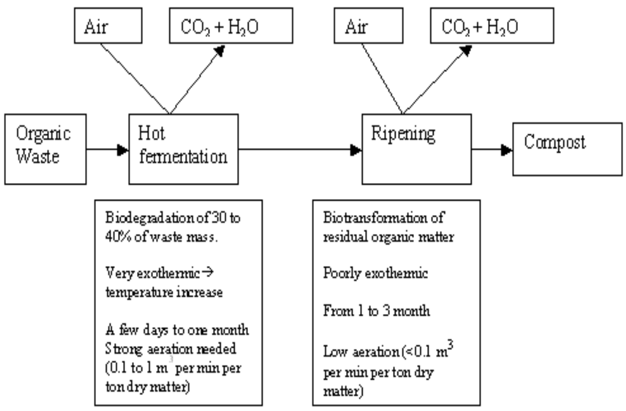


Fig. 1.3 Composting stages (pre- and / or post treatments may be needed)

VI. WASTE DISPOSAL

Landfills:- Land filling is the most simple and economical measure as far as natural decomposition occurs at the disposal site. Unscientific and ordinary Land filling is the common practice for solid waste disposal in many developing countries.

Sanitary Landfills:- Sanitary Land filling is a process of dumping of MSW in a scientifically designed area spreading waste in thin layers, compacting to the smallest practicable volume and covering with soil on daily basis. The methane (rich biogas) is produced due to anaerobic decomposition of organic matters in solid waste.

Underground injection wells:-waste are injected under pressure into a steel and concrete-encased shafts placed deep in the earth.

Waste piles:- it is accumulations of insoluble solid, non flowing hazard waste. Piles serves as temporary or final disposal□

Land treatment:- it is a process by which solid waste, such as sludge from wastes is applied onto or incorporated into the soil surface.

VII. CAUSES OF INCREASE IN SOLID WASTE

Population growth

- Increase in industrials manufacturing
- Urbanization
- Modernization

Modernization, technological advancement an increase in global population created rising in demand for food and other essentials. This has resulted to rise in the amount of waste being generated daily by each household.

VIII. ADVERSE EFFECTS ON LIVING ORGANISM DUE TO SOLID WASTE

- Populations in areas where there is no proper.
- waste treatment method..
- Children.
- Waste workers.
- Populations living close to waste dump.
- Animals.

IX. SOURCES OF HUMAN EXPOSURES

The group at risk from the unscientific disposal of solid waste include – the population in areas where there is no proper waste disposal method, especially

- Pre-school children
- Waste workers
- Workers in facilities producing toxic and infectious material
- Other high-risk group includes population living close to a waste dump and those, whose water supply has become contaminated either due to waste dumping or leakage from landfill sites.
- Uncollected solid waste also increases risk of injury, and infection.

X. POINTS OF CONTACT TO LIVING ORGANISM

There are number of point by which solid waste may be come in contact with living organism such as

- Soil adsorption, storage and biodegrading
- Plant uptake
- Ventilation
- Leaching
- Insects, birds, rats, flies and animals
- Direct dumping of untreated waste in seas,rivers and lakes results in the plants and animals that feed on it.

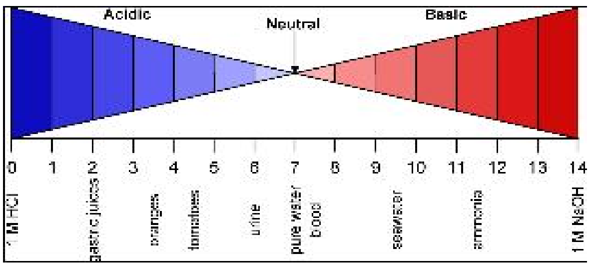
1.3 Sample collection process

Water: Sample Collection, preservation and analysis were done as per the standard methods2. Water samples were taken at each station. Three water samples were collected at different locations at Ramayanpatti Nagar. The polyethylene sample containers cleaned by 1 mol/L of nitric acid and left it for 2 days followed by thorough rinsing of distilled water. Two litres of samples were collected for the analysis. The generally suitable techniques for the preservation of samples followed as per Indian standard methods. The pH, Electrical conductivity, Total alkanity, hardness and chloride test were done at the site. Total suspended solids. nitrate, phosphate and sulphate were analysed as soon as possible.

Soil samples: Sample collection, preservation and analysis were done as per the standard methods. The representative soil samples were collected as per standard methods. The sampling of soil was done using hand augur. The augur was used to bore a hold to the desired depth and then withdrawn. The samples were collected directly from the augur. The sampling area first to be cleaned and first six inches of surface soil was removed with the radius of 6 inches around the drilling location. Begin auguring, periodically removed and deposited accumulated soil onto the plastic sheet. After reaching the desired depth slowly and carefully removed the augur from the hole and the samples were directly from the augur. The composite samples collected and they were kept in the suitable labeled container. The collected soil samples were protected from sunlight to minimise any potential reaction. The dry soil samples for various tests were prepared as per the indian standard method**.** The received soil samples dried in sun or air and the pulverization was done. The pulverised soil was passed through the specified sieve and taken for various analysis. anlysis were acidified with concentration HNO_3 to bring pH < 2.

1.4 Physical parameters

pH - expresses the intensity of the acid or alkaline condition of a solution. A pH of 7 indicates neutral conditions on a scale of 0 (acidic) to 14 (alkaline). The generally accepted range for pH in water is 6.5 to 8.5 with an upper limit of 9.5.The pH of water is measured on a scale of 0 to 14. A pH of 7.0 is neutral while pH levels below 7.0 are acidic and levels above 7.0 are basic. Each whole number difference represents a ten-fold difference in acidity. The pH of water along with alkalinity affects the solubility and availability of nutrients and other chemical characteristics of irrigation water. In general, most plants prefer slightly acidic conditions in a pH range of 5.0 to 7.0. Problems with low or high pH are exacerbated in plants grown in soil-free or small growing systems since growth media can often act to buffer pH problems. Higher water pH levels can be tolerated if the water alkalinity is not excessive. High pH (>7.0) may reduce the availability of various metals and micronutrients causing deficiency symptoms. High pH is often accompanied by high alkalinity. High pH problems can be corrected by acid injection or in some cases by using an acid fertilizer. Rainwater in PA is acidic (pH 4.0 to 5.0). Less commonly, low pH (< 5.0) may result in toxic high levels of metals like iron and manganese; this is usually found in combination with low alkalinity. Low pH problems can be corrected by switching to a basic fertilizer or liming the growing medium.



Turbidity - is a measurement of particles of matter suspended in water. These particles can be clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles. It is not a measurement of the particles themselves. In general terms, the cloudier the water, the more the light scatters and the higher the turbidity. The treated water turbidity target is 0.1 NTU (nephelometric turbidity units). Turbidity as a secondary indicator of suspended solids and is a common measurement made in surface water. It is used to determine the likely effectiveness of some disinfection processes such as ultraviolet light or chlorination that require direct exposure to the target contaminant..

NO_3 nitrogen (Nitrate) - higher levels are often an indicator of contamination by human or livestock wastes, excessive fertilization or seepage from dump sites. The maximum acceptable concentration in drinking water is 10 mg/L. This figure is based on the potential for nitrate poisoning of infants. Adults can tolerate higher levels, but high nitrate levels may cause irritation of the stomach and bladder. The suggested maximum for livestock use is 100 mg/L.

Nitrate is converted to nitrite in the body. Nitrite causes asphyxiation by entering the bloodstream and reacting with hemoglobin (the red, oxygen-carrying pigment of the blood) to form met hemoglobin, which is not able to carry oxygen to the body's tissue. Nitrate in water is approximately 10 times more soluble than in feed. Caution is needed to differentiate between nitrate and nitrate-N or nitrate as N (where only the amount of nitrogen occurring in the Nitrate is reported). Nitrate = Nitrate-N * 4.4. Nitrates can also occur naturally in groundwater at lower levels.

NO_2 nitrogen (Nitrite) - has an element of toxicity. If sampled correctly, nitrite is usually an indicator of direct contamination by sewage or manure because nitrites are unstable and can quickly be transformed into nitrates suggesting that a current and ongoing source of fecal contamination is present. Nitrates and nitrites are considered together in water analysis interpretation. The conversion of the nitrogen ion as compared to the nitrogen component within the nitrite ion (Nitrite-N) is approximately Nitrite = Nitrite-N * 3.28.

Sodium - is not considered a toxic metal. 5,000 to 10,000 milligrams per day are consumed by normal healthy adults without adverse effects. The average intake of sodium from water is usually only a fraction of that consumed in a normal diet. People suffering from certain medical conditions such as hypertension may require a sodium restricted diet, in which case the intake of sodium from drinking water could be significant. Sodium is a significant factor in assessing water for irrigation and plant watering. High sodium levels affect soil structure and a plant's ability to take up water.

Sulphate (SO_4) - concentrations over 500 mg/L can be a laxative to some humans and livestock. Sulphate levels over 500 mg/L may be a concern for livestock receiving marginal intakes of certain trace minerals. Very high levels of sulphates have been associated with some brain disorders in cattle and pigs.

Calcium (Ca)

Calcium concentrations in water are most often a reflection of the type of rock where the water originates. Groundwater and streams in limestone areas will have high calcium levels while water supplies from sandstone or sand/gravel areas of the state will typically have low calcium concentrations.

Calcium levels below 40 mg/L will typically need fertilizer additions of calcium to prevent deficiency while high levels of calcium above 100 mg/L may lead to antagonism and resulting deficiency in phosphorus and or magnesium. High levels of calcium may also lead to clogged irrigation equipment due to scale formation ($CaCO_3$ and other compounds precipitating out of solution).Water softening (cation exchange) is typically used to reduce calcium levels in water but softening for irrigation should use potassium for regeneration rather than sodium to prevent damage by excess sodium in the softened water.

Magnesium (Mg)

Like calcium, magnesium in water tends to originate from the rock and generally only causes problems when it is below 25 mg/L necessitating the addition of magnesium in fertilizer. Magnesium can also cause scale formation at high concentrations which may require softening.

Electrical Conductivity (EC or Soluble Salts)

Electrical conductivity is a measure of electrical current carried by substances dissolved in water. Conductivity is also often referred to as "soluble salts" or "salinity". As more salts are dissolved, water will better conduct electricity resulting in a higher conductivity reading. Conductivity is usually reported in millimhos per centimeter (mmhos/cm) or milliSiemens per centimeter (mS/cm) which are equivalent units.

Elevated conductivity levels in water can damage growth media and rooting function resulting in nutrient imbalances and water uptake issues. The conductivity of typical clean water is 0 to 0.6 mmhos/cm. Conductivity of fertigation solutions varies with the fertilizer concentration and salt, but generally ranges from 1.5 to 2.5 mmhos/cm. To avoid problems from excessive salts, raw water before fertilizer additions should be below 1 mmhos/cm for plugs and below 1.5 mmhos/cm for other growing conditions. Raw water conductivity above 3 mmhos/cm can be expected to cause severe growth effects on many plants.

While excessive water conductivity is a common problem in the western United States, water supplies in Pennsylvania rarely reach levels of concern unless the same soil or media is irrigated repeatedly without winter exposure to rain and snow. Treating water with high conductivity typically requires either dilution with another lower conductivity water source (e.g, rain) or advanced treatment with reverse osmosis or distillation.

Chloride (Cl)

Chloride can occur in water supplies naturally or from various activities (road deicing, gas well drilling wastes, etc.). Chloride can damage plants from excessive foliar absorption (sprinkler systems) or excessive root uptake (drip irrigation). Most plants can tolerate chloride up to 100 mg/L although as little as 30 mg/L can be problematic in a few sensitive plants. Chloride is difficult to remove from water so advanced treatment using membranes (reverse osmosis) or distillation is necessary. Dilution with low chloride water can also be used.

Potassium (K)

High potassium is generally not a concern for plant growth. Levels above 10 mg/L may indicate water contamination from fertilizers or other man-made sources. Water concentrations are useful simply for determining the overall fertilization requirements for plants receiving the irrigation water.

2.PREVIOUS WORK

2.1 GENERAL

Soil and groundwater samples were collected nearer to Pallavaram Solid waste landfill-site in Chennai to study the possible impact of solid waste effect on soil and ground water quality. The physical and chemical parameters such as temperature, pH, hardness, electrical conductivity, total dissolved solids, total suspended solids, alkalinity, calcium, magnesium, chloride, nitrate, sulphate, phosphate and the metals like sodium, potassium, copper, manganese, lead, cadmium, chromium, nickel, palladium, antimony were studied using various analytical techniques. It has been found that most of the parameters of water are not in the acceptable limit in accordance with the IS 10500 Drinking Water Quality Standards. It is concluded that the contamination is due to the solid waste materials that are dumped in the area.

A review of literature gives the various information's of the topic solid waste management, future scope and studies. Sahu Amiya Kumar (2007) experienced one such case of dumping ground on which a business hub center at Mind space, Malad (W), Mumbai situated and has become the largest center of BPO's irrelevant of understanding the health and technicality of problem arising from this dumping ground and provided solutions for it. Zaveri Chetan (2004) had challenge in the context of Mumbai lied in developing a scientifically and environmentally compatible MSW processing and landfill facilities while keeping the site specific constraints in mind.

studied the solid waste in all municipal corporations is rising in Mumbai Metropolitan region Rode Sanjay (2000). Such rise in solid waste generation was observed in Brihan Mumbai, Thane, Mira-Bhayander, Kalyan-Dombivali, Ulhasnagar, Navi Mumbai and Bhiwandi-Nizampur Municipal Corporation. An increase in solid waste is observed because of increase in urbanization, population density and income, changing food habits, taste and pattern and it was concluded that the city needs improvement in solid waste management system of MMRDA region.

The journal Environmental and Resource Economics (2001) showed main interest in the application of economic theory and methods to environmental issues and problems that require detailed analysis in order to improve management strategies. Areas of particular concern include evaluation and development of instruments of environmental policy; cost-benefit and cost effectiveness analysis; sectoral environmental policy impact analysis; modeling and simulation; institutional arrangements; resource pricing and the valuation of environmental goods; and environmental quality indicators. Special issues are occasionally dedicated to particular topics.

The journal Environmental Monitoring and Assessment (2001) focused the results of analyzed data pertaining to assessment and monitoring of risks that may affect the environment and human beings. The analysis was also synthesized with various categories of health data. The data gathered from the studies of diseases in human populations (risk factors and remedies), and toxicological ramifications obtained from the data analysis was published as well. Coverage included the steps and process of assessing risks from exposure to pollution

The Journal of Environmental Assessment Policy and Management (JEAPM) (2000) covered laws, policies and procedures for environmental assessment, including areas such as environmental impact assessment, eco-labeling, stakeholder communication and environmental tools for the financial community. Gautam *et.al* (2011) presented study done at Sewapura MSW dump site near Jaipur to assess the ground water quality in and around the study area The ground water in the study area was being polluted by percolation of toxic substances into it and also concluded that MSW dumping in the open area should be prohibited by the authorities to control the further pollution of water.

2.2 SOCIAL IMPACTS

- We can secure our human health by controlling pollution by our project.
- It creates awareness study of solid waste management.
- The main objective of this project is to create knowledge about MSW in future.

2.3 ENVIRONMENTAL IMPACTS

- To get knowledge about the soil pollution due to the dumping station.
- The open water sources and ground water pollution due to the dumping station to be examined and it will be helpful to control the water pollution.
- It helps to determine the remedy measures for agriculture land pollutions.

3. STUDY AREA

3.1 Study Area

Ramayanpatti is a significant village in Tirunelveli district. It cites 5 km north east of Tirunelveli junction. The Sewage Treatment plant of Tirunelveli Corporation and solid waste dump site are located in this village only. The village located on Tirunelveli – Sankarankoil highway Road. This is one of the important state highway road in Tamilnadu. The road connects Rajapalayam and Madurai.

The village is situated at R.L - 54.190 M (HAE) its location are 08 ^{0} 45’04” N Latitude and 77^{0} 41’ 31” E Longitude.

This village has a healthy climate, located in plain surface and surrounded agricultural lands. The maximum temperature during summer is only 40^{0} C and then the minimum temperature during winter is about 27^{0} C.

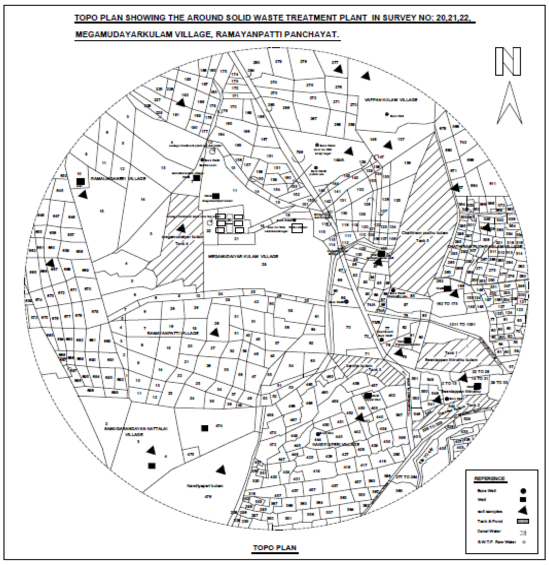
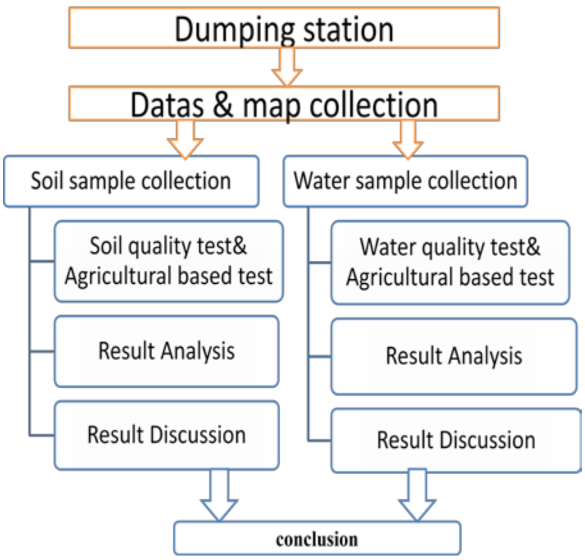


Fig 3.1 Topography plan showing the locations

4.PROPOSED METHODOLOGY



CHAPTER-5

COLLECTION DETAILS

5.3. OBSERVATION DATA

Figure 5.3.1 DUMPING AREA

Figure 5.3.2 WATER TRETMENT SITE

Figure 5.3.3 Open Dumping.

Figure 5.3.4 Treatment plant.

Figure 5.3.5 SOIL SAMPLE COLLECTION PROCESS

5. SIMULATION/EXPERIMENTAL RESULTS

5.1 RESULT ANALYSIS

5.1.1 WATER SAMPLE RESULTS

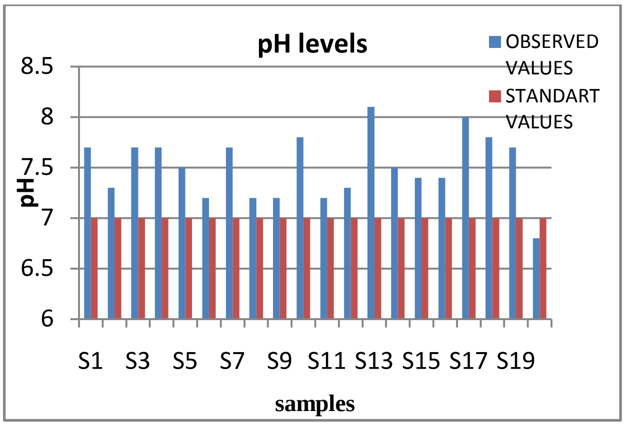
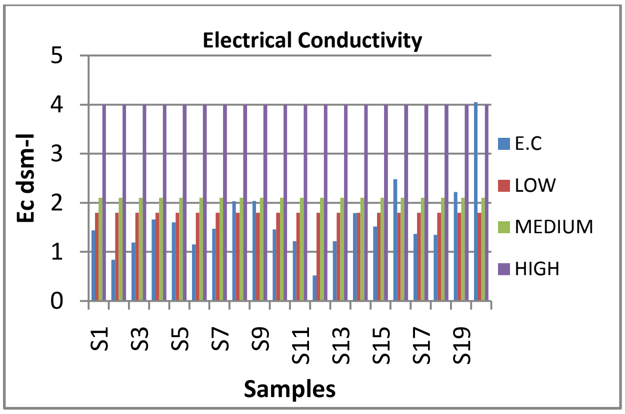


Figure 5.1.1 pH value of water



Figur 5.1.2 Electrical conductivity of water

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Note:

The value of Electrical conductivity of water is high at vepemkulam Krishna mines (S20).

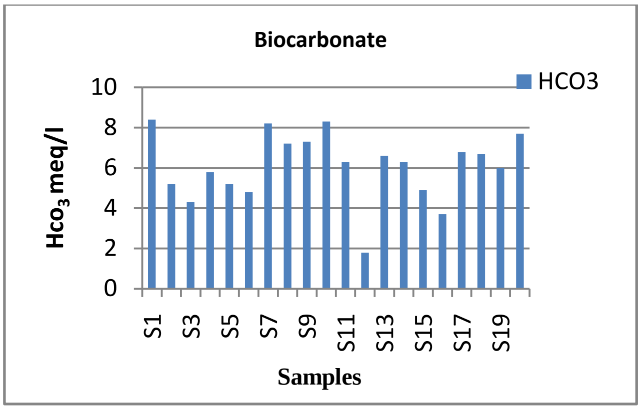

Figure 5.1.3 Biocarbonate (Hco3) in Waste Water

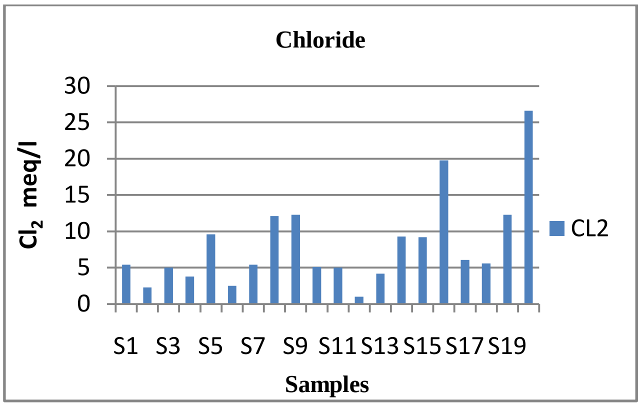

Figure 5.1.4. Chloride (Cl2) value of Waste Water

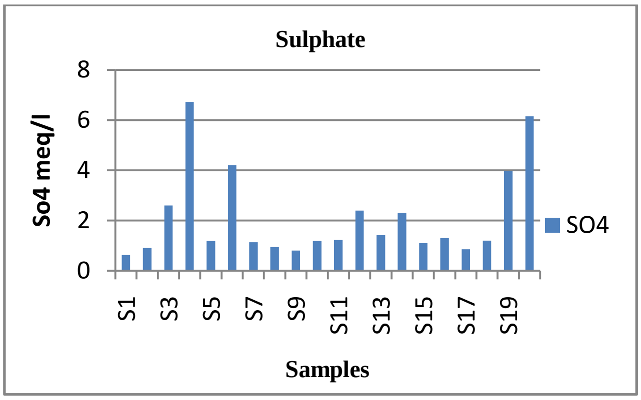

Figure 5.1.5 Sulphate (SO_4) Value for waste water.

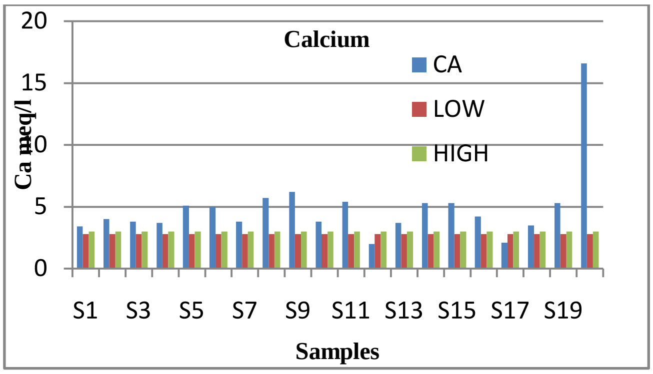

Figure 5.1.6 Calcium (Ca) value of Waste water.

Low levels

The value of Calcium of water is low at Theenerkulam well water (S12).

The value of Calcium of water is low at Chathirapudhukulam wear out site (S170).

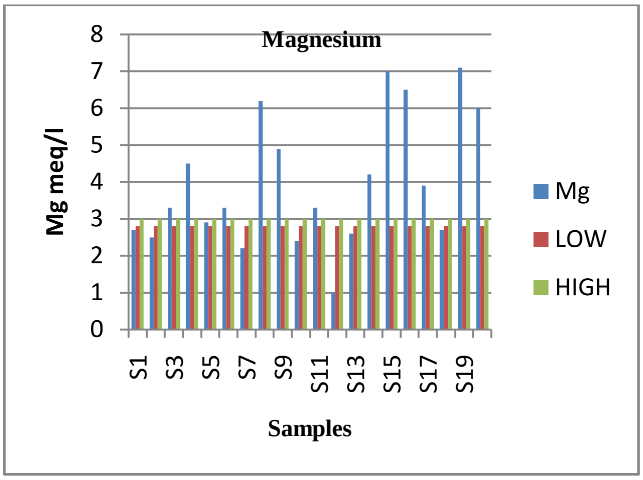

Figure 5.1.7Magnesium (Mg) Value of Waste water.

High levels

The value of Magnesium of watrer is high at Rajagobalapuram Agriculture land (S3).

The value of Magnesium of watrer is high at Kamallankulam village Agriculture land (S4).

The value of Magnesium of watrer is high at Sastha kovil megamudiyarkulam west (S6).

The value of Magnesium of watrer is high at TNVC near agriculture land (S8).

The value of Magnesium of watrer is high at Sewage pipe damage water near by tank1 (S9).

The value of Magnesium of watrer is high at Kandiyaperi pond water (S11).

The value of Magnesium of watrer is high at ChatShriampudhukulam wear out side (S14).

The value of Magnesium of watrer is high at Chathriampudhukulam Temple well water (S15).

The value of Magnesium of watrer is high at Chathriampudhukulam pond near well water (S16).

The value of Magnesium of watrer is high at vepemkulam near well water (S17).

The value of Magnesium of watrer is high at Vepemkulam krishna Mines (S20).

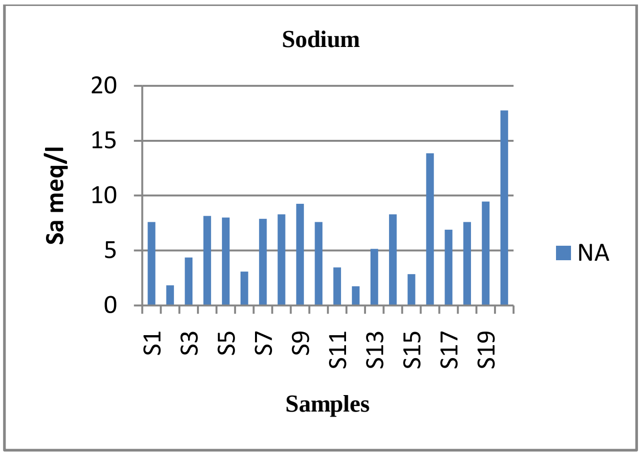

Figure 5.1.8 Sodium (Na) Value of Waste water.

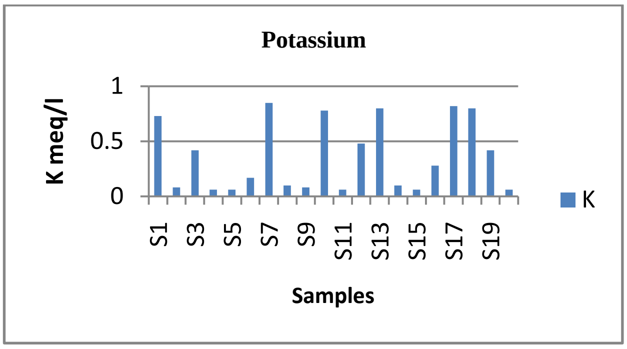

Figure 5.1.9 Potassium (K) Value of Waste water.

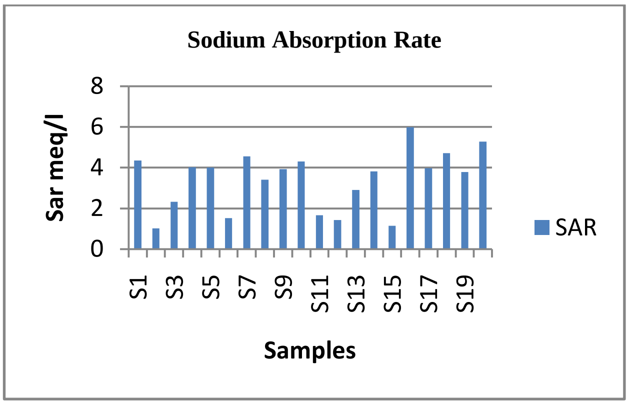

Figure 5.1.10 Sodium Absorption rate (SAR) Value of Waste Water

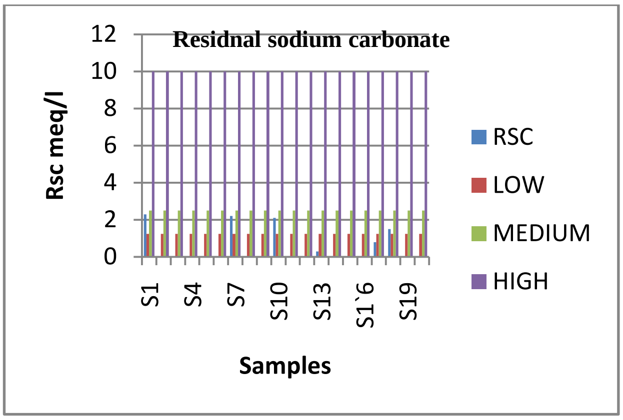

Figure 5.1.11 Residual Sodium Carbonate (RSC) Value of Waste water

5.1.2 SOIL SAMPLES RESULTS

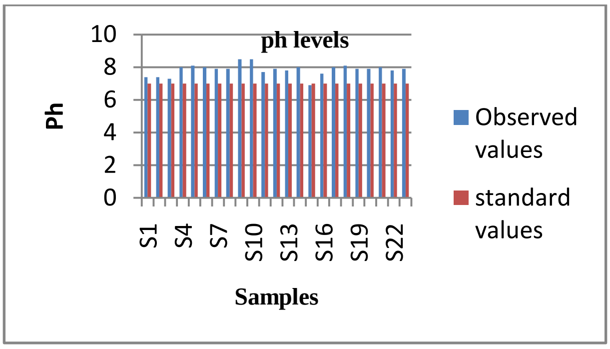

Figure 5.2.1 PH levels of Soil

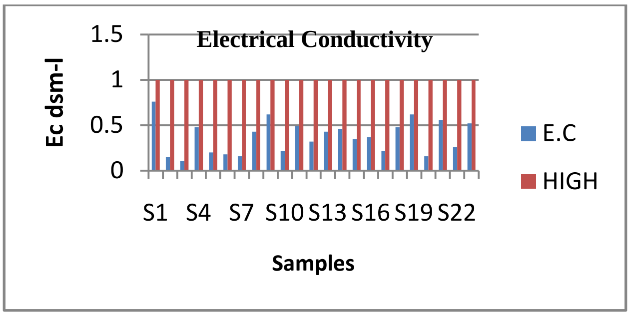

Figure 5.2.2 Electrical Conductivity Of Soil.

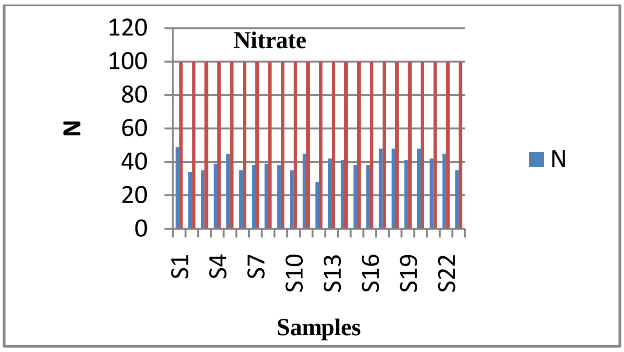

Figure 5.2.3 Nitrate Value of Soil.

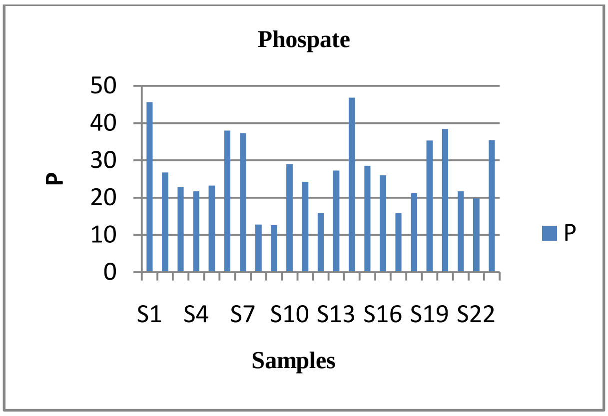

Figure 5.2.4 Phosphate Value of Soil.

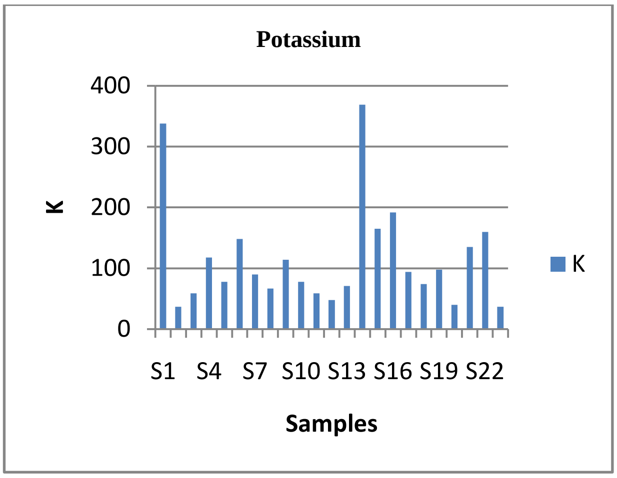

Figure 5.2.5 Potassium (k) Value of Soil.

5.2 RESULT DISCUSSION

Chemical Characteristics: pH of water samples varies from 5.24 to 6.59. The acceptable limit for the drinking water standard is 6.5 – 8.5. Since W2 does not lie in the limit, it is not suitable for drinking. The pH of soil varies from 6.3 to 7.0 and the solid waste sample varies from 6.4 to 7.3. Total alkalinity values vary from 40 mg/L to 260 mg/L. The desirable limit for total alkalinity is 200 mg/L and the permissible limit in the absence of alternate source is 600 mg/L. The total alkalinity value of water sample S2 is very lower as compared to the standard. Hardness of water sample varies from the 450 mg/L to 669 mg/L. The desirable limit for hardness is 300 mg/L and the permissible limit in the absence of alternate source is 600 mg/L. The calcium concentration varies from 107 mg/L to 169 mg/L and the magnesium concentration varies from 22.5 to 60.1 mg/L. The desirable limit for calcium is 75 mg/L and the permissible limit in the absence of alternate source is 200 mg/L. The desirable limit for magnesium is 30 mg/L and the permissible limit in the absence of alternate source is 100 mg/L. Chlorides are not usually harmful to people; however, the sodium part of table salt has been linked to heart and kidney disease. Sodium chloride may impart a salty taste at 250 mg/L; however, calcium or magnesium chlorides are not usually detected by taste until levels of 1000 mg/L are reached. The desirable limit for chloride is 250 mg/L and the permissible limit in the absence of alternate source is 1000 mg/L. All the water samples fall within the limit.

TDS is generally considered not as a primary pollutant, but it is rather used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of presence of a broad array of chemical contaminants. The values for the present water samples vary from 1622 mg/L to 1809 mg/L. The desirable limit for TDS is 500 mg/L and the permissible limit in the absence of alternate source is 2000 mg/L. The TDS levels of the water come within the limit. Total Suspended Solids (TSS) (measure of the mass of fine inorganic particles suspended in the water values) are in between 24 and 42 mg/L.

Nitrate is one of the most common groundwater contaminant. The excess levels can cause methemoglobinemia, or "blue baby" disease. Although nitrate levels that affect infants do not pose a direct threat to older children and adults, they do indicate the possible presence of other more serious residential or agricultural contaminants, such as bacteria or pesticides. Nitrate in groundwater originates primarily from fertilizers, septic systems, and manure storage or spreading operations. The permissible limit for the nitrate is 45 mg/L. The water samples are in the range of 22.35 to 26.37 mg/L. All the samples are within the permissible range. Sulfate can be found in almost all natural water. The origin of most sulfate compounds is the oxidation of sulfite ores, the presence of shales, or the industrial wastes. Sulfate is one of the major dissolved components of rain. High concentrations of sulfate in the water we drink can have a laxative effect when combined with calcium and magnesium, the two most common constituents of hardness. The sample contains the sulphate concentration in the range of 351 to 487 mg/L. The desirable limit for sulphate is 200 mg/L and the permissible limit in the absence of alternate source is 400 mg/L. The samples W2 and W3 are not suitable for drinking. Phosphorus is usually present in natural water as phosphates (orthophosphates, polyphosphates, and organically bound phosphates). Sources of phosphorus include human and animal wastes (i.e., sewage), industrial wastes, soil erosion, and fertilizers. Excess phosphorus causes extensive algal growth called "blooms," which are a classic symptom of cultural eutrophication and lead to decreased oxygen levels in creek water. The water samples contain 0.11 to 0.16 mg/L of phosphate.

Sodium is an essential nutrient. The Food and Nutrition Board of the National Research Council recommends that most healthy adults need to consume at least 500 mg/day, and that sodium intake be limited to no more than 2400 mg/day. This low level of concern is compounded by the legitimate criticisms of EPA's 20 mg/L [Drinking Water Equivalency Level (DWEL) or guidance level] for sodium. The maximum permissible level of sodium is 200 mg/L as per WHO guidelines. The present water is having higher concentration as compared to DWEL Level. The sodium level of water is ranging from 449.8 mg/L to 482.2 mg/L.

Preventive measures: Proper methods of waste disposal have to be undertaken to ensure that it does not affect the environment around the area or cause health hazards to the people living there. At the household-level proper segregation of waste has to be done and it should be ensured that all organic matter is kept aside for composting, which is undoubtedly the best method for the correct disposal of this segment of the waste. In fact, the organic part of the waste that is generated decomposes more easily, attracts insects and causes disease. Organic waste can be composted and then used as a fertilizer.

CONCLUSION

Soil samples and water samples were collected from various places around Ramayanpatti. The samples were stared and analyzed for various chemical parameters such as pH, Calcium, Magenesium, Phosphate, Sulphates etc.., The results are depicted in graphs for all the parameters analyzed. The results are compared with the standard values recommended by the Bureau of Indian Standards. From the analysis we conclude that the concentration of various chemical parameters is within the permissible limits recommended by BIS. But the concentration is nearly reached the desirable limits for almost all the chemical parameters. This indicates that the water around study area has started getting polluted. If this condition persists, this will lead to complete contamination of water bodies in the study area.

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